EAST ANGLIAN ARCHAEOLOGY

REPORT NO. 17

NORFOLK

Waterfront Excavation and Thetford Ware Production, Norwich

NORFOLK ARCHAEOLOGICAL UNIT

Norfolk Museums Service

1983

EAST ANGLIAN ARCHAEOLOGY

EAST ANGLIAN ARCHAEOLOGY

REPORT NO. 17

NORFOLK

Waterfront Excavation and Thetford Ware Production, Norwich

NORFOLK ARCHAEOLOGICAL UNIT

Norfolk Museums Service

1983

EAST ANGLIAN ARCHAEOLOGY

REPORT No.17

Published by

The Norfolk Archaeological Unit,
Union House,
Gressenhall,
Dereham,
Norfolk, NR20 4DR,

in conjunction with

The Scole Archaeological Committee Ltd.

Typed by Joan Daniells

ISSN 0307 2460

For details of East Anglian Archaeological Reports - see last page

This volume is published with the aid of a grant from the
Department of the Environment

CONTENTS

	Page
List of Contents	iii
List of Plates	iv
List of Figures	iv
List of Tables	v
Contributors	v
A WATERFRONT EXCAVATION AT WHITEFRIARS STREET CAR PARK, NORWICH, 1979, by Brian Ayers and Peter Murphy	
I. Summary	1
II. Introduction	1
III. The Excavation	4
IV. The Artefacts	11
V. Environmental Evidence	28
VI. Radiocarbon Analysis	51
VII. Extract and Documentary Reconstruction from the Enrolled Deeds 1285-1340, by Serena Kelly and Margot Tillyard	51
VIII. Historical and Topographical Conclusions	55
IX. Acknowledgements	59
THETFORD-TYPE WARE PRODUCTION IN NORWICH, by Malcolm Atkin, Brian Ayers and Sarah Jennings	
I. Summary and Introduction	61
II. Method of Study	61
III. Historical and Topographical Introduction to the Pottergate Area	64
IV. Evidence of Kiln Structure	66
V. The Pottery	74
VI. Gazetteer of Sites	91
VII. Scientific Dating Evidence	92
VIII. General Conclusions	93
IX. Acknowledgements	97
Bibliography	98
Index	105

LIST OF PLATES

Pl.I Detail of 1558 map of Norwich
Pl.II View of the Whitefriars Street Car Park excavation
Pl.III Detail of Period II brushwood surface
Pl.IV View of the Thetford ware kiln at 27 Bedford Street

LIST OF FIGURES

		Page
Fig.1	Map of probable principal routes in Late Saxon Norwich	2
Fig.2	Location of the excavation at Whitefriars Street Car Park	3
Fig.3	Period I plan	6
Fig.4	Period II Phase 1 plan	6
Fig.5	Period II Phase 2 plan	6
Fig.6	Period II Phase 3 plan	7
Fig.7	Period II Phase 4 plan	7
Fig.8	Period II Phase 5 plan	7
Fig.9	North section of the excavation	8
Fig.10	East section of the excavation	8
Fig.11	South section of the excavation	8
Fig.12	Period III plan	10
Fig.13	Period IV Phase 1 plan	10
Fig.14	Period IV Phase 2 plan	10
Fig.15	Iron and stone objects	13
Fig.16	Pottery	16
Fig.17	Pottery	17
Fig.18	Pottery	18
Fig.19	Bone objects	21
Fig.20	Bone and wooden objects	22
Fig.21	Leather	facing p. 24
Fig.22	Leather	facing p. 25
Fig.23	Leather	26
Fig.24	Leather	27
Fig.25	Leather	29
Fig.26	Percentage composition of marine mollusc samples from four East Anglian sites	35
Fig.27	Scattergrams showing dimensions of 100 fruitstones from context 84	41
Fig.28	Map to show tenements and purprestures in 1286	52
Fig.29	Site location plan and the reconstructed Saxon defences	62
Fig.30	Standard drawing conventions on plans and sections	63
Fig.31	27 Bedford Street (424N). Location plan, site plan and profile	67
Fig.32	21 Bedford Street (163N). Location plan	69
Fig.33	2-4 Bedford Street (53N). Location plan	70
Fig.34	5 Lobster Lane (336N). Location plan, site plan and sections	71
Fig.35	Cooking-pot rim types	75
Fig.36	27 Bedford Street (424N). Kiln group	78
Fig.37	21 Bedford Street (163N). Kiln group	80
Fig.38	2-4 Bedford Street (53N). Kiln products	83
Fig.39	2-4 Bedford Street (53N). Kiln-associated material	84
Fig.40	5 Lobster Lane (336N). Kiln group	86
Fig.41	Details of rouletting and waster groups	89
Fig.42	Thetford-type ware production in Norwich - interpretation plan	94
Fig.43	Suggested reconstruction of kiln, 27 Bedford Street (424N)	95

LIST OF TABLES

(All except Tables 1, 18 and 19 are on microfiche)

		Page
Table 1	Pottery sherd count by period and fabric	19
Table 2	Categories of animal bone types	
Table 3	Total number of identifiable animal bone fragments	
Table 4	Percentages of the main mammalian species	
Table 5	Description of measurements taken from the main mammalian species	
Table 6	Measurements of the main mammalian species	
Table 7	Distribution of identified fishbones	
Table 8	Marine mollusca	
Table 9	Freshwater and land mollusca from context 114	
Table 10	Diatoms and other algal remains	
Table 11	Mosses	
Table 12	Pollen counts calculated as a percentage of total pollen	
Table 13	Plant macrofossils	
Table 14	Fruits and seeds recovered by machine flotation	
Table 15	Description of timbers	
Table 16	Identified timbers	
Table 17	Soil analytical data	
Table 18	5 Lobster Lane (336N) phase summary chart	72
Table 19	Quantitative analysis of the pottery from the four kiln sites	76

Also on microfiche - Soil Micromorphology, level 30 and tree ring data (contexts (49), (78)B and (99)A)

CONTRIBUTORS

Steven J.Ashley, Dip.Memb.S.I.A.D.,
Illustrator, Norfolk Archaeological Unit

Malcolm Atkin, B.A.,
Reports Director, Norwich Survey; formerly Field Officer for Norwich

Brian Ayers, B.A.,
Field Officer for Norwich, Norfolk Archaeological Unit

Lynn Ayers,
formerly Finds and Research Assistant, Norfolk Archaeological Unit

Judith Cartledge, B.Sc.,
Research Graduate, University of Sheffield

A.J.Clark, Ph.D., F.S.A.,
Head of Geophysics Section, Ancient Monuments Laboratory

Martin Creasey,
Illustrator, Norwich Survey

Clare Goff, M.A., Ph.D.,
formerly Illustrator, Norfolk Archaeological Unit

Ryszard Hajdul, B.A.,
formerly Illustrator, Norfolk Archaeological Unit

Jennifer Hillam, B.Sc.,
DoE Dendrochronologist, Department of Prehistory and Archaeology, University of Sheffield

Sarah Jennings,
Finds Researcher, Norwich Survey

A.K.G.Jones, B.Sc.,
Research Fellow, Environmental Archaeology Unit, University of York

Phillip Judge, B.A.,
Reports Assistant, Norwich Survey

Serena Kelly, B.A.,
Documentary Researcher, formerly with Norwich Survey

Peter Lambley, B.Sc., A.M.A.,
Keeper, Natural History Department, Norwich Castle Museum

Richard McPhail, M.Sc., Ph.D.,
Research Fellow, Institute of Archaeology

W.F.Milligan,
Assistant, Archaeology Department, Norfolk Museums Service

Brian Moss, Ph.D.,
Reader, School of Environmental Sciences, University of East Anglia

Peter Murphy, B.Sc., M.Phil.,
Environmental Archaeologist, Centre of East Anglian Studies, University of East Anglia

Rob Scaife, B.Sc., Ph.D.,
Research Fellow, Institute of Archaeology

Margot Tillyard, B.A.,
Documentary Researcher, Norwich Survey, and Norfolk Archaeological Unit

Sue White, A.A.I.S., Dip.Memb.S.I.A.D.,
Senior Illustrator, Norfolk Archaeological Unit

Philip Wyn Williams, B.Sc.,
Illustrator, Norfolk Archaeological Unit

(Contributors to this report can be contacted through the Norfolk Archaeological Unit)

A Waterfront Excavation at Whitefriars Street Car Park, Norwich, 1979

by Brian Ayers and Peter Murphy

I. SUMMARY

A trial trench was sunk in 1979 south of the River Wensum and west of Whitefriars Bridge to investigate the possibility of Saxon and medieval use of this part of the waterfront. A shelving gravel beach was uncovered which had been consolidated by levels of Late Saxon brushwood matting to form a firmer surface, probably for the beaching of river craft. The evidence suggests that the area fell into disuse in the late eleventh century, presumably following commercial disruption entailed by the construction of the Cathedral Close. Medieval deposits were sparse although it is argued from documentary evidence that the construction of a quay to the north of the excavated area inhibited development on this site. Considerable quantities of leather were recovered as well as a fine bone comb and significant amounts of imported pottery.

Chronological Summary

Period I consisted of primary utilisation of the foreshore of the river above natural deposits. The occurrence of an Ipswich ware sherd together with Thetford-type and Pingsdorf-type ware would suggest the tenth century for initial occupation and usage of the area. This supposition is confirmed by radiocarbon analysis of Period I timbers (1040 ± 40 bp i.e. 910 ad).

Period II consisted of brushwood and organic deposits containing considerable quantities of Thetford-type ware as well as imported pottery, and in the upper levels numerous sherds of red-painted Pingsdorf-type. These and inferences drawn from known historical developments suggest that Period II occupied the latter part of the tenth and most of the eleventh centuries when the area was probably used as part of a commercial waterfront.

Period III deposits also contained Thetford-type wares as well as local Early Medieval wares and probably occupied the years between the later eleventh and the later twelfth centuries, the waterfront gradually falling into decline.

Period IV reflected the continued disuse of the area with deposits containing only a few artefacts, mainly early medieval material apart from residual Thetford-type ware. The lack of any recognisable medieval material indicates that the area was under-used if not disused from the early thirteenth century onwards, although documentary evidence would imply a change of use which is not reflected in the archaeological record.

II. INTRODUCTION

Responsibility for archaeological work in the City of Norwich passed from the Norwich Survey to the Norfolk Archaeological Unit in 1978 with the writer being appointed Field Officer for the city in 1979. Excavation policy is being formulated to build upon

research priorities established by the Survey, one of the primary concerns being a better understanding of the origins and nature of settlement in the Saxon and early medieval periods. Work by the Survey on various types of evidence, topographic, cartographic and documentary as well as that provided by archaeological excavation, all summarized recently by Carter (Carter 1978, 183ff), has demonstrated the piecemeal development of the Middle to Late Saxon town from a number of small settlements to a relatively homogenous unit by the early eleventh century. Whilst this work continues it is clear that some aspects of the town's history remain obscure and that only further selective excavation can help to shed some explanatory light on them. One such aspect concerns the nature of the Late Saxon waterfront, the commercial heart of the town, an area which has hitherto been generally unavailable for archaeological research. The potential of such waterfront sites is considerable as they frequently contain deep deposits with well-preserved and stratified waterlogged material, such material being of great value to the study of the early town and port.

The precise location of the Middle to Late Saxon waterfront in Norwich is open to conjecture, as the disparate nature of the early settlement in the area of the later town must have meant that much of the River Wensum, on both the north and south banks, was utilised for some waterfront activity. Late Saxon usage, however, probably concentrated near the junctions of the principal land routes through the town; that is on the stretch of river east of Fye Bridge. This area (Fig.1) was close to the north-to-south King Street/Tombland line, north of east-to-west Holme Street and was crossed by a probable north-to-south street connecting Cowgate to St Faith's Lane (Carter and Roberts 1973, 446). Trading activity may have been centred in the area of Palace Plain, immediately north of the putative Saxon burh (Carter and Roberts 1973, 445), where a spur of gravel protrudes northwards towards the river; this spur could have provided a suitable landing-place for the loading and off-loading of goods. An early name for Palace Plain was Bichil or Bycche Hyl which could indicate a hill associated with a person called Bicca or similar (Campbell 1975, 25). The church of St Martin-at-Palace is one of the few men-

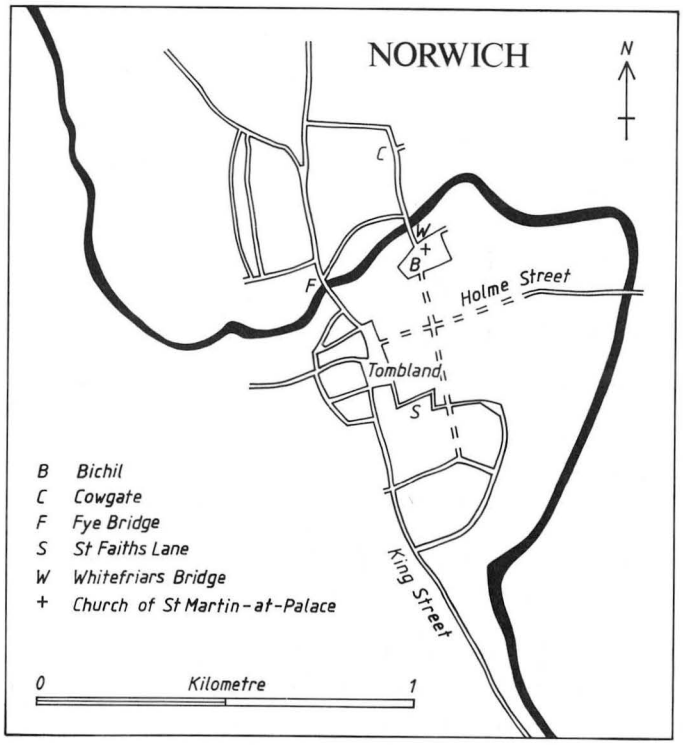


Fig.1. Map of probable principal routes in Late Saxon Norwich (after Carter 1979).

tioned by name in Domesday (Blomefield 1806, 12) and, although not clearly on a hill today, certainly enjoyed a slightly elevated position in the early medieval period being referred to on occasion as St Martin del Hille, de le Hil or super montem (Hudson 1889, 69). Its position, on the Plain and adjacent to both the river and a north-to-south road, would have been a focal point and may have been associated with a thriving waterfront.

The Site (County Site Number 421N)

An opportunity to excavate a small part of this area occurred in late summer 1979 with the proposals by Norwich City Council to erect housing upon the site of Whitefriars Street Car Park, immediately west of Whitefriars Bridge and south of the river (TG 2343 0912). Prior to redevelopment a trench was cut at right angles to the river in an attempt to sample the nature of the archaeological deposits between the river and the Plain. Unfortunately, owing to the proximity of the proposed dwellings, certain con-

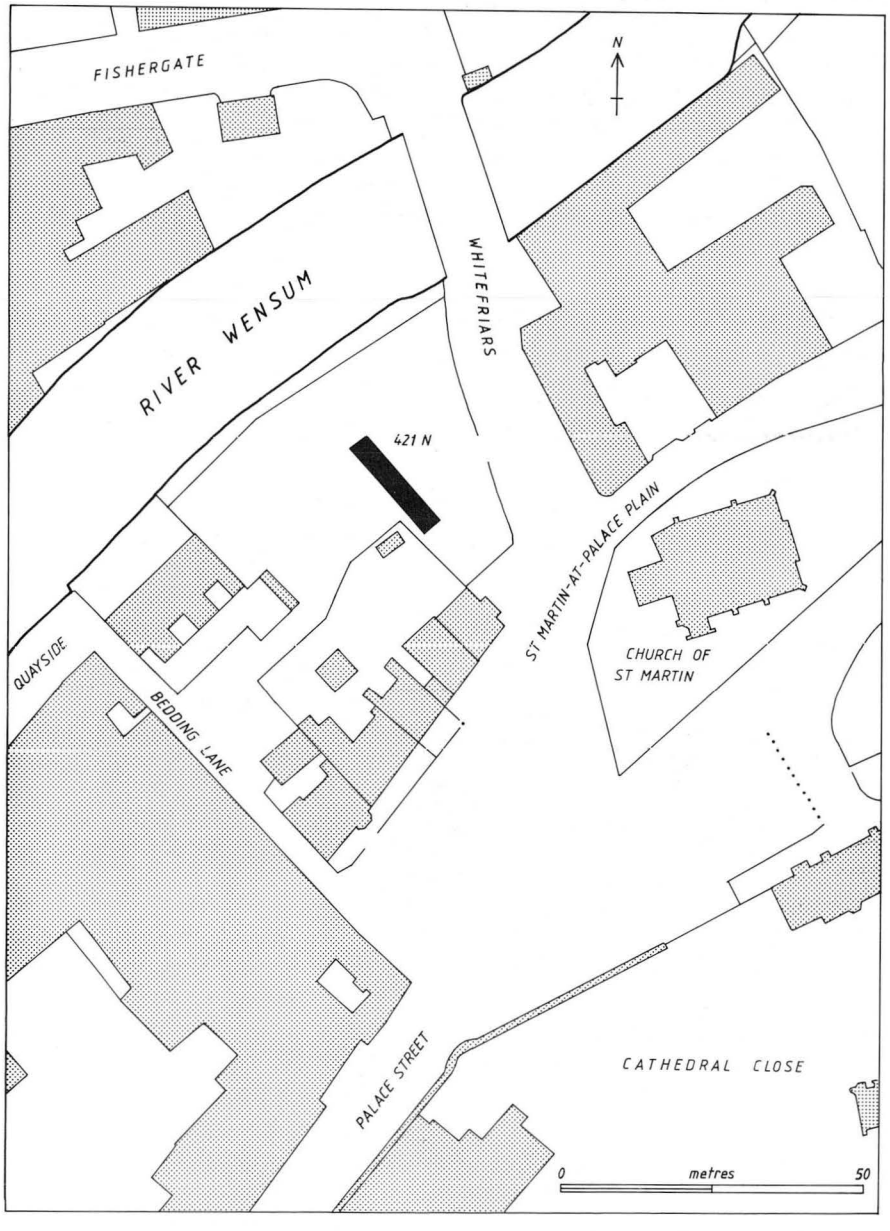


Fig.2. Location of the excavation: the trench is indicated by a black rectangle with the county site number.

straints had to be placed on the location of the excavation, effectively cutting it off from both river and Plain (Fig.2). This restriction of area affected the results as will be seen below (p.57-8).

The top 2.5 m of the 17 m long trench were removed by machine to a width of 4 m (a further 2 m length to the north was excavated to the same depth but was restricted to a width of only 2 m and had to be abandoned as unworkable). The material removed by machine consisted of brick rubble and loose debris, all post-medieval in character and containing remarkably few artefacts. The excavated trench was then shored and close-shuttered (Plate II). Hand-excavation was thereafter undertaken within an inner trench, some 1.80 m wide; it is this trench which is outlined on the plans in Figs.3-8.

III. THE EXCAVATION

PERIOD I
(Fig.3)

The natural ground surface was found to consist of sands and gravels (58) extending over the entire area of the excavation. They formed a gently-sloping beach located at a depth of 0.14 m O.D. at the south end of the trench nearest to Palace Plain and at -1.17 m O.D. at the north end nearest to the river. Given that the gravel on Palace Plain itself is known to occur at a depth of 1 m to 1.50 m, that is c. 3 m O.D., it was apparent that the entire excavation lay off the slight rise of Bichil and was situated in or near a marshy area immediately south of the river. Although excavation continued to a depth of some 40 cm through the gravel it was not possible to observe the underlying chalk as Hudson had done at Fye Bridge in 1896 (Hudson 1896, pl.II). A layer of sand with small amounts of gravel (98) had accumulated above the natural surface. This sand contained considerable quantities of animal bone. The sand thickened considerably to the north (114) where the gravel dipped (Fig.10) and here it contained abundant small traces of wood. Driven through this deposit, in the north section, was an oak post or pile (70) (Fig.9), 1.30 m long. The top was damaged but appeared to have formed a saddle. Interpretation is difficult given the lack of associated finds but, as it is likely that this part of the excavation was underwater at high tide at this period (p. 55), it may have served as a mooring post. There were also four stakes (99) (Figs.3 and 10) which had been driven into the gravel in an east-to-west line some 7.50 m to the south. These oak stakes were radially split and chamfered to a point. Radiocarbon analysis of one of these stakes would suggest a felling date in the tenth century (p. 51).

PERIOD II

This period saw the provision of artificial surfaces above the natural shelving beach. These consisted of layers of brushwood above compressed levels of straw and other organic material, laid to provide a firm, water-resistant footing. Five sub-phases of such matter could be identified and are summarized below. The location of these surfaces is seen to indicate variations in the mean high water level during this period.

Period II Phase 1 (Fig.4)

The east end of the sandy deposit was covered with a thin layer of shell (82), which also sealed the oak stakes (Fig.10), and by a gravelly layer (88). These layers were in turn overlain by an organic deposit (74) above which was a layer of brushwood matting (66). This occupied the width of the excavation but only extended north as far as 4.20 m from the south section, probably being cut further north. It had also been cut to the south by later intrusions and did not reach the south section (Fig.4). It consisted of both branches and stems of brushwood, generally laid north to south, with interlaced branches

across them. The thicker pieces were the longest, up to 80 cm being fairly common, and the whole was held in place by a combination of a silty humic loam between and under the twigs and occasional pegs (one of which is shown on the east section, Fig.10). A small group of flints placed across the matting did not serve any recognisable purpose unless they weighted the north edge. The brushwood surface itself, at the south end of the excavation and covering the upper part of the shelving gravel beach, probably lay above normal high tide levels and would only be covered by exceptional tides (p.55). It is likely that small river-craft were beached on this part of the riverbank and hauled up onto this platform, out of the range of normal high water, the matting therefore serving as a rudimentary waterfront facility.

Period II Phase 2 (Fig.5)

During the use of the Period II Phase 1 brushwood surface, an accumulation of silty material (113) took place to the north in the area generally covered by high water. A similar level (52) appeared above the brushwood itself, presumably deposited by spring tides. This began to seal the surface, rendering it useless and necessitating the laying of a second platform. However, this new brushwood surface (111) was constructed further to the north above a deliberately dumped and hard-packed organic deposit (112) (Fig.10). This second level was more sparse than its predecessor. Larger pieces were scarce, although two such did survive at the south end, and little evidence of inter-lacing or orientation could be recovered. It is indeed likely that much of the surface was removed, possibly for re-use in a later level. A large peg recovered from the underlying layer of organic material (Fig.20, No.2) may have helped to stabilise the brushwood. This organic layer also contained the complete upper of a shoe (Fig.21, No.5).

Period II Phase 3 (Fig.6)

The second brushwood surface was covered by a further layer of dense organic material (102) which formed a basis for a third brushwood mat (101) now extending at least as far as the north section. Like its predecessor it did not extend southward above the area occupied by the first layer of brushwood. Bark survived on many of the branches of this third level, which contained a well-preserved although not intact Thetford-type ware cooking pot (Fig.16, No.7). It is interesting to note that, although the layer accumulated around the upper part of the Period 1 post (70), no attempt was made to saw it off (Fig.9). Presumably it was still functional as a useful mooring station for beached vessels.

Period II Phase 4 (Fig.7)

The Period II Phase 3 brushwood surface was overlain by more organic matter (100) and (96) although these layers contained silty pockets which are probably attributable to the occasional high tide. Within these deposits was the large unidentified leather fragment (Fig.24, No.14). A fourth brushwood level (66A) lay above the organic level. This surface was better preserved than either of its predecessors in this area with many large twigs aligned north to south, interlaced with smaller cross twigs. Several flints were scattered both across its surface and within it, probably to help provide a better footing.

Period II Phase 5 (Fig.8)

The fourth brushwood surface was overlain by a humic level (93) and (86) which contained silty or sandy pockets presumably resulting from inundation by high tides. The humic level was in turn overlain by a fifth layer of brushwood (87) (Fig.10). It was sealed by a further layer of humic material (84) containing, like its predecessors, straw, organic material and pockets of silt as well as fruit and nut kernels.

Fig.3. Scale 1:50.

PERIOD 1

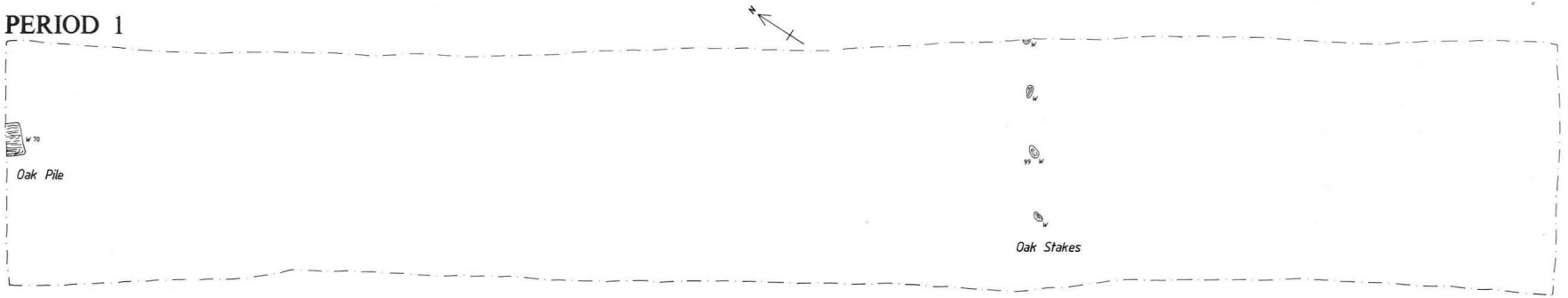


Fig.4. Scale 1:50.

PERIOD II PHASE 1

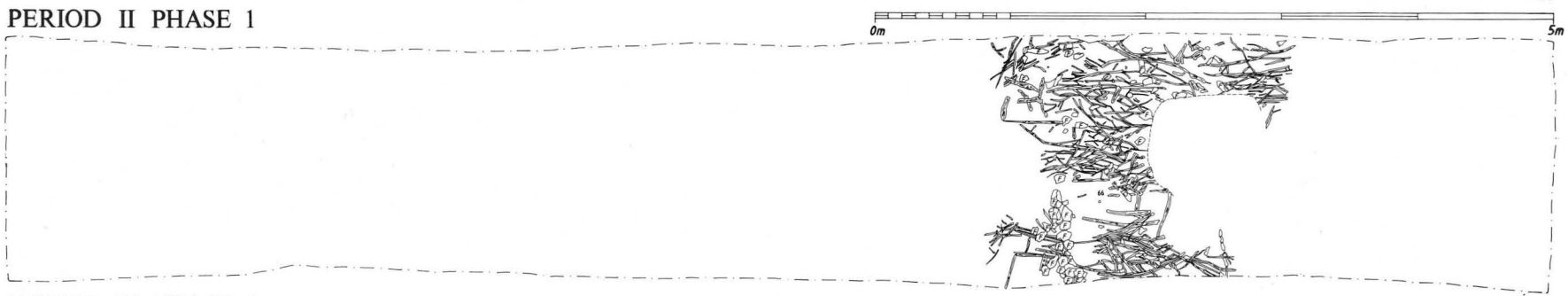


Fig.5. Scale 1:50.

PERIOD II PHASE 2

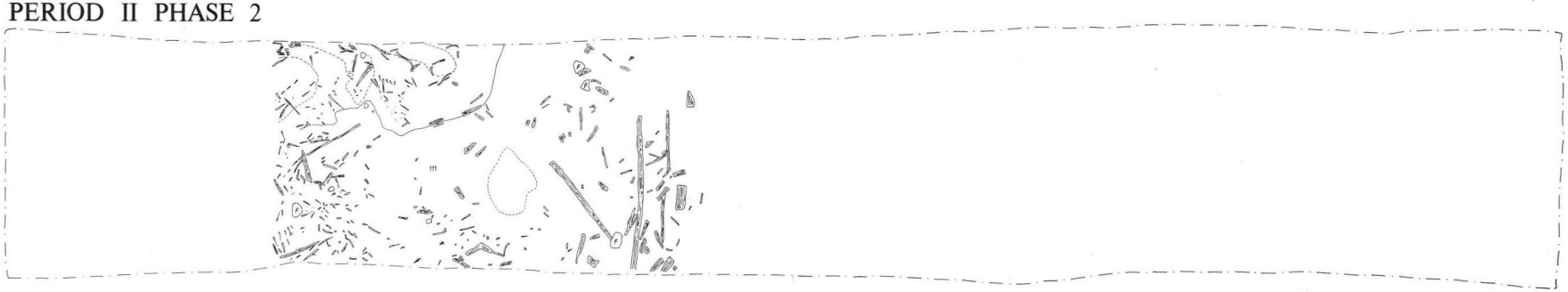


Fig.6.
Scale
1:50.

PERIOD II PHASE 3

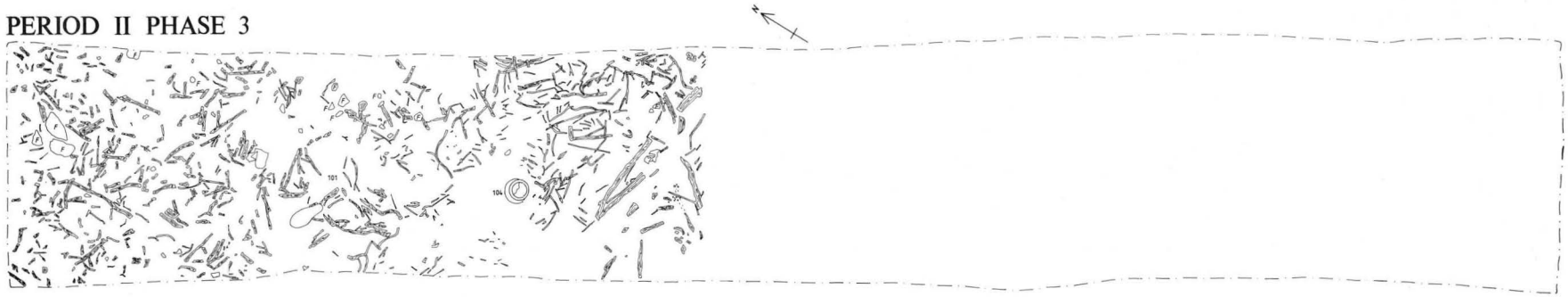


Fig.7.
Scale
1:50.

PERIOD II PHASE 4

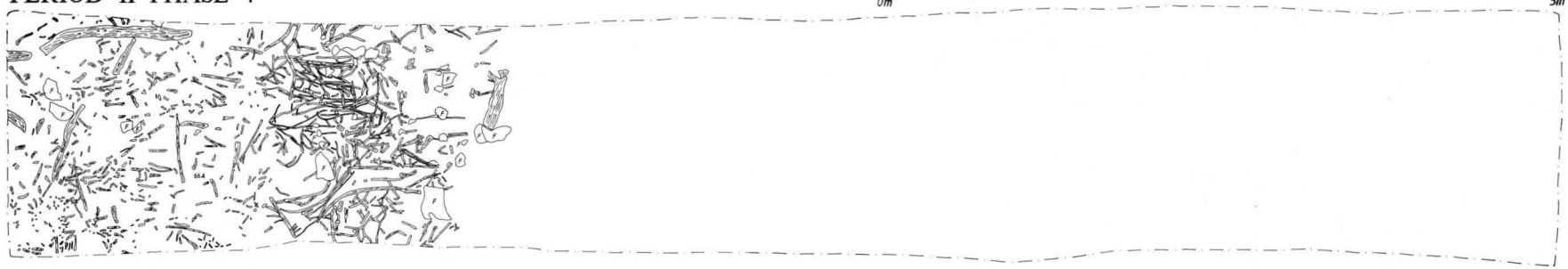
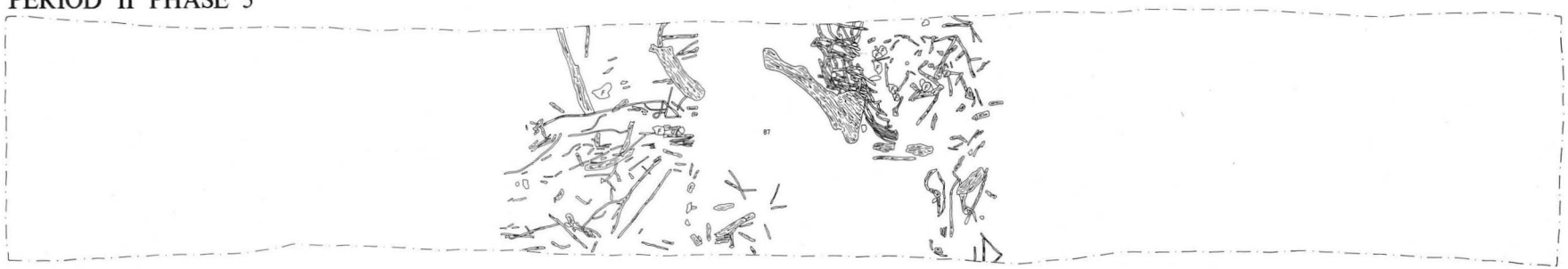


Fig.8.
Scale
1:50.

PERIOD II PHASE 5



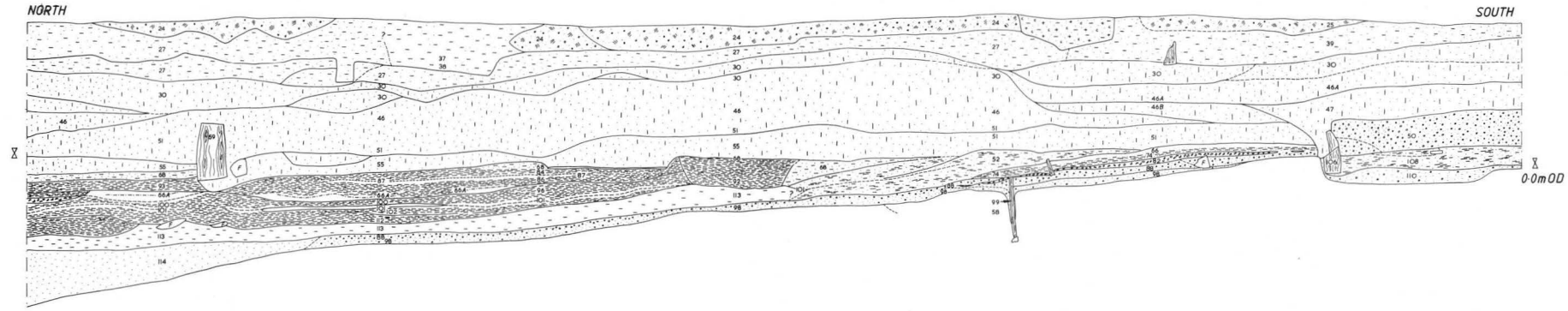
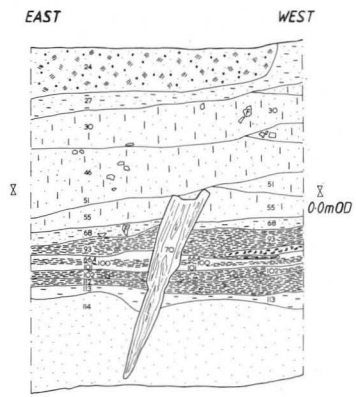


Fig.9. North section of the excavation. Scale 1:50.



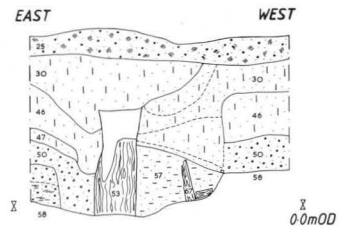


Fig. 10.
East section of the excavation.
Scale 1:50.

Fig. 11.
South section of the excavation.
Scale 1:50.

PERIOD III
(Fig.12)

With the sealing of the fifth level of brushwood matting, utilisation of this area as a working waterfront seems to have come to an end, although occupation still continued. Material still accumulated above the Period II deposits, generally due to sporadic rubbish dumping. Some silting was mixed into this material, indicating that the area remained prone to occasional floods. All the Period III deposits were very homogenous and difficult to separate during excavation. Various levels were, however, identified and can be divided into the following subphases, although layers 55, 51, 46 and 30 were each very similar in constitution. The earliest of these deposits contained material such as twigs which were probably eroded from the later levels of the preceding period.

Period III Phase 1

A sandy silt layer (68) accumulated above the top level of organic material and contained some small pieces of twig. It covered much of the excavated area and was cut by pits 72 (fills of 73; 76) and 91 (fill of 92). These were filled by humic material similar to the earlier organic levels. It was then overlain by 55, a layer similar to 68, being a black sandy silt loam in which was located an almost intact bone comb (Fig.19, No.4).

Period III Phase 2

A further pit 65 cut 55 and was probably intended for a post. Such a post may have been associated with fragments of timber also located in this phase. Of these 103 was a stake, 2.25 m in length which had been radially split and driven into the underlying deposits; 63 protruded from the west section adjacent to pit 65, and 62 was a squared stake driven through pit 72. A further pit (59) at the southern end of the excavation may have been contemporary.

Period III Phase 3

Level 55 was overlain by layer 51 (Fig.10), a sandy silt loam similar to its predecessors with some refuse within it. This layer occupied the entire area of the excavation and its silty content probably indicates that the site was subject to occasional inundation from the river. A piece of driftwood (94), found within this deposit, had been dowelled. The deposit was also cut by pit 64 (fills of 108; 110) into which was inserted a timber which had decayed (106). No associated features were located.

Period III Phase 4

Layer 51 was overlain by 46, a similar dark grey/black silty loam with less grit and containing traces of vivianite. Two pits (56: fill 57 and 77: fills 78 and 89) were cut from the top of this deposit. Each contained a large, squared oak post. That in pit 56 was badly decayed, but traces of the decayed portion survived in the south section (Fig.11). This pit also cut the Period III Phase 3 pit (64). The other timber (49) in pit 77 with a fill of 75 survived in a much better state of preservation. It consisted of a block of oak (61 cm in height) squared by an adze or shaping axe. It was set upright in the pit upon a sawn base. The post had obviously been made from a larger beam, a further part of which possibly became post 53 in pit 56. Both posts and pits are similar and it is tempting to see them serving a similar, if unknown, purpose. A third, small post (69) was also set in a pit (Fig.10). This post, also squared, lacked associations and its function cannot be determined. All these features were sealed by level 30, a dark grey silty loam with white sand grains, some stones and shell (Fig.10).

Fig.12. PERIOD III
Scale 1:50.

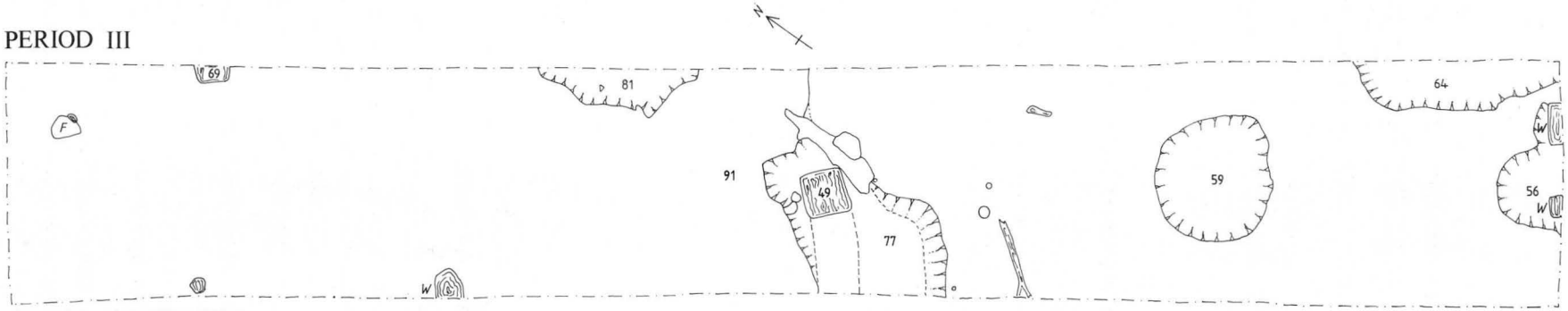


Fig.13. PERIOD IV PHASE 1
Scale 1:50.

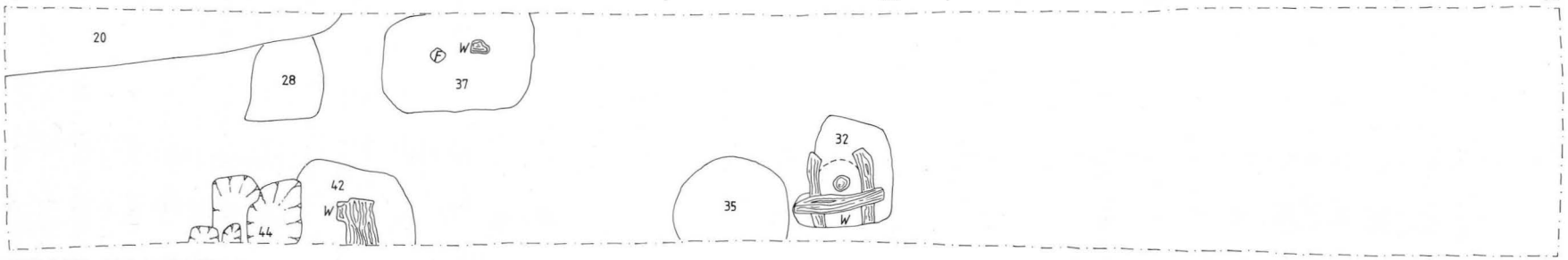
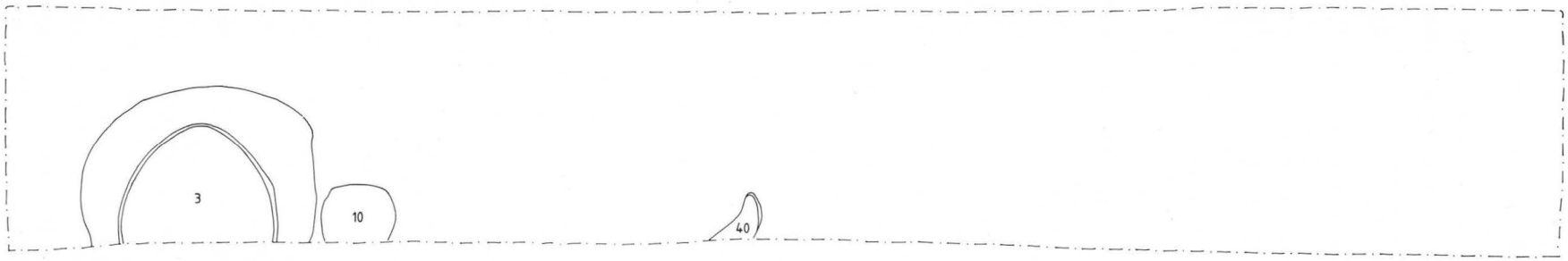


Fig.14. PERIOD IV PHASE 2
Scale 1:50.



PERIOD IV
(Figs.13 and 14)

This phase was similar to Period III in that it was subjected to haphazard rubbish disposal but the deposits were easier to define and had less organic content. The features themselves which constitute Period IV were slight. A humic silty loam (27) overlay layer 30 (Fig.10) and was cut by a shallow pit (37), part of which lay below the east section. It in turn was overlain by layer 24, a very sandy loam with patches of stone and gravel. This was cut by several pits which can be divided into two subphases.

Period IV Phase 1

Pits 35, 32, 42 and 44 (Fig.13) had no obvious function. Pit 32 was of most interest as it contained a small timber structure, consisting of three split logs grouped around a small central post. These timbers were not jointed together and no associated features were located. The other three pits were each cut by slightly later features.

Period IV Phase 2

Pit 35 was cut by feature 40; pit 42 by feature 10; and pit 44 by pit feature 3 (Fig. 14). Into pit 3 was inserted a roughly circular timber-lined feature of 1.16 m diameter, possibly a barrel. The timber, some 20 mm thick, was badly decayed and may have formed the base of a cistern, cess pit or storage pit. Feature 10 was shallow and rectangular whilst feature 40 contained the decayed remains of a hollowed-out log which, at a higher level, may have formed part of a pumping mechanism.

It was not possible to establish whether these levels were associated with buildings on the north side of Palace Plain or with structures along the river. They were overlain by post-medieval rubble used to level up the area. By necessity most of this material was removed by machine.

IV. THE ARTEFACTS

INTRODUCTION

The excavation at Whitefriars Street Car Park was essentially a trial operation, undertaken in order to assess the waterfront stratigraphy and, as such, severe limitations were imposed on the work. Hardly any contexts could be excavated in their entirety and the study of the recovered material was made more difficult by the location of the excavation, midway between the presentday course of the River Wensum and the street frontage on Palace Plain. Thus the deposits could not be clearly related to areas of occupation or usage. Further, the nature of the deposits, influenced by their location within the town, was such that much of the activity on the site had ceased by the twelfth century (p. 56) and, in consequence, few finds of later date were recovered. As on many other waterfront excavations, levels undoubtedly composed of secondary deposits were uncovered in the Late Saxon and early medieval periods, laid down either through river action or through the redeposition of rubbish and cesspit waste. Later infilling, however, did not occur on any great scale; the excavated levels did not thereby compare with deposits recovered from later medieval sites. Stratification was generally good, especially with Period II where consecutive phases of brushwood matting were recognisable, but was more tenuous in Period III where levels were extremely difficult to separate during excavation. Frequently soil had to be removed in spits, with stratification only becoming relatively clear by later consultation of the section. Period III material is, therefore, subdivided as in the excavation report but ought, for dating purposes, generally to be considered as a whole. The almost complete absence of Middle

Saxon pottery indicates that general utilisation of this area began in the Late Saxon period and radiocarbon analysis of a timber from a context associated with the earliest levels provides a terminus post quem of c. 910 ad for the material (p.51). The calculation of a terminus ante quem is more difficult although the notable dearth of late medieval and post medieval finds provides an approximate date for the greater disuse, if not complete neglect, of the area.

OBJECTS OF IRON

All the iron artefacts were recovered from Period III (Fig.19, No.1). The majority of iron objects are nails, of which eleven were recovered, four complete. These can be roughly divided into nine thin and two broad examples although there is no real uniformity. Most are squared in section with circular or sub-angular heads. All, including the broken fragments, are straight and the thinner nails account for three out of the four complete survivals. The knife blade (Fig.15, No.1) is similar to an example published from Great Yarmouth (Rogerson 1976, 164, fig.52). Fragments of two awls were recovered as well as a small chisel (Fig.15, No.4). A heckle tooth (from an instrument used for combing flax or hemp) and a fish hook complete the assemblage. Most objects were coated with vivianite, a bright blue ferrous phosphate.

Fig.15, No.1 Knife, blade only. SF23, Layer 51, Period III Phase 3
Not illustrated. Fragment, possibly of a fish-hook. Length 50 mm. SF17, Layer 51, Period III Phase 3
No.2 Possible tooth of a heckle. Square section. More complete samples are known from Thetford (Rogerson and Dallas, forthcoming). SF16, Layer 51, Period III Phase 3
No.3 Awl broken at one (both ?) ends. SF41, Layer 51, Period III Phase 3
Not illustrated. Awl fragment. 54 mm long. SF40, Pitfill 75, Period III Phase 4
No.4 Small chisel. SF8, Layer 46, Period III Phase 4
No.5 Nail, SF7, Layer 46, Period III Phase 4
No.6 Nail, SF4, Layer 30, Period III Phase 4

OBJECTS OF STONE
(Stone identification by Peter Lawrance)

One stone artefact was recovered, a large fragment of Rhenish lavaquern (Fig.15, No.1a), found in Layer 51, (SF18 Period III Phase 3). Fragments of lava were located in Periods II, III and IV. One pink, calcareous, fossil-rich, oolitic limestone with a white outer surface was found and may be from Lincolnshire, but is more likely to be an import from France, the white surface being caused by weathering (Layer 46, Period III). Fragments of shale, very fine grain quartzite, millstone grit and mudstone are probably local or regional erratics.

POTTERY
(with L.M.Ayers)

It was recognised that detailed quantitative analysis of the pottery, given the limitations of the excavation, could at best be inexact and it has not therefore been attempted. The deposits uncovered, however, were a sample, no matter how limited, of the levels to be encountered at the waterfront. The number of imported vessels in particular is sufficiently common to be of some interest, as will be seen from the incidence of sherds in Table 1. This table enumerates all the pottery recovered and enables the published catalogue to be confined to illustrated material. The full catalogue in the excavation archive holds details of every sherd of imported pottery (defined as non-local English as

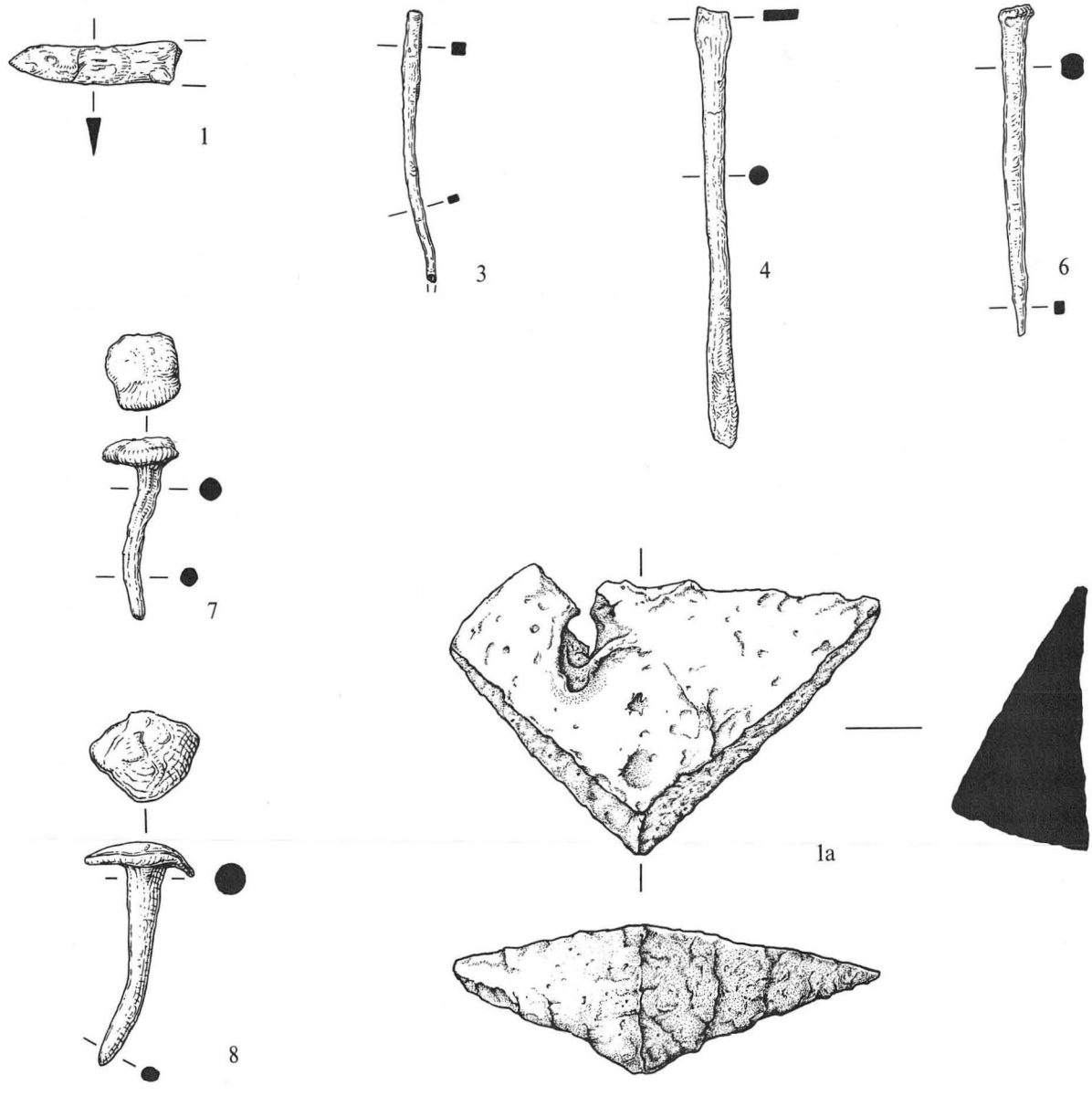


Fig.15. Iron and stone objects. Scale 1:2.

well as Continental wares) and of most rims, bases and decorated sherds of other vessels.

In the catalogue the categories and descriptions of Thetford-type ware generally follow those of Hurst (1976). However, several variations of rim form were noted and typological examples of these are all illustrated. The remaining rims and bases are published in quantitative terms on Table 1 but, in the archive, are fully cross-referenced to the typological illustrations. Typological body sherds of various wares are illustrated if decorated but other examples can also be found in the archive.

The assemblage has been used to date the excavated features wherever possible, although much of the dating has come from negative evidence, notably the lack of medieval wares. Few Middle Saxon sherds were recovered and all those that were seem to have been residual, including the sherd of Ipswich ware in Period I which was probably water-carried as it was found in a sedimentary deposit. Thetford-type ware dominates the

assemblage in all periods with little perceptive change in style. The imported material, however, is of some interest as it highlights the problems of residuality on such river-side sites. The greatest quantities of imported wares occurred in Period III when the use of the waterfront was already in decline, perhaps indicating that the area was being used for the dumping of rubbish whilst it had been kept relatively clean during the 'working' stage of Period II. The single sherd of blue-grey or Paffrath ware in Period III is perhaps the most interesting. This Rhineland pottery is not usually dated earlier than the Norman period in England and is most commonly found in twelfth to thirteenth century contexts. Its occurrence in the earliest of the post-brushwood deposits therefore emphasises the supposition that this area of the waterfront was abandoned after the Conquest.

In order to avoid unnecessary repetition in the catalogue, the principal wares recovered are described below as follows:-

Ipswich ware - this fabric has recently been summarized by Hurst (1976, 299). Basically a hard, well-fired sandy grey pottery, occasionally with a smooth or burnished surface or with grits which render the surface rough to the touch;

Thetford-type ware - hard, well-fired sandy fabric. Wheel-thrown with a grey core and a grey-black surface. Occasionally oxidised to a dull red. Wide distribution in East Anglia with several kiln sites being known in both urban and rural areas. Examples found in Norwich (with the possible exception of storage jars) may be from local kilns in the area of Pottergate and Bedford Street. Waster dumps have been observed during building work at several sites on these streets and adjacent lanes and a kiln has recently been excavated in Bedford Street (Atkin, Ayers and Jennings, this volume pp. 61-97);

Early Medieval ware (EMW) - similar to Thetford-type ware, usually slightly thinner-walled and lighter in colour with a smoother surface texture and frequently handmade. Recently discussed by Hurst (1976, 342-3);

Early Medieval sparse shelly ware (EMSS) - grey sandy ware with large sparse shelly inclusions;

Early Medieval Sandwich ware (EMSW) - dark grey sandy fabric with dull red to brown margins and dark grey to black surfaces, often with minute white inclusions;

Stamford ware - two of the Stamford ware fabrics recognised by Kilmurry (1980, 9) occur in the assemblage but are not illustrated. These are fabrics D (very sandy with quartz grains, generally medium grey) and G (slightly sandy with quartz grains and oxidised to pale pink);

Pingsdorf-type - thin walled, wheel-thrown pottery with buff-coloured surfaces. Decorated with strokes of red paint which can form a lattice decoration;

Rhenish - often Relief-band Amphora - light orange surfaces (occasionally cream inner surface) with light grey core. Often with roller stamp decoration;

Badorf ware - buff-coloured, hard, sandy fabric with grey core;

Andenne ware - pinky or cream buff fabric with yellow or orange glaze;

Limburg ware - cream buff fabric decorated with streaks of red paint.

(These are summaries of more detailed descriptions given in Jennings 1981).

Catalogue of illustrated material (Figs.16, 17 and 18)

Period II Phase 1

1. Ipswich ware stamped body sherd, probably from a spouted pitcher. Layer 88.

Period II Phase 2

All the vessels illustrated from this phase were found in Layer 52.

2. Thetford-type rim, possibly from a pitcher.
3. Unusual Thetford-type rim with an internal hollow and slight internal beading. Probably a cooking vessel.
4. Early Medieval ware rim with heavy vertical knife trimming below, forming a small, unusual, less globular vessel.
5. ? Stamford ware rim. Straight-sided, simple vessel with strip of green glaze decorating top edge of rim.
6. Rhenish body sherd, possibly from a Relief-band Amphora. Light-orange surfaces with light grey core.

Period II Phase 3

7. Thetford-type ware cooking pot encrusted with soot to well above the shoulder. Context 104.

Period II Phase 5

Nos.8-16 are all of Thetford-type ware.

8. Hollowed rim from a bowl. Layer 84.
9. Slightly hollowed rim. Layer 84.
10. Hollowed everted rim. Layer 84.
11. Storage jar body sherd with thumbed applied strip. Layer 86.
12. Cooking pot body sherd decorated with a roller stamp. Layer 86.

13-16. These are rims from cooking vessels. Layer 86.

17. Rim of red-painted Pingsdorf-type ware. Possibly from a jug or other fairly narrow-necked vessel. Layer 84.
18. Decorated body sherd, possibly of a Normandy ware. Very fine, hard fabric with a white core and cream surfaces. Layer 93.

Period III Phase 1

Nos.19-25 are all of Thetford-type ware.

19-22. These are all rims of cooking vessels. All are from Layer 55.

23. Body sherd decorated with a roller stamp, probably of a cooking pot. Layer 55.
24. Storage jar decorated with thumbed applied strips. Layer 55.
25. Simple rim, possibly from a straight-sided vessel. May slant slightly inwards. Compare with No.8. Layer 90.
26. EMSS ware base. Crossjoins with Layer 84 from which deposit it was probably disturbed. Layer 92.
27. EMSS simple rounded rim. Probably same vessel as above. Crossjoins with Layer 84 from which deposit it was probably disturbed. Layer 92.
28. Medieval cooking pot rim in a hard, grey, smooth fabric with inverted top edge. Layer 90.
29. ? Thetford-type ware body sherd. Very flat and must be from a very large vessel. Similar sherds found in excavations at Thetford (Dallas, personal communication). Layer 68.
30. Ipswich ware rim, similar to West's Group 1C (1963, 248). Pimply feel to the fabric. Layer 55.
31. Ipswich ware rim, slightly distorted. Layer 55.
32. Base of sandy grey fabric glazed on outer surface with an all over, thick, dark-green glaze. Probably an English ware. Layer 90.
33. Handle, possible Rhenish. Exact source unknown. Grey ware, cream surface.

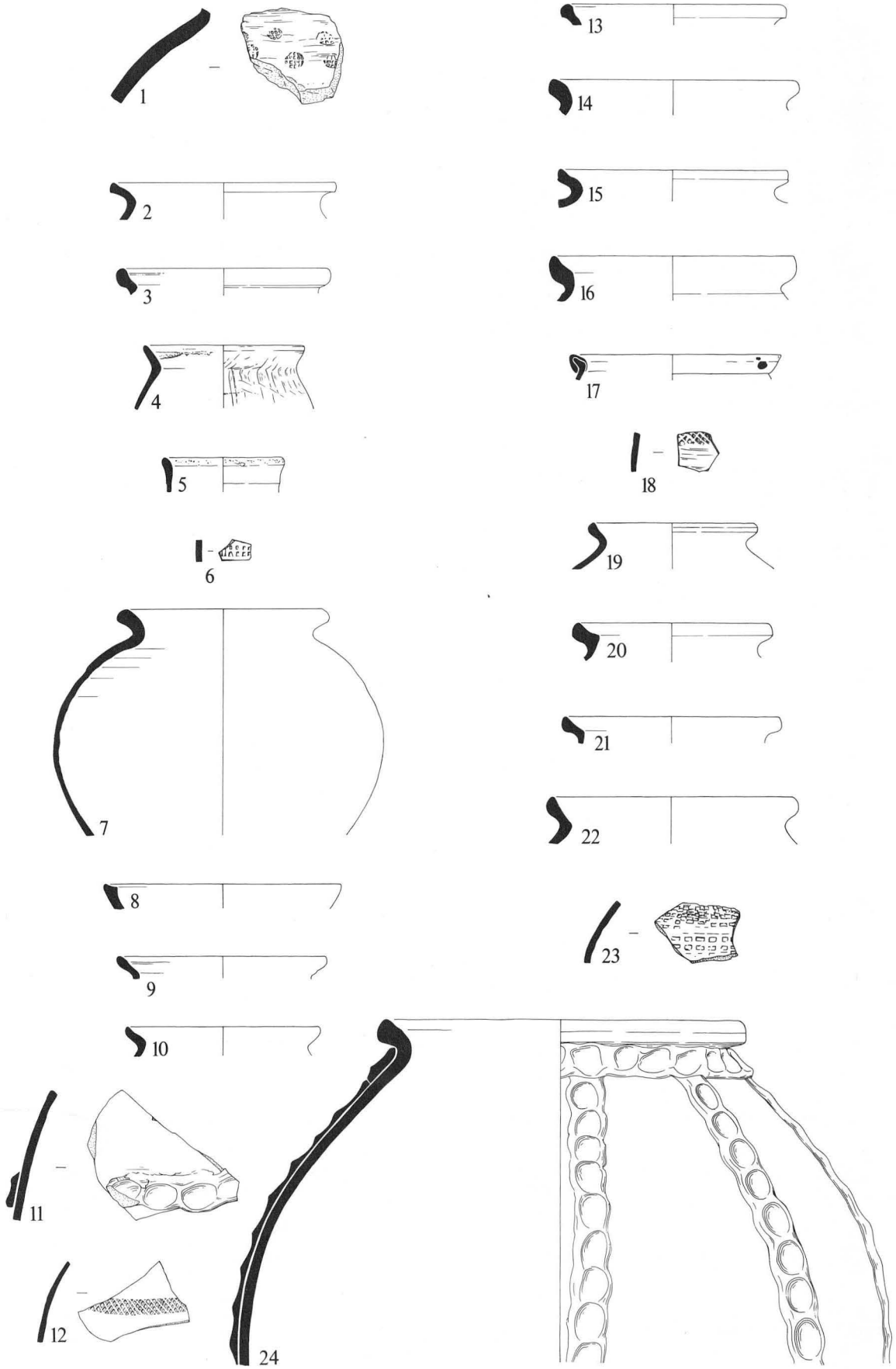


Fig.16. Pottery. Scale 1:4.

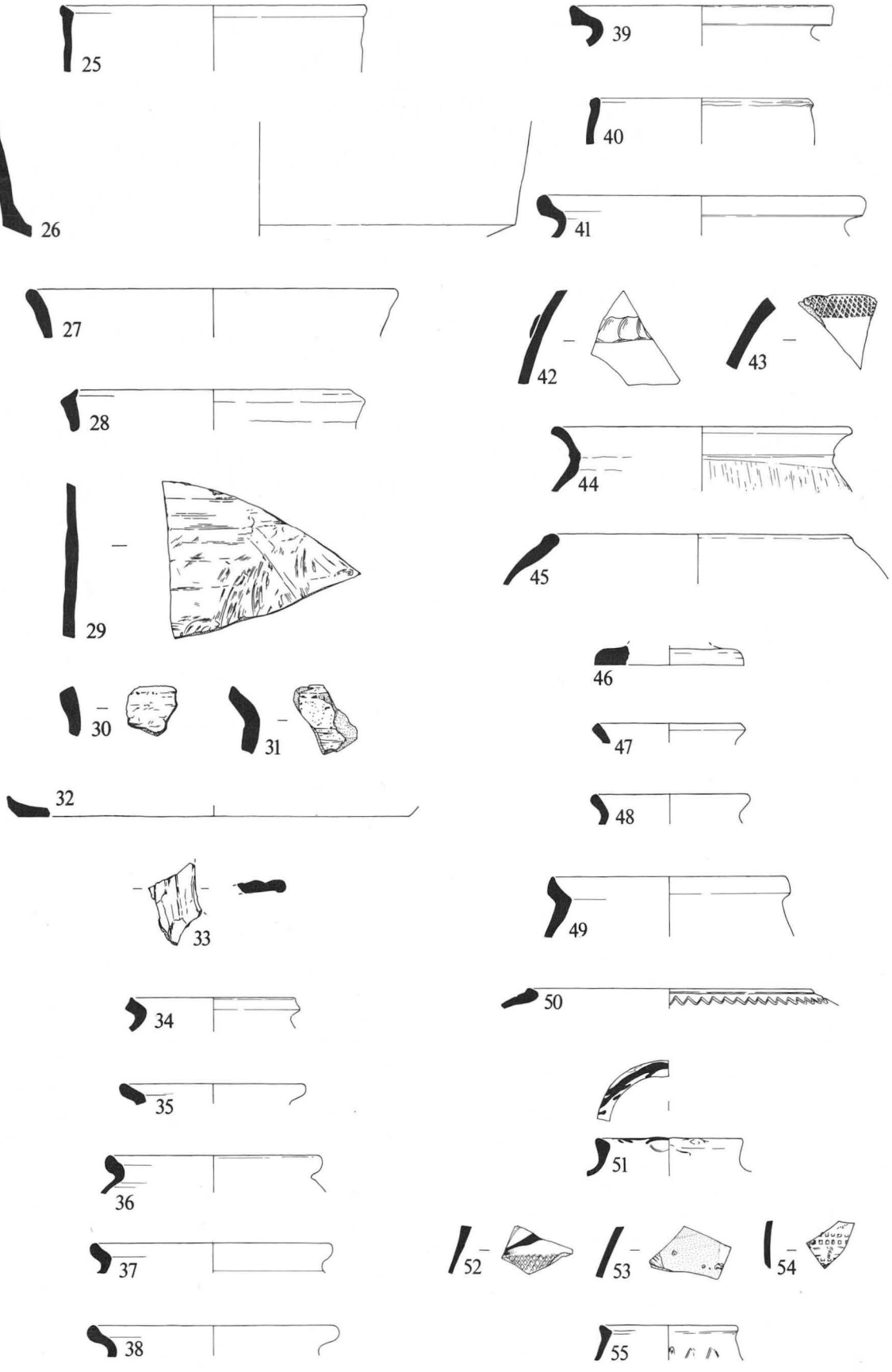


Fig.17. Pottery. Scale 1:4.

Small gritty inclusions give a pimply feel and appearance to the fabric. Layer 55.

Period III Phase 3

All the vessels illustrated from this phase were found in Layer 51.
Nos.34-43 are all of Thetford-type ware.

34-41. These are all slight variations of rim forms, generally from cooking vessels. The angle of No.40 is possibly more acute.
42. Early Medieval storage jar decorated with thumbed applied strip.
43. Cooking pot body sherd decorated with a roller stamp.
44. Simple everted rim in a fabric similar to Thetford-type ware with slight collar, some burnishing and vertical wipe.
45. Early Medieval inverted round rim of a ginger jar.
46. Base in sandy grey fabric, well-made with all over dark green glaze on outer surface. Probably an English ware.

Period III Phase 4

Nos.47-49 are all of Thetford-type ware.

47-49. Three rims of cooking vessels. Layer 75.
50. Early Medieval rounded rim of a ginger jar with wavy incised line. Layer 46.
51. Limburg ware rim from a fairly narrow-necked vessel decorated with red paint. Layer 30.
52. Limburg ware body sherd decorated with red paint and a roller stamp. Layer 30.
53. Andenne ware body sherd with pinky/buff fabric and orange glaze with random yellow patches on outer surfaces. Layer 30.
54. Unidentified ware but possibly from Northern France or Meuse Valley. Body sherd of pinky, light orange fabric with light grey core. Decorated with a roller stamp. Layer 48.
55. Unknown ware but possibly Northern France. Rim of grey sandy ware. Simple slightly hollowed rim form. Outer surface and edge of rim glazed with all over greeny-grey glaze. Crudely incised wavy line. Layer 46.

Period IV

56. Reinforced rim of Thetford-type ware jar. Layer 21.
57. Medieval cooking pot rim in a hard, grey, smooth fabric. Layer 21.
58. Probably local Early Medieval ware in a light grey fine sandy fabric. Two body sherds decorated with criss-cross incisions (only one illustrated). Layer 24.

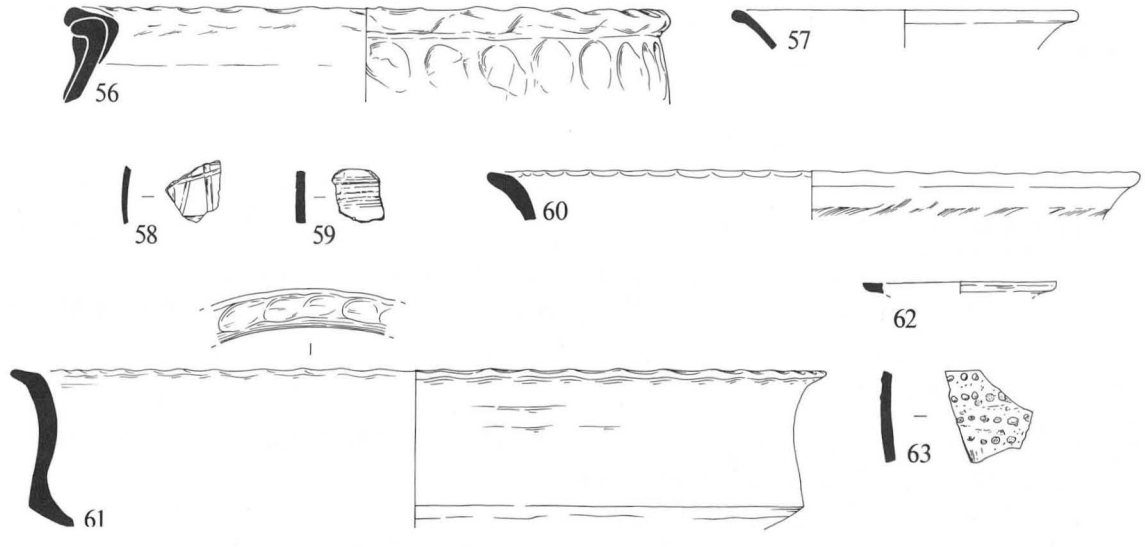


Fig.18. Pottery. Scale 1:4.

TABLE 1. POTTERY SHERD COUNT BY PERIOD AND FABRIC

WARES	PERIODS AND PHASES											Total by Fabric	% of Total
	I	II.1	II.2	II.3	II.4	II.5	III.1	III.2	III.3	III.4	IV		
Ipswich	1	1					3					5	0.40
Thetford	1	10	57	7	3	94	340	53	206	133	110	1014	77.29
Stamford			1						2	3		6	0.18
EMSS			1			8	20		2	1	6	38	2.91
EMSW										4	1	5	0.40
Shelly							1					1	0.08
EM ware			1					1	1	10	9	22	1.69
Med.CP						2	2			7		11	0.86
Uniden.local			3			1	9	3	5	14	4	39	2.99
Uniden.English							1		2	1	2	6	0.48
Rhenish + RBA		2	1				1					4	0.32
Badorf			1				1	1	2			5	0.40
Pingsdorf	1					25	88*		1	4		119	9.09
Andenne			1							2	9	12	0.93
Normandy						1						1	0.08
Paffrath							1					1	0.08
Low countries									4			4	0.32
Limburg										4		4	0.32
Rouen copy											1	1	0.08
Uniden.import								1	1	5	1	8	0.62
Post.med.											6	6	0.48
Total by phase	3	13	66	7	3	131	467	59	226	188	149	1312	100.00

% of Continental imports in the assemblage - 12.10
% of non-local imports in the assemblage - 0.84

Total no.of sherds	Total %

Glossary

EMSS - early medieval sparse shelly ware
EMSW - early medieval sandwich ware
EM ware - Early Medieval ware
Med.CP - Medieval cooking pot
RBA - Relief-band Amphora
* - this total is inflated as it probably represents only two vessels

59. ? Early Medieval ware body sherd. Sandy fabric with quite large gritty inclusions. Grey core and inner surface. Outer surface orange brown. Decorated with a combed band of incised parallel lines on outer surface. Layer 24.
60. Rim of ? Early Medieval ware. Slight internal thumbing and traces of an exterior wipe. Layer 24.
61. Bowl of Early Medieval ware. Oxidised with traces of post-fractural burning. Layer 27.
62. Rim of oxidised orange coloured sandy fabric with all over dark green glaze on outer surface. Probably English. Layer 27.
63. Possibly an English copy of Rouen ware. Smooth grey-brown inner surface with grey core. Outer surface has thick reddish-brown and green glaze with regular applied yellow glazed pellets. Traces of burning. Layer 25.

OBJECTS OF BURNT CLAY

Fragments of brick or tile were found in deposits of Period I, Period II Phases 2 and 5, Period III Phase 1, 3 and 4, and Period IV. It may be reused Roman material or possibly imported ballast. Burnt daub was located in Period II Phase 1 and Period III Phases 1, 3 and 4. Impressions of wattle were visible and traces of thonging or straw could be seen on the Period II Phase 1 example. Similar material has been recently published from North Elmham (Wade-Martins 1980, 483-4) and Bedford (Baker and Hassall 1979, 258).

OBJECTS OF BONE
(bone identification by Peter Lawrance)

Seven worked bone objects were recovered, all from Periods II and III, and all of them are illustrated. The assemblage contains decorated strips, a composite comb, an antler point and two perforated pins.

Fig.19, No.1 Strip squared and decorated with parallel incised lines cut diagonally. Decorated surface polished, underside rough. Pierced by small bone pin. Probably made from metapodal of a horse or cow and used as a mount. SF58, Layer 74, Period II Phase 1.

No.2 Perforated pin or needle shaped and smoothed from fibula of a pig. Point broken away. SF49, Layer 52, Period II Phase 2.

No.3 Strip squared and decorated with parallel incised lines cut diagonally. Decorated surface polished, underside rough, except for one edge which has been smoothed. Pierced by small hole at one end, possibly for a bone pin. Probably formed from metapodal of a horse or cow and used as a mount. Very similar to No.1. SF64, Pit or depression 91, Period III Phase 1.

No.4 Almost complete single-sided composite comb (nomenclature follows Galloway 1976, 154-6). Consists of seven teeth segments between two connecting plates and held by five iron rivets. Both connecting plates have a decorated panel located off-centre with parallel incised lines cut diagonally and cross hatched. Each end of the decorative motif is terminated by four vertical lines. The base of each connecting plate has nicks where the teeth were cut after assembly (see Addyman and Hill 1969, 75-6 for constructional details). The teeth, which are coarse, seem to have been cut by a right-handed craftsman, the nicks on each of the connecting plates occurring on the right-hand side only when the comb is inverted and held either in the left hand or in a clamp to the left. All the bone elements in the comb are polished by wear, especially the connecting plates. Similar combs from Clifford Street, York can be dated to the late tenth or eleventh centuries (Waterman 1959, fig.16) as can combs from Thetford (Rogerson and Dallas forthcoming fig.186, nos. 2 and 6). Probably made from antler of Red Deer. SF29, Layer 55, Period III Phase 1.

Fig.20, No.5 Perforated pin or needle shaped and smoothed from the fibula of a pig. Traces of vivianite adhering to sides of perforation. SF56, Pitfill 75, Period III Phase 4.

No.6 Antler point from tip of tine of Red Deer. Smoothed outer surface. SF22, Layer 30, Period III Phase 4.

No.7 Fragment of strip with irregularly-spaced incised lines and a small hole containing traces of a nail or rivet. Squared from a rib, possibly that of a cow, with the decorated face smoothed, the underside rough. Probably part of a knife handle. SF13, Layer 46, Period III Phase 4.

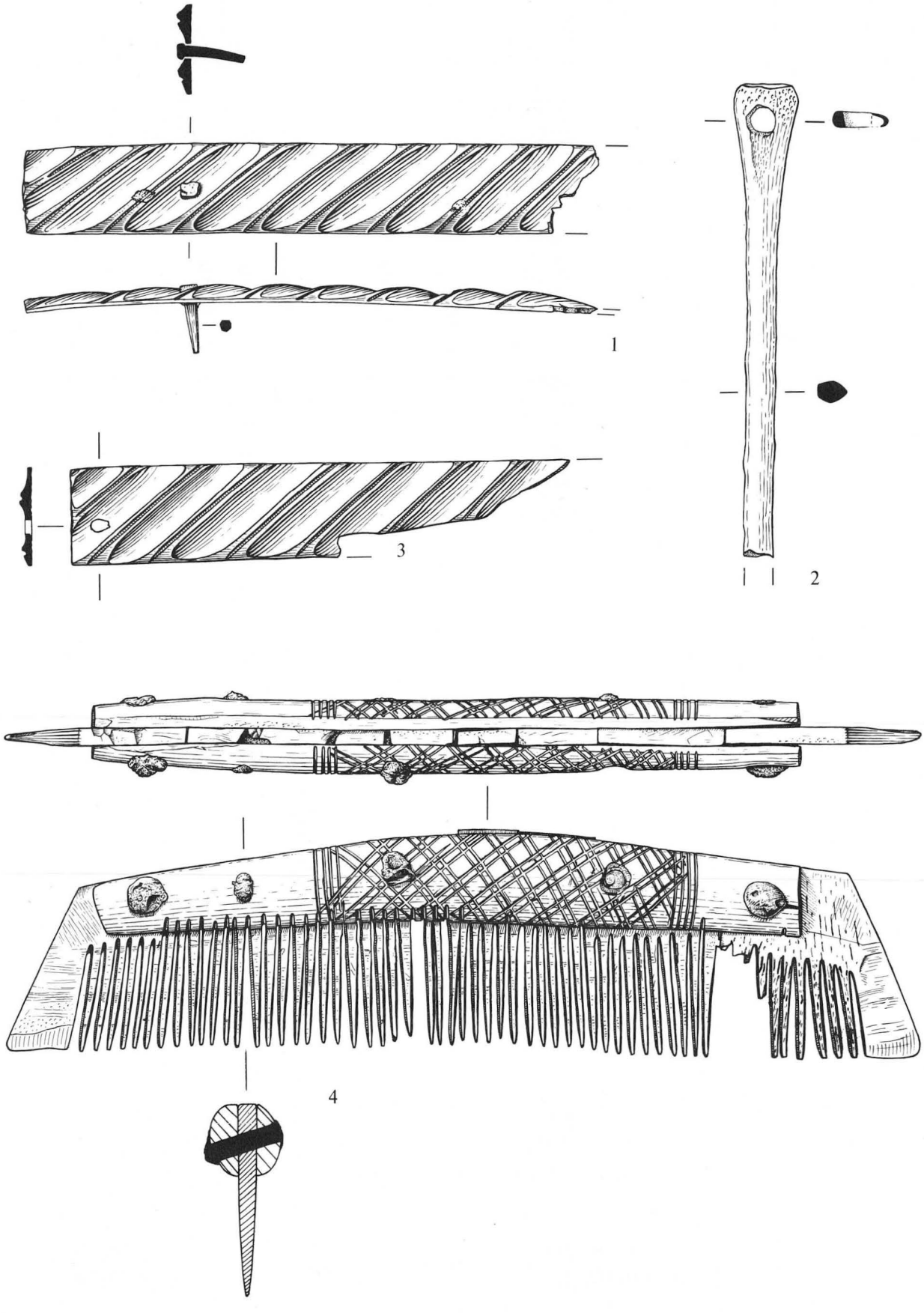


Fig.19. Bone objects. Scale 1:2.

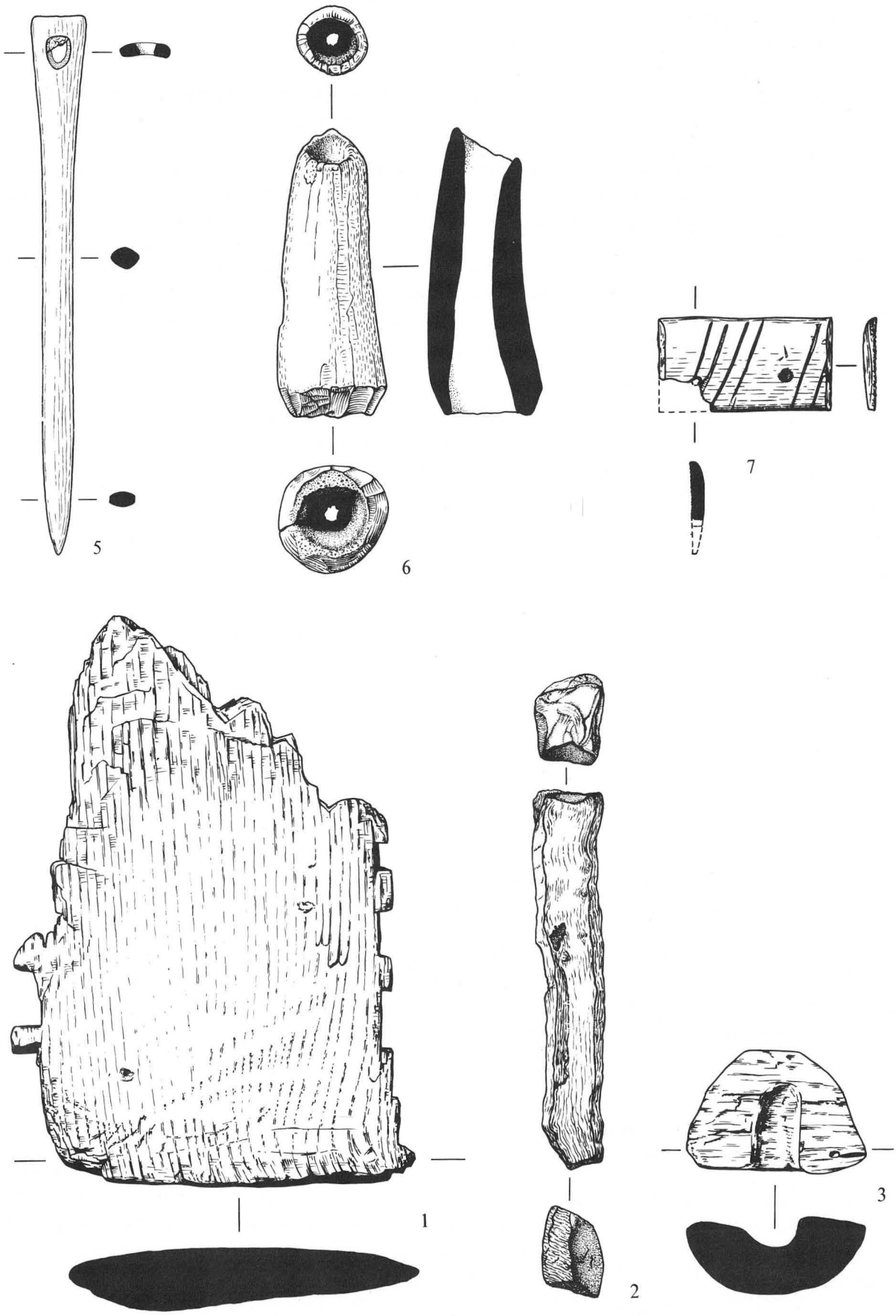


Fig.20. Bone and wooden objects. Scale 1:2.

OBJECTS OF WOOD
(wood identification by Karen Wardley)

Only three worked wooden objects, all of Period II Phase 2, were found (excluding stakes and posts). The recovery of the bowl core suggests local lathe-turning.

Fig.20, No.1 Rectangular fragment of oak (Quercus sp.). Heavily burnt on one side with severe charring at one end and scorching at the other. Notches on both long sides were possibly parts of dovetail or rabbetted joints. The objects may have formed part of a box which was thrown into a fire. The illustrated face would thus be the inside of the box, generally unburnt due to protection from the box base and/or the contents. Flames would lick the top of the box causing the charring but only scorch the bottom. Layer 113.

No.2 Shaped wooden peg of oak (Quercus sp.). Possibly used to secure brushwood surface. Layer 112.

No.3 Ash (Fraxinus excelsior) core of curved conical type from a turned bowl. Broken by withdrawal of mandrel after turning. Similar objects are known from excavations of Anglo-Scandinavian levels in York, most recently at Coppergate (Macgregor 1978, 51-52). This example is very similar to a split core from the Saxon levels at Portchester castle (Cunliffe 1976, 224). Layer 52.

OBJECTS OF LEATHER

The published leather material, with one exception, was recovered from Period II contexts, generally in the humic layers of redeposited dung and organic waste which formed the footings of the brushwood surfaces. The exception, No.16, was from a deposit which partly filled a Period III pit or depression, but which may have been residual from Period II. All the recognisable leather items appear to be of cow hide and are here catalogued. Offcuts are generally omitted except where they are clearly fragments or reused waste items or were found in association with one of the published items. Most of the offcuts are shoemaking and cobbling waste, consisting of strips and characteristic triangular pieces. They, like the published objects, also predominate in Period II, and those few from Period III are from pits where the fill seemed to be composed of residual material (e.g. around Period III Phase 4 post 49). A few fragments only were recovered from Period I. No leather was found in Period IV.

The shoe parts generally seem to represent cobbler's waste, as several of the shoes recovered have been cannibalised for leather. A similar careful attitude has recently been noted from material in Durham (Carver 1979, 31). The preponderance of uppers is interesting although perhaps merely reflecting that soles wore out more rapidly. Some of the waste was that of shoemaking rather than cobbling consisting of the unusable scraps of edges of hide from which shoe parts were cut.

The shoes are all of turnshoe construction, a technique thought to be a Saxon introduction to England (Thornton 1973, 47). They have a single sole (grain side to the ground) and an upper made in one piece (grain side up); they all lacked heel stiffeners, in common with similar shoes from York (Thornton and Goodfellow 1956-8, 525). The shoe was made inside-out, the inside quarter and vamp wing of the upper being sewn together and the top edge of the upper occasionally whip-stitched for reinforcement or for a binding. The sole was then attached by thonging or stitching and the shoe turned the right way around. Thonged shoes are unlikely to be post-Conquest in date (John Thornton, personal communication) and the recovered examples thus provide additional dating evidence for the Period II brushwood surfaces. All the shoes are low ankleboots and were generally held on the feet by lacing around the ankle, through slits purpose-cut in

the leather. Many similar examples are known from Winchester (Swann 1973, 17). One boot (No.7) may have been held by flaps over the ankle. Two examples (No.5 and No.7) have 'V'-shaped gussets in the rear of the upper which would have been filled by an upturned pointed sole. A restitched example of such a shoe is illustrated by Thornton (1973, 10).

No thread survived from the stitching but it is likely that flax or hemp would have been used. A curiosity is that all the surviving uppers seem to be left-footed, although this could easily be a misinterpretation; it has been assumed that the seam of the vamp wing and the quarter would have been on the inside of the foot.

In the following catalogue the measurements in the text refer to dimensions before conservation which entailed shrinkage of some ten per cent. The illustrated items were drawn after conservation and shrinkage should therefore be taken into consideration. All pieces, including unpublished offcuts, had their outlines traced before shrinkage and these outlines are available in the excavation archive.

Period II Phase 1

Fig.21, No.1 Fragment of the flank of a skin. Probably piece of cutting offal discarded as unusable. Cut edge where sections have been removed. Narrow slit at one end may be hole by which the skin was pegged out to dry. Similar examples known from Feasegate, York (Radley 1971, 51). Partial delamination. Length 390 mm. Width 90 mm. Layer 74. SF72.

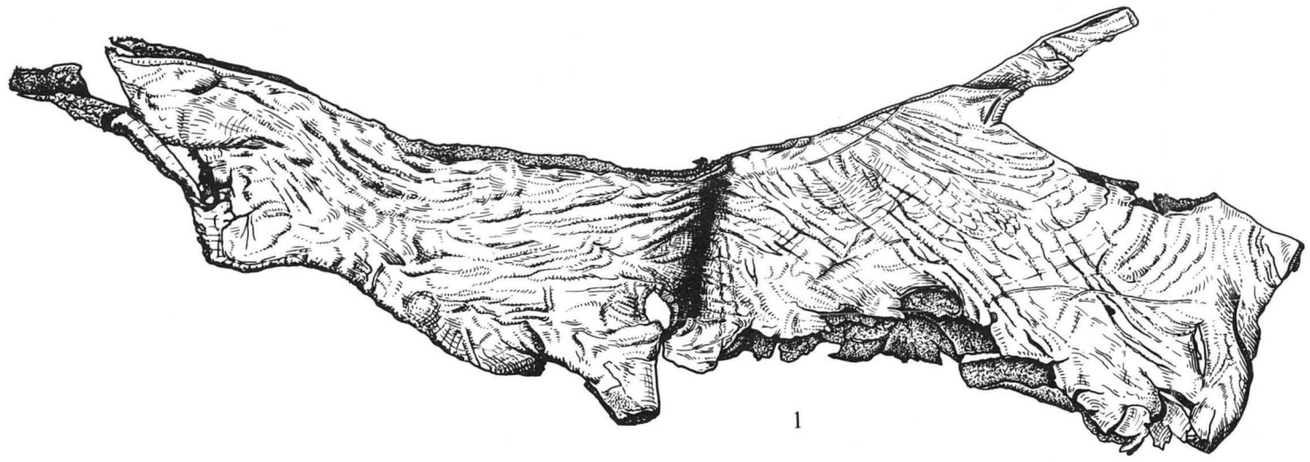
Period II Phase 2

Fig.21, No.2 Offcut. Possibly the flank of a skin from which a section has been cut (curved cutting edge survives). Partly delaminated. Seven slits in the piece may have formed an identification mark when the skin was pegged out to dry. Length 165 mm. Width 158 mm. Layer 113. SF105.

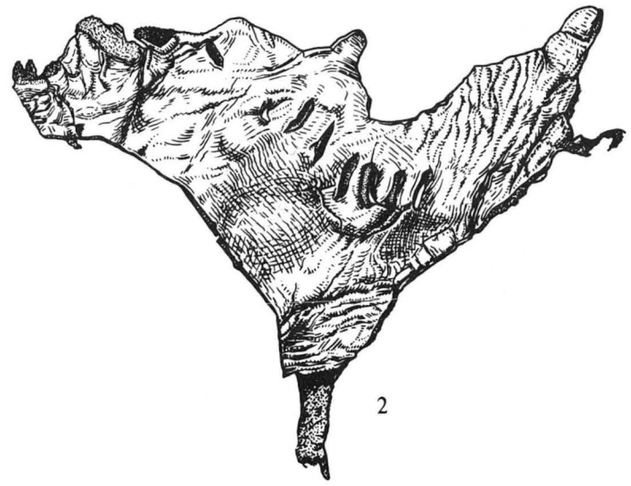
No.3 Offcut, reused from discarded object. Curved cutting edge, which may be due to cut by cobbler but which could indicate previous use as part of a large pouch. A possible alternative use would have been as a decorated collar attached to a garment (the piece folds in such a way as to pass around the back of the neck). Pierced by two parallel rows of holes, these holes being 10 mm apart, which show signs of pulling. The whole has been gathered and puckered. Ultimately used as waste, three roughly circular pieces being cut out of it. Length 660 mm. Width 75 mm. Layer 113. SF104. Associated with five small offcuts (not illustrated), one of which may be a piece of kid. Also associated with No.4.

No.4 Not illustrated. Instep latchet lace. Delaminated. Would have been stitched to upper by holes at its broad end. Length 136 mm. Layer 113. SF104.

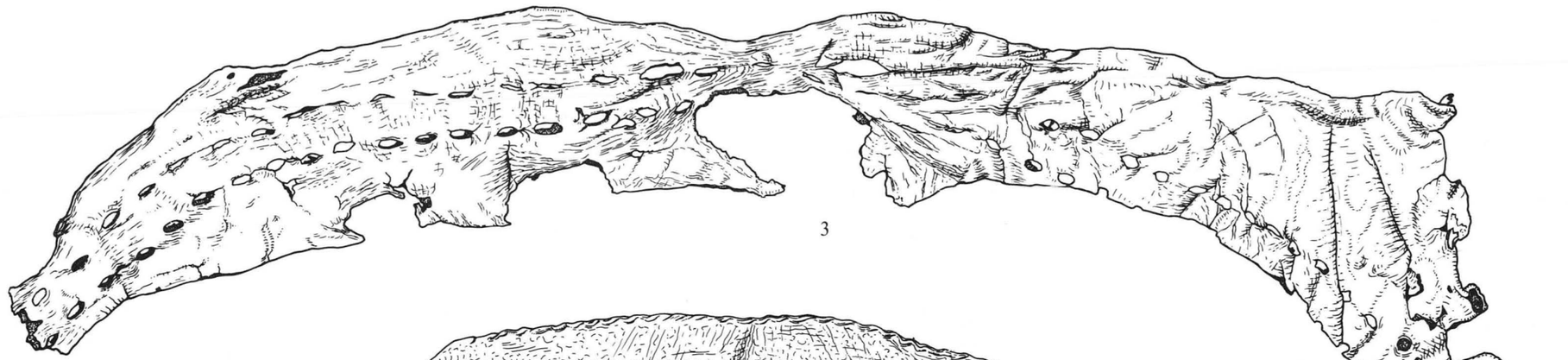
No.5 Upper of left-foot turnshoe or low ankle-boot of Danish-type. Top edge has whipped stitch reinforcement. Inside quarter and vamp butt seamed (stitch length 7-8 mm). Inside quarter itself is double sewn and probably had a reinforced strip; this latter, however, was not sewn to the vamp. Continuous section of the quarter at the back is cut as a 'V'-gusset from the lasting margin, similar to examples from Lund (Blomquist 1938, fig.11, 199) and York (Richardson 1959, 58). This, and the lasting margin, have a coarse turned seam (stitch length 6 mm) which was subsequently repaired with a tunnel-stitched clump sole (stitch length 7-8 mm). Laceholes at the back and grooves for the laces show that the shoe had been laced around the ankles although a flap across the instep may have been attached to the inside quarter as additional support. Probably had a pointed sole to fill the back gusset. Length 440 mm. Width 154 mm. Layer 112. SF91.



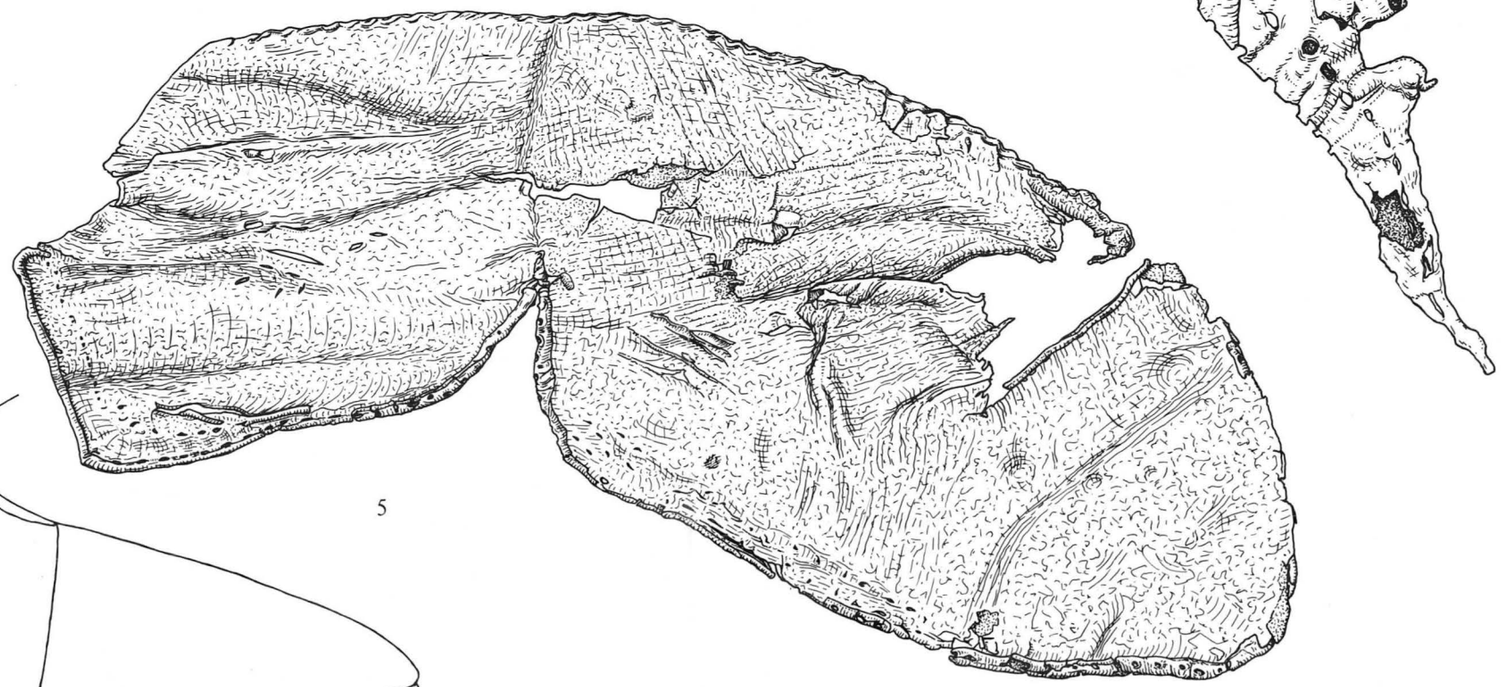
1



2



3



5

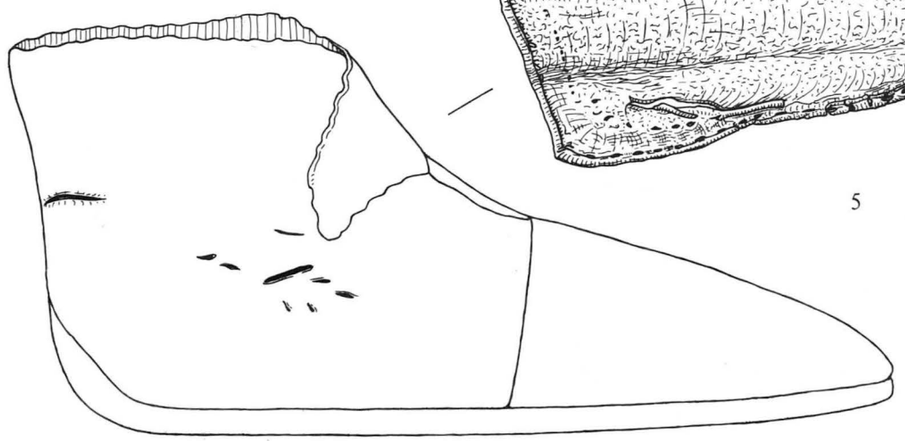


Fig.21. Leather. Scale 1:2.

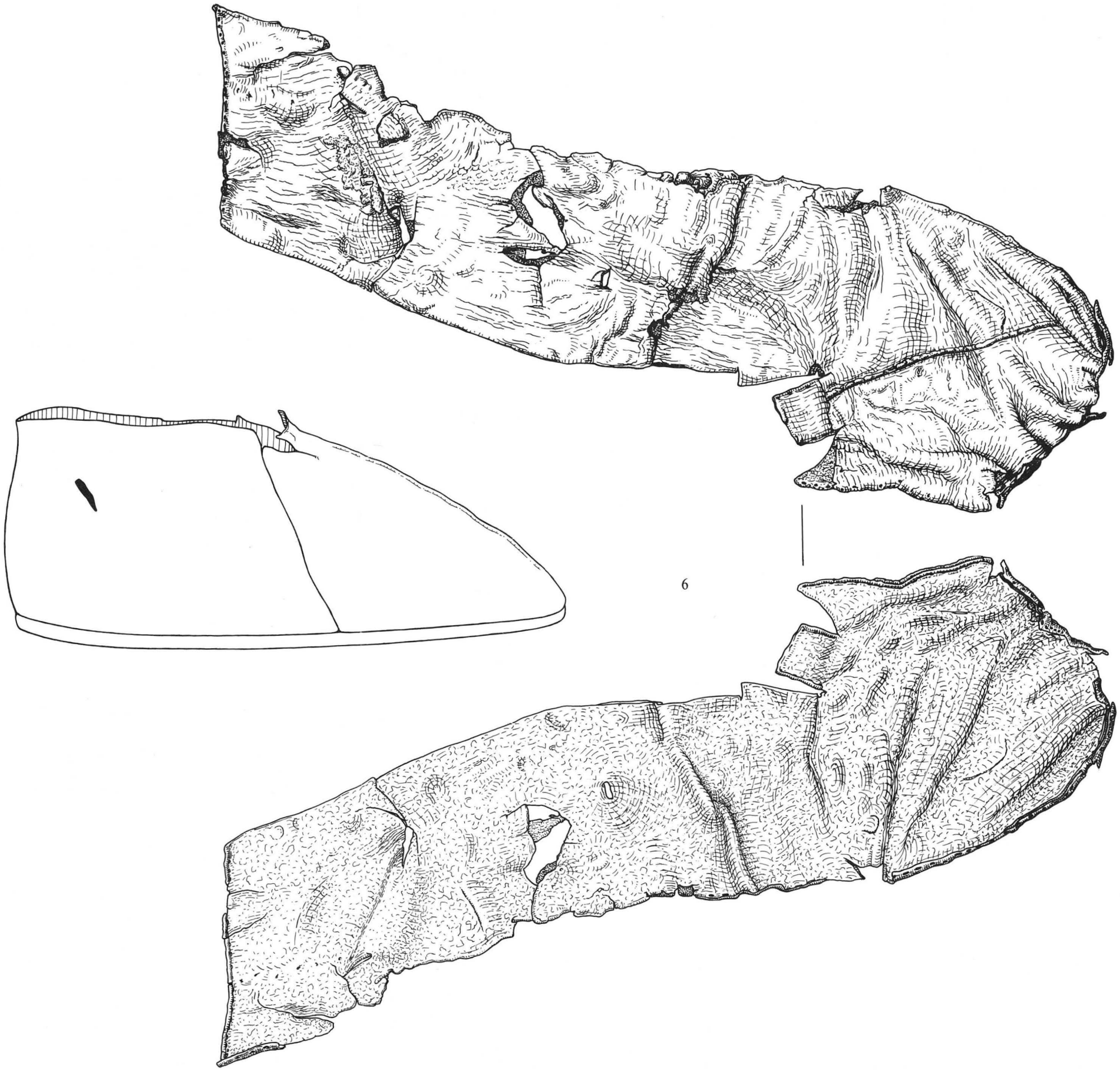


Fig. 22. Leather. Scale 1:2.

Period II Phase 3

Fig.22, No.6 Upper of left-foot turnshoe. Top edge is not reinforced. Inside quarter and vamp are close-seamed (stitch length 5 mm). Lasting margin has a coarse simple turned seam (stitch length 7 mm). The centre of the vamp has two rows of decorative tunnel stitching which do not pierce the thickness of the leather. Small rectangular tongue similar to that on child's shoe (No.12). Tongues or tabs such as this have been found on material from Coventry (unpublished information from June Swann and John Thornton). Stitching on the inside of the tongue may have been for a lining but it is more likely that it was intended to give rigidity to the tongue. Blunt-pointed toe. Laceholes at rear show signs of pull and wear for a knotted lace (similar to Anglo-Danish material at York, e.g. Richardson, 1959, fig.21). Dimensions 406 mm. Width 130 mm. Layer 102. SF87.

Fig.23, No.7 Upper of left-foot turnshoe or ankleboot. Top edge has whipped stitch reinforcement. Inside quarter and vamp are butt seamed (stitch length 5 mm). Inside quarter itself has second line of stitching, probably for a reinforced strip which did not join the vamp (similar to No.5). Continuous section of the quarters at the back is cut by a 'V' gusset from the lasting margin (also similar to No.5). Pointed back. Coarse tunnel seam to lasting margin (stitch length 7 mm) and to the gusset (5 mm). Two tongues or flaps, cut where the vamp joins the outside quarter, may lap over to the inside quarter. No evidence survives as to how they were fixed but they could be associated with two pairs of holes on the inside quarter. A similar shoe with flaps is known from Hungate, York (Richardson, 1959, 88, fig.22, no.9). Length 420 mm. Width 130 mm. Layer 102. SF85.

Fig.24, No.8 Thonged sole and upper fragment. Pieces attached by thong passing straight through scalloped edge (see illustrated detail). Pointed toe to the sole which is heavily worn under the forepart and what remains of the seat. Probably a left-foot turnshoe. This object has been reused as waste, material being cut from the upper, hence its cut edge. Length 240 mm. Also, not illustrated, upper fragment, probably of a vamp. Brushwood surface 101. SF106.

No.9 Not illustrated. Fragments of upper and sole of a turnshoe. Probable closed seam (stitch length 7 mm). Also two small fragments with thonging. Brushwood surface 101. SF84.

No.10 Not illustrated. Fragments of upper of thonged turnshoe. Thonging is fine. (Length 5-7 mm). Brushwood surface 101. SF80.

Period II Phase 4

Fig.24, No.11 Upper fragment from left-foot turnshoe. Top edge has a scalloped seam (stitch length 5 mm) possibly where a top band was attached. Three laceholes, at each side and at the back were used for lacing. Sideseam of inside quarter is butted with an edge-flesh seam (stitch length 5 mm). Lasting margin has coarse turned seam (stitch length 6-7 mm) which used wide thread. Upper subsequently reused, most of the vamp being cut away. Length 406 mm. Width 80 mm. Layer 100. SF82.

No.12 Upper of left-foot child's turnshoe. Top edge not reinforced. Inside quarter and vamp joined by simple turned seam (stitch length 5-6 mm). Lasting margin fixed to sole by coarse thonging (thongholes 5 mm apart). The centre of the vamp has a row of decorative tunnel stitching which does not penetrate the thickness of the leather. Small rectangular tongue has been cut, without waste, out of the vamp. Beneath, this tongue has edge-flesh stitch holes (stitch length 5 mm), possible for a

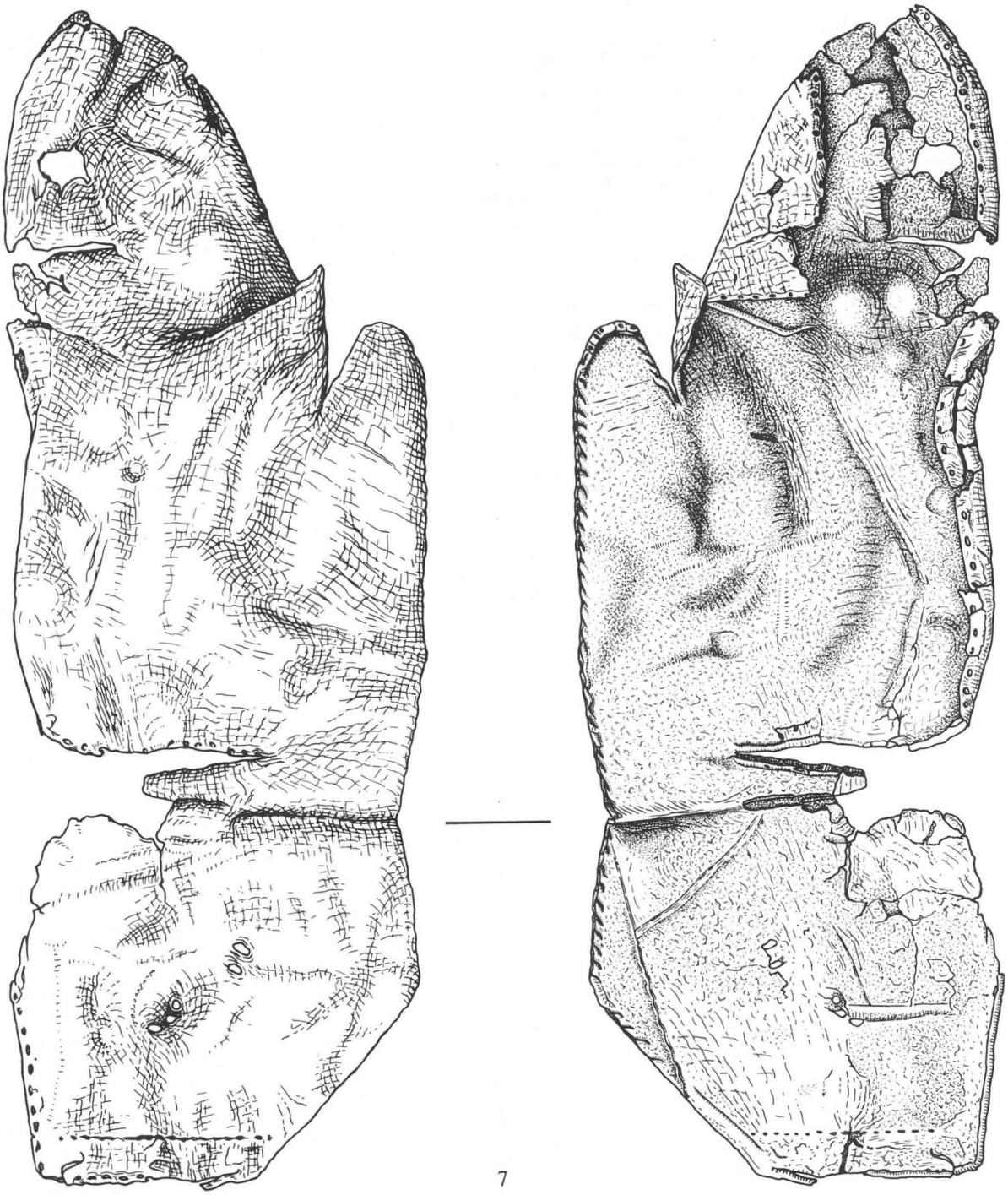


Fig.23. Leather. Scale 1:2.

Fig.24, No.12 (cont.) pad. Two slits at the back were used for lacing. The construction of this shoe is similar to one from Winchester (unpublished but illustrated as fig.7 in Thornton 1973, 7). Length 206 mm. Width 120 mm. Layer 100. SF75.

Fig.25, No.13 Fragment of flesh lamina or margin of thonged turnshoe sole. Crude, wide-spaced holes (8-9 mm) with remains of serpentine thonging. Length 202 mm. Width 24 mm. Layer 100. SF79.

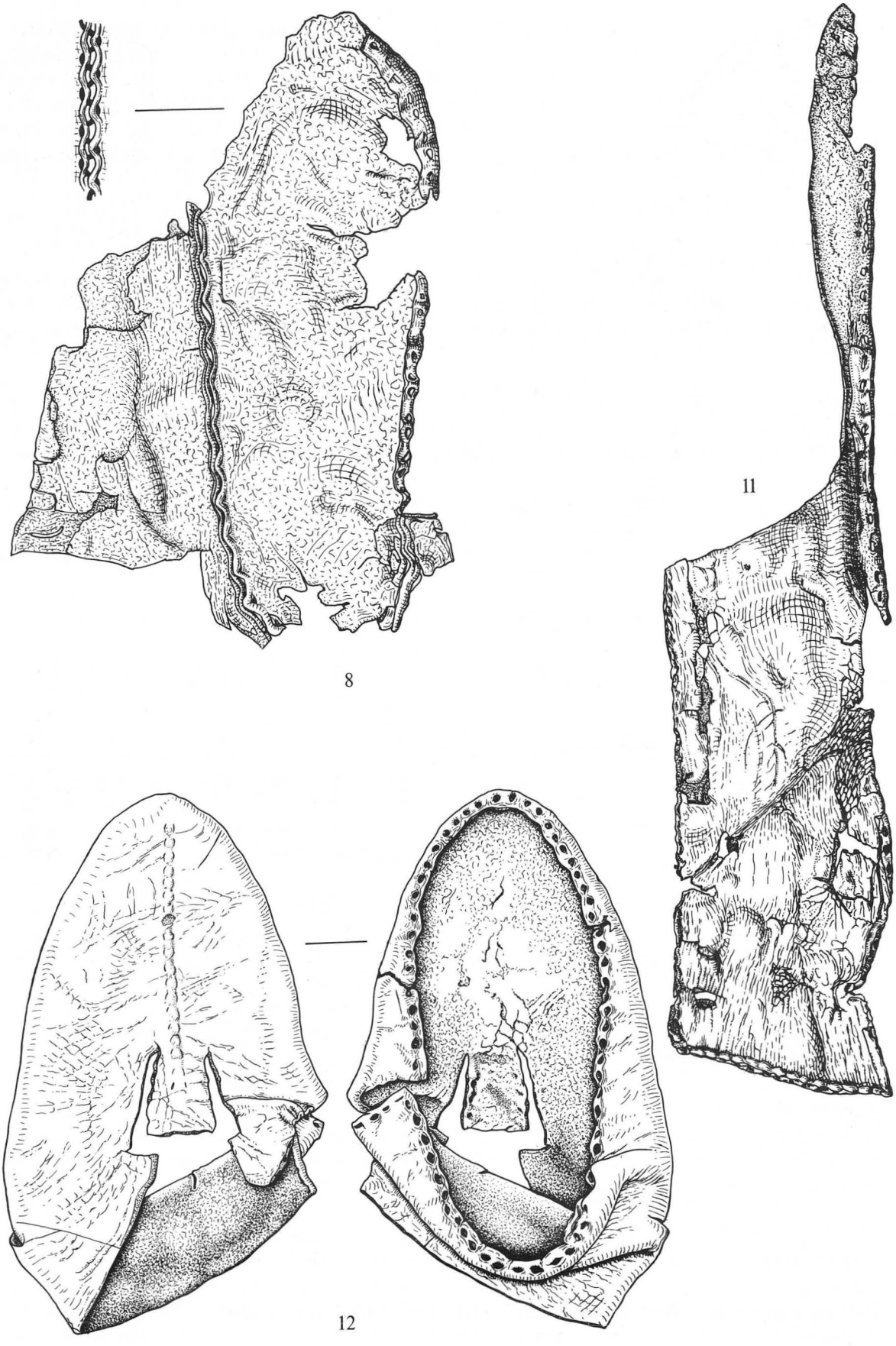


Fig. 24. Leather. Scale 1:2.

Fig.25, No.14 Rectangular leather fragment of unknown use. Probably almost intact except for tattering of one edge. Squared at one end, tapers to a point at the other. Pierced by two parallel lines of laceholes the length of the tapered side. These holes have signs of pulling and show evidence of being crosslaced from line to line. Pairs of smaller holes on the tattered side may be associated with missing attachments. Partially delaminated. Possibly part of a garment or hanging. Length 880 mm. Width 180 mm. Layer 96. SF73.

Period II Phase 5

Fig.25, No.15 Not illustrated. Vamp wing fragment with edge-flesh seam where it met the inside quarter (stitch length 5 mm). Top edge not reinforced. Torn piece rather than reused waste. Length 90 mm. Width 50 mm. Layer 86. SF52.

Period III Phase 1

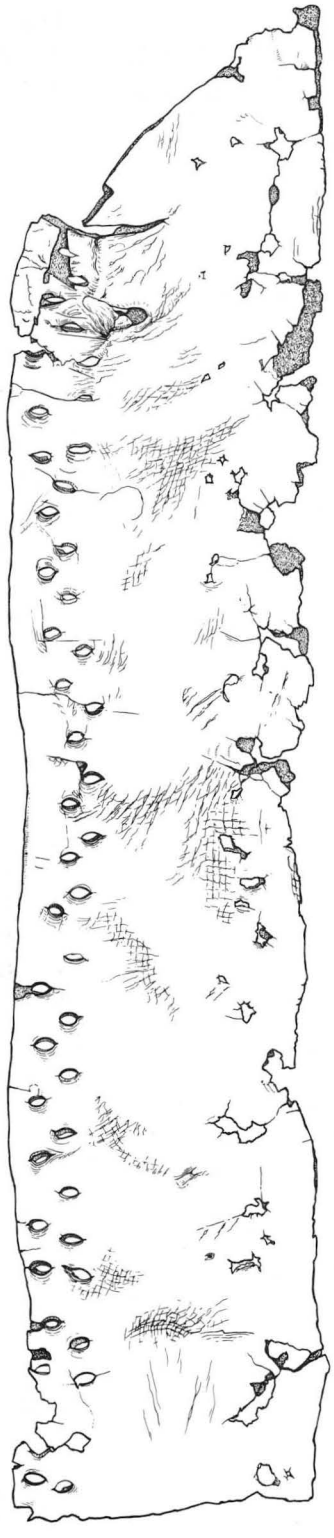
Fig.25, No.16 Fragment of upper of left-foot turnshoe. Consists of top of vamp with the remains of an upstanding tongue (evidence of some stitching on inside of tongue, as No.6), a scalloped top edge to the vamp wing and a butted seam (stitch length 5 mm) where vamp met inside quarter. Possibly reused as waste with reinforcement to top edge cut by roughly circular removal. Also five other offcuts and shoe fragments (not illustrated). Pitfill 92. SF66.

V. ENVIRONMENTAL EVIDENCE

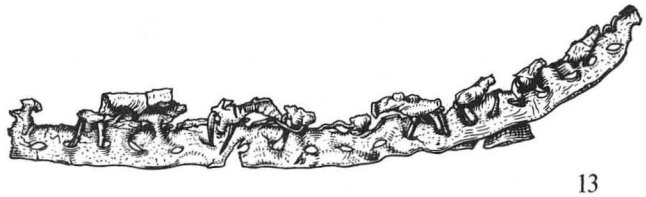
INTRODUCTION

Although Late Saxon and medieval occupation on reclaimed peaty marsh surfaces in the floor of the Wensum valley has been investigated at several sites (Carter et al. 1973; Roberts et al. 1975), the majority of excavations undertaken by the Norwich Survey in the 1970s were at sites on dry fluvial and glacial gravels where conditions were generally unsuitable for the preservation of most biological material. The excavation at Whitefriars Street Car Park provided the first opportunity to examine sediments and refuse deposits directly associated with the river itself, in which excellent preservation conditions might be expected. The results obtained at this excavation are of considerable interest in their own right, providing a wide range of information relating to the economy and ecology of the site; but the work at this site was also seen as a 'pilot study' to assess the state of preservation of different categories of biological remains in these waterlogged layers and to determine which were most informative in terms of the environment and economy of the Late Saxon town. To these ends, as wide a range of material was examined as was possible, given the available expertise and resources. Besides their intrinsic interest the results proved to be invaluable at the stage of planning environmental investigations for the 1981 excavation season across the street at the site of the new Magistrates' Courts (County Site No.450N) where comparable preservation conditions were expected.

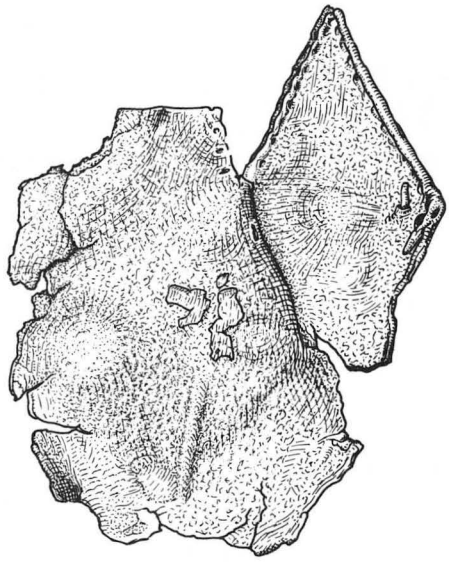
This report may be read at three distinct levels. Readers with no specialist knowledge will find an outline of the main conclusions in the General Discussion (p. 47). Those requiring further detail and substantiation should refer to the individual reports. Full species lists, measurements and analytical data are provided on microfiche for interested researchers. Details of methods used for recovery, extraction and identification are also given on microfiche. Extraction methods for macrofossils were essentially those of Kenward et al. (1980).



14



13



16

Fig. 25. Leather. Scale 1:2 except No. 14, 1:4.

MAMMAL BONES
by Judith Cartledge

The state of preservation of the bones varied, two major states being distinguished; firstly, those bones which were heavy and hard and had undergone very little attrition from weathering; secondly, those which were still in good condition but were more brittle and had suffered a greater degree of fragmentation.

Range of species (Table 3: fiche)

The Total Number of Fragments (TNF) of the sample was 3,333. Of these, approximately 47 per cent were identifiable. The bird bones have not yet been assigned to species. 91 per cent of the identifiable fragments came from pig, caprovines and cattle, the highest percentage, 39.5 per cent, coming from cattle. There was also a range of other species that occurred sporadically and in fewer numbers. These were hare, dog, cat, horse, and red and roe deer. The emphasis on major stock animals suggests that the sample derives mainly from animals slaughtered for meat.

Percentages of the main mammalian species (Table 4: fiche)

Cattle fragments dominate in Periods I, III and IV, though the degree of dominance is not consistent. In Period II, caprovine fragments are most frequent. In the other phases they take second place. Pigs are the least frequent, averaging 25 per cent, except in Period I, where they form only 11.5 per cent.

As a separate calculation all those fragments which supported epiphyseal endings were added together. This included mainly long bones but also the scapula, calcaneum and the phalanges. Where the long bones were intact and therefore had two epiphyses, they were counted as two. This method is designed to exclude bones that are inclined to fragment excessively and which may therefore be over emphasized in the TNF calculation. The percentages differ from the TNF in that the cattle percentages are reduced. This seems to be due largely to fragmented cattle skull-bones which are included in the TNF, but are obviously excluded from the count of bone with epiphyses. Otherwise these two methods of calculation basically confirm each other. There is a change of percentage in the later phases, which increases the proportion of pig and decreases that of caprovine.

Measurements of the main mammalian species

Measurements have so far been taken from humeri, radii, tibiae and metapodia.

Data has been used from King's Lynn (Noddle 1977) and Yarmouth (Gebbels 1976), for comparing measurements from the same region, and from Exeter (Maltby 1979) for data from another urban medieval context. The measurements are here summarised and quantitative data, together with full details of the location of the measurements, are given in Tables 5 and 6 (fiche).

Pig The pigs fall within the same range as the measurements from the other areas. The distal tibiae demonstrate a wide range but are evenly spread.

Caprovine The measurements produced larger means than those from King's Lynn and are also slightly larger than those from Yarmouth. The King's Lynn radii are distinctly smaller and the Yarmouth radii just smaller than those from Whitefriars Street. The Whitefriars Street and Yarmouth measurements of tibiae only just overlap each other.

Cattle There are two clear groups in the radii, though, from the modest number of measurements, their significance is not assured. The metacarpals also show this double grouping, but the group of larger measurements contains fewer examples compared with the radii.

Ages of the main mammalian species

Thus far, age estimates have only been carried out on the stages of epiphyseal fusion of the bones in the appendicular skeleton. The stages have been estimated period by period as well as overall. The purpose of the period by period analysis is not so much to detect minor anomalies, which may be apparent but not necessarily statistically significant, but to ensure that each of the phases follows the general trend that occurs in the overall estimation.

Pig The age range of the pig remains is broad and may explain the wide range of tibia measurements. Some were killed at less than one to one-and-a-half years but the majority were killed upwards of this age, with a few even surviving to over three to three-and-a-half years.

Caprovine There was only a single six to ten month fusing fragment that was unfused. The caprovines were slaughtered from the age of one-and-a-half years onwards, the majority at two-and-a-half to three-and-a-half years, but several lived on beyond that age.

Cattle As with pig, there seems to have been a range of deaths - a few being slaughtered at less than one to one-and-a-half years, about the same quantity surviving until two to three years, and perhaps over half living beyond their third or fourth year.

Proportions of the main mammalian species

The smaller bones are poorly represented. A change in the sizes of different categories occurs for the cattle and caprovines from Period I to Period IV. In Period I, for both animal types, there is a large proportion of skull bone and, in the caprovine group, there is also a high proportion of metapodials. Thus, the emphasis in these bone remains seems to be on waste fragments. In Period IV the numbers of the categories which include long bones increase, and the relative numbers of waste bones, both skull and metapodial, are considerably reduced. In the pig bones a pattern of change is not apparent.

DISCUSSION AND CONCLUSION

The aim of this report was to reconstruct, from the recovered animal bone assemblage, the man-animal relationships prevalent on a waterfront site in Late Saxon Norwich. Quantifying the bones in various ways has demonstrated that, although there was a range of species, the vast majority came from the major stock animals. However, the proportions of the main mammalian species are not necessarily indicative of the proportions in which they entered Norwich since the range at Whitefriars Street is only a selection of the range entering the town. They may as easily be merely the proportions of waste produced from each animal type in this part of the city. Cattle fragments dominate the TNF, followed by caprovines, but it is possible that, for instance, pig carcasses may have been cured or converted into sausage meat in another area. The Whitefriars Street remains in this case, therefore, would only come from those animals consumed as pork. The presence, however, in varying quantities of pig, cattle, caprovines, hare, dog, cat, horse, red and roe deer shows a minimum range of the species present in the town. If the stock animal proportions are an approximate representation of the animals entering the city it appears that cattle were providing the most meat, pig contributed a comparatively small amount and horse was possibly not even regarded as a source of edible flesh.

The pig measurements suggest that the pigs were a similar size to those from King's Lynn, Yarmouth and Exeter. It is interesting that there was a range of sizes. However, as was previously suggested (p. 31), this could merely reflect the broad age range. It could alternatively be an indication of non-intensive production which did not emphasise uniformity; in fact the broad age range would tend to support this possibility. Measurements from other excavations in Norwich will be useful here to clarify the extent of variation. The analysis of caprovine sizes is difficult since sheep and goats have not been distinguished, although it is clear from horn-cores that both species were present. It is, therefore, likely that two separate patterns of stock rearing were involved which may have produced two different age ranges. However, since most of the animals seem to have died in their second or third year, it is a possibility that meat production was a priority. The double grouping in the cattle measurements may well be sexual grouping although, as with the pigs, the size variation may also be related to the age range. The low percentage of small bones can be attributed to a sample bias consistent with a trowelled excavation.

The change in emphasis in bone type between the earlier and later phases for both cattle and caprovine requires an explanation. It is possible that the numbers in the individual phases are too small to be significant. However, the repetition of the trend in both cattle and caprovine seems more than coincidental. Post-slaughter and post-depositional activities are most likely to modify the proportions of bone-types. Post-depositional selection, that is the relative survival of bones in the soil, is unlikely to modify the proportions of cattle and caprovines without also affecting pig, so a post-slaughter activity seems the likely modifier. The following explanations are possible:

1. the butchery traditions changed so that originally waste bones were deposited but were later sold with the meat;

2. in the later periods the waste bones were deposited elsewhere, possibly being taken for industrial use in another part of the city;

3. the nature of the waste itself could have changed, being in the earlier stages butchery waste and, in the later periods, domestic waste.

Explanation 3 seems most convincing since, in the later periods the area declined dramatically in commercial importance. Thus, it is possible that butchers ceased to use this part of the river for dumping their waste. In conclusion, however, it should be emphasised that the bone samples here discussed are small and the present interpretation, though plausible, may require reassessment in the light of evidence from future excavations.

FISH REMAINS
by Andrew Jones

Introduction

Seventeen fish taxa have been identified from eleven contexts. Some of the remains have been identified to family, and vertebral centra and dermal denticles testify to the presence of at least one member of the cartilaginous fishes (Elasmobranchii). Approximately half of the bones collected from the soil samples were found to be unidentifiable, mostly fin rays, ribs, interhaemals and brachiostegal rays. All these bones are insufficiently characteristic to allow specific determinations to be made.

Table 7 (fiche) is a condensation of the analyses. A full catalogue of the identified bones is available from the Environmental Archaeology Unit, University of York, the Fish Section of the British Museum (Natural History) and the Norfolk Archaeological Unit. Fish nomenclature follows Wheeler (1969).

Discussion

Because the sampled deposits are likely to contain refuse from a large number of households over unspecified periods of time, it is unwise to make much of the assemblages of fish bones recovered from the site. Indeed, it is possible that the deposits, and therefore the groups of fish bones, include material from a number of distinct sources.

The majority of the fish remains were of marine species, most of which are frequently eaten today. Bass (Dicentrarchus labrax (L.)) and horse mackerel (Trachurus trachurus L.), however, are no longer commonly found on the slabs of East Anglian fishmongers. The nature of the sampled deposits means that detailed conclusions concerning the relative abundance of the various kinds of fish would be inappropriate. Nevertheless it is clear that certain species appear to be more important than others. Of the marine fish, remains of herring (Clupea harengus L.), cod (Gadus morhua L.) and whiting (Merlangius merlangus (L.)) were more abundant than those of cartilaginous fish, eel and flatfish while mackerel (Scomber scombrus L.), horse mackerel and bass bones were uncommon.

Herring was the most abundant species with 287 bones, mainly vertebral centra, from eight contexts. It is a pelagic fish occurring in large shoals in the lower reaches of estuaries and at sea at depths of up to 200 metres. The Whitefriars Street herring were probably caught by means of surface nets by the famous East Anglian herring fishery which is known to have been in existence since the compilation of the Domesday Book in 1086.

Bones of cod and whiting were identified in samples from ten contexts. These fish are today mainly taken in trawls, but baited hooks and a variety of nets may be used. The cartilaginous fish were represented by denticles including the highly distinctive dermal denticles (bucklers) of the thornback ray (Raja clavata L.). This species is usually captured on hook and line or in trawls. The flatfish remains included plaice (Pleuronectes platessa L.) (identified from one left dentary) and flounder (Platichthys flesus (L.)) (recognised from an angular-articular and a quadrate). In addition forty-four vertebral centra from eight contexts have been assigned to the family Pleuronectidae, which contains both plaice and flounder. Plaice is a common marine flatfish living on sandy or muddy ground and is usually caught in trawls, seine nets or on hook and line. Flounder is the only British flatfish able to live in freshwater, although it is also taken in estuaries and inshore waters. The remaining marine species - bass, horse mackerel and mackerel - were represented only by small numbers of vertebral centra from a few contexts. All the marine fish recovered from this site were present in material recently excavated from deposits at Great Yarmouth (Wheeler and Jones 1976). Several species, ((spur-dog (Squalus acanthias (L.)), conger eel (Conger conger (L.)), garfish (Belone bellone (L.)), haddock (Melanogrammus aeglefinus (L.)), ling (Molva molva (L.)), tub gurnard (Trigla lucerna L.), turbot (Scopthalmus maximus (L.)), halibut (Hippoglossus hippoglossus (L.)), and Dover sole (Solea solea (L.))) identified at Yarmouth were not present in the samples from the Whitefriars Street site.

In addition to the marine component of the fish assemblage, remains of estuarine and freshwater fish were present both at lower frequencies. These include eel (Anguilla anguilla (L.)), pike (Esox lucius L.) and species of the families Salmonidae and Cyprinidae. Twenty-six vertebral centra of eel were recovered from seven contexts. As the eel spends some parts of its life in freshwater before returning to the sea to spawn it can be caught in salt, brackish or freshwater by a variety of methods including hook and line, nets, traps and eel spears. The single salmonid vertebral centrum from the site is most likely to be from a trout (Salmo trutta L.), its size suggested that a fish in the region of 40 cm total length was represented. The family Cyprinidae includes a large number of common British freshwater fish including roach (Rutilus rutilus (L.)), rudd (Scardinius erythropthalmus (L.)), bream (Abramis brama (L.)) and chub (Leuciscus (Squalis) cephalus (L.)). Whilst it is most likely that the bones of freshwater fish represent food

debris, it is possible that some of them are remains of fish which died in the river and whose bones became incorporated with other rubbish on the river bank.

Despite the limitations of the material, this group of fish bones is of considerable significance, for relatively large numbers have been recovered by sieving soil samples. This procedure removes the bias in favour of large bones which is inherent in assemblages which have been recovered by picking out bones from trowelled soil. While it is not possible to relate these particular bones to individual households or even to areas within the town, the assemblages provide an illustration of the variety of fish in the diet of the medieval occupants of Norwich.

MARINE MOLLUSCA AND OTHER INVERTEBRATES

Species composition and shellfish exploitation

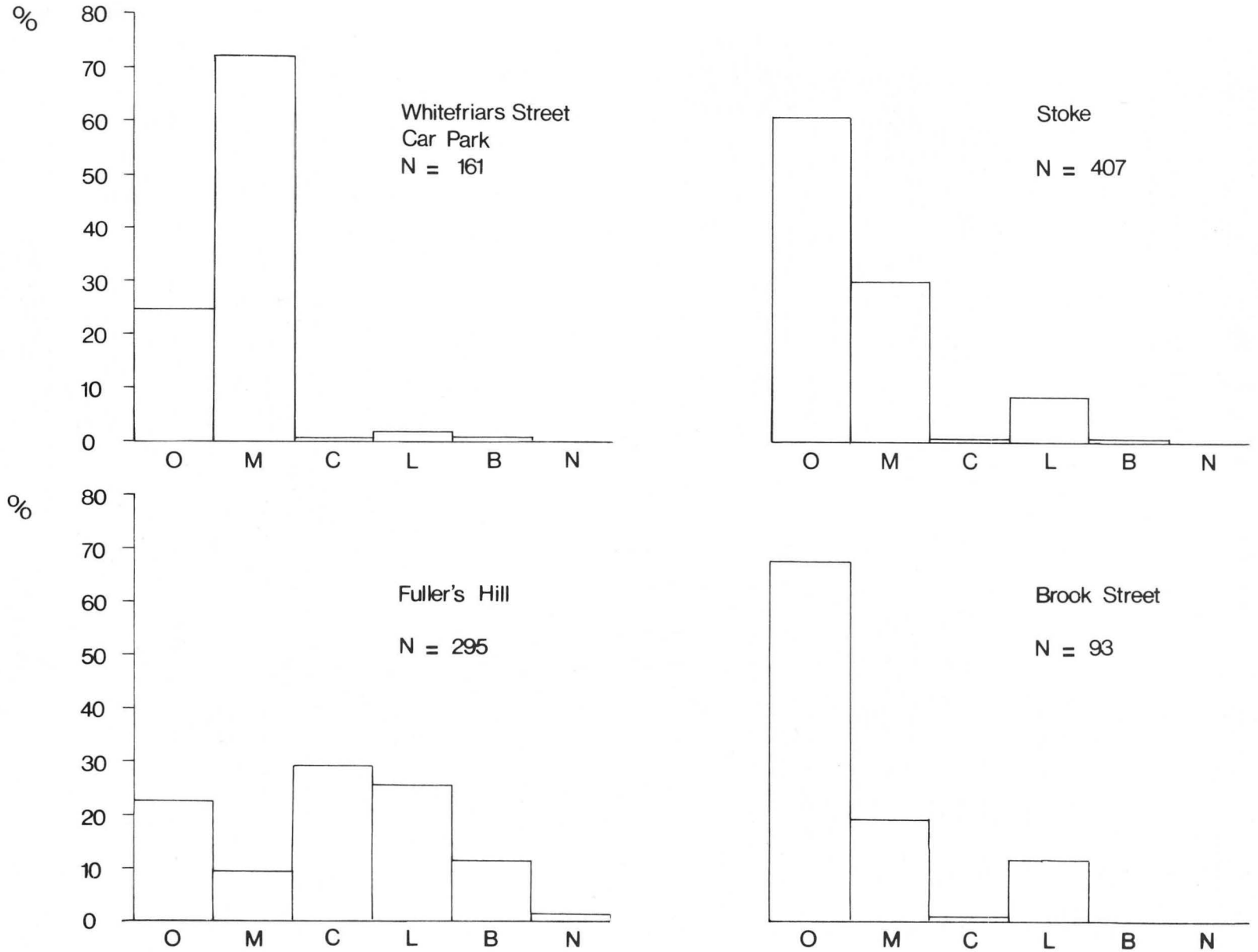
Shells and fragments recovered by bulk sieving are listed in Table 8 (fiche). Fig.26 summarises the species composition of shell samples from four early medieval sites: Whitefriars Street Car Park; Fuller's Hill, Great Yarmouth (Jones 1976); Vernon Street, Stoke, Ipswich, and Brook Street, Ipswich (both Jones forthcoming). The samples from Ipswich were recovered, as at Whitefriars Street, by bulk sieving, but the Great Yarmouth sample was hand-collected. By comparison with the coastal sites the Whitefriars Street percentages seem to indicate relatively specialised exploitation, with a distinct emphasis on mussels (Mytilus edulis). In fact, the exclusion of 82, a layer of crushed shell, from the calculated percentages (because of poor preservation) has resulted in mussels being under-estimated and in reality the mussel percentage should be still higher. Most modern commercial mussel-beds are just below low water in sheltered estuaries where food supply in the form of suspended organic material and phytoplankton is near-constant, and mussels thus grow to a size worth gathering (Tebble 1976, 41). The nearest suitable site for mussel gathering is the estuarine area now known as Breydon Water. The valves from Whitefriars Street are slightly under-sized by modern standards (mean 48 mm; range 38-61 mm; 21 measurable specimens): mussels are nowadays considered to be marketable at just over 2 in (51 mm) (Tebble 1976, 41).

Oysters (Ostrea edulis) account for only about a quarter of the molluscs from Whitefriars Street and Fuller's Hill, in marked contrast to the samples from the Ipswich sites where they were evidently the predominant shellfish species consumed. The reasons for this difference can only be conjectured but may simply be related to local variations in food preferences, or perhaps to a reduction in suitable habitats for oysters in the Yare estuary resulting from the development of the Yarmouth sand-spit and consequent restriction of tidal range in the early medieval period (Coles 1977).

The remaining species identified at Whitefriars Street occur at very low frequencies. Indeed, it seems possible that the winkles (Littorina littorea) represent chance inclusions. Winkles are frequently associated with self-supporting clumps of mussels in sheltered intertidal areas (Funnell et al. 1979, 514) and the few specimens from Whitefriars Street could easily have been accidentally collected during mussel harvesting.

Fig.26. Percentage composition of marine mollusc samples from four East Anglian sites.

O - Ostrea edulis L. M - Mytilus edulis L.
C - Cerastoderma edule (L.) L - Littorina littorea (L.)
B - Buccinum undatum L. N - Nucella lapillus (L.)
Small estuarine species (Phytia myosotis, Hydrobia spp. and Assiminea grayana) are not included.


%
80
70
60
50
40
30
20
10
0
O
M
C
L
B
N
Whitefriars Street
Car Park
N = 161
Stoke
N = 407
Fuller's Hill
N = 295
Brook Street
N = 93

The higher frequencies of Littorina at Yarmouth and Ipswich, by contrast, do appear to indicate the consumption of winkles, and Jones (1976) has suggested that winkles were brought from the rocky coasts of Lincolnshire or Yorkshire by coastal trade. Only a single shell fragment of cockle (Cerastoderma sp.) was recovered at Whitefriars Street. At Yarmouth cockle valves were relatively common, (though the total percentage is inflated by a single large deposit of this species). This probably reflects the proximity of intertidal sand-flats associated with the developing Yarmouth spit. The whelk (Buccinum undatum), a sublittoral mollusc, is, again, represented at Whitefriars by only a single fragment although it accounted for some 12 per cent of the Yarmouth sample. Unlike the intertidal species, which can be collected at low water, whelks are nowadays collected from boats using iron-framed, rope-bound pots baited with fish, usually salted herring (Jones F.R.H. 1976).

Meat Weights

Winder (1980), working with very large mollusc samples from Saxon Southampton, has calculated percentage meat-weights contributed by different species. Meat-weight calculations have not been made at the present site since shell counts could not be obtained for 82. The degree of shell fragmentation will determine whether such calculations may be attempted at the 1981 excavations.

Epifauna

Two species of Bryozoa were identified: Callopora aurita Prenant and Bobin and Conopeum reticulum (Linnaeus) (det. P.S.Whittlesea). The latter can occur both in the sea and in river mouths where salinities are low (O.E.C.D. 1965). Barnacles, Balanus balanoides, were attached to some of the oyster shells. B.balanoides is an intertidal species (Yonge 1949, 112). 82 produced remains of a hydrozoan, Dynamena sp.

Unfortunately the remains of these organisms are not directly informative so far as the location of shell-fish beds is concerned.

Conclusions and prospects for future work

Comparison of the shell sample from Whitefriars Street with that from Fuller's Hill must of necessity take into account the different collection methods used. However, the Yarmouth sample clearly reflects the exploitation of a relatively wide range of shellfish beds, including whelk grounds, cockle beds on intertidal sand-flats, and mussel and oyster beds probably in estuarine areas: in short a diversified shellfish 'industry'. By contrast, the Whitefriars Street sample is thought to indicate much more specialised exploitation of estuarine beds in the Breydon Water area. There remains, of course, the possibility that shells of other molluscan species were disposed of elsewhere along the waterfront, and that the present sample is biased towards mussels. The 1981 excavations will provide an opportunity to determine whether the sample is indeed representative.

It also has yet to be established just how important shellfish consumption was in the diet of the inhabitants of the early city. Extensive layers of shell at this site certainly gave a subjective impression that shellfish were an important food source. Block sampling of mollusc deposits, combined with meat-weight calculations, should serve to quantify the importance of shellfish, although the complex factors influencing the composition of urban refuse deposits may invalidate direct comparison of shellfish meat-weights with those of domestic animals and fish.

FRESHWATER AND LAND MOLLUSCA

Only one context (114) produced significant numbers of freshwater shells: the remaining samples contained only a few specimens, insufficient for any ecological studies. Consequently this report is concerned only with mollusca from (114) (see Table 9: fiche). The assemblage from this context included a high proportion of very small apical fragments and abraded shells, many of which have not been specifically determined. Pisidium valves were abundant, but the majority of these were immature specimens and have not been identified to species. Ecological interpretation is therefore based on the freshwater gastropods from the deposit.

The most abundant species was Valvata piscinalis, which is included by Sparks (1961) in his group of 'moving water' snails. Bithynia tentaculata, another snail characteristic of well-oxygenated flowing water habitats, was present but not common. 'Ditch' species from 114 included Valvata cristata and Planorbis planorbis. These are typically found in clean slow-flowing water with abundant aquatic vegetation (Sparks 1961). Suitable habitats would have occurred in beds of water crowfoot, horned pondweed and perfoliate pondweed, fruits and seeds of which were also present in 114. Other freshwater species from the deposit included Lymnaea peregra, Bathyomphalus contortus and Gyraulus albus. These are catholis snails, found in most freshwater habitats. Anisus leucostoma was the only species in the assemblage which is characteristic of 'slum' habitats subject to drying, stagnation and wide temperature variations, and was represented by only a single shell. Terrestrial snails (Helicella sp. and Discus rotundatus) were also identified only from single specimens.

The overall composition of the assemblage, in which 'moving water' and 'ditch' species predominate, confirms the fluvial origin of 114.

DIATOMS
by Brian Moss

A series of fifteen samples was taken, mostly from a vertical profile 5.65 m from the north end of the trench (contexts 24, 27, 30, 46, 51, 52) but also from deeper deposits (58, 74, 82, 83) to the south where they were accessible at the time of sampling. Sample 74 comprised the sediment in the interstices of the twiggy layer at this horizon. Samples 58, 82 and 83 are believed to be from in situ natural deposits overlain by the sequence 52-24 which may have varied origins. All samples were dominantly inorganic with much sand and clay. Compared with those of lake sediments in eastern Norfolk, the deposits were sparse in diatoms and many of the remains were so fragmented as to be unidentifiable, particularly in the upper sequence 52-24. Results are given in Table 10 (fiche).

The diatom remains divide the deposits into two groups, 24-52 and 58, 74, 82 and 83. The latter group comprises sediments with a relatively abundant flora in which many diatoms were intact, and in which Chrysophycean cysts were absent. The diatoms are all freshwater ones and mostly species and genera associated with submerged surfaces such as those of higher plants, stones, and pilings (e.g. Achnanthes, Cocconeis, Epithemia, Cymbella, Rhoicosphenia) or sediments (Fragilaria, Pinnularia, Nitzschia, Navicula, Hantzschia, Campylodiscus, Diploneis). Some genera are found in both these habitats. There is a very small planktonic component (Coscinodiscus, certainly and potentially Synedra and Diatoma) but in general the diatoms tell of an in situ fertile river sediment with its own indigenous mud flora, but receiving also the frustules from nearby more solid substrata. The intactness of many frustules in such mineral sediments implies a quiet environment not vigorously disturbed. The freshwater nature of the diatoms in context 82 contrasts with the marine origin of the mollusc shells which are abundant in this layer.

Samples from contexts 24-52 have a broadly similar diatom flora to those of the lower group but contain many fewer frustules, a much greater proportion of which were fragmented. The low counts are dominated by Chrysophycean cysts and the most abundant diatom genera are those of sediment - living forms with those genera which grow attached to firm substrata less well represented than in the lower layers.

The comparatively greater fragmentation of the frustules in these layers suggests a mechanically disturbed habitat, but the presence of diatoms at all in such sandy sediments is not consistent with this being natural vigorous wave action on a sandy beach which would probably remove all fine remains. The presence of genera of firm substrata, e.g. Cocconeis suggests wash-in and deposition at water levels which covered the sediments, but the greater abundance of Nitzschia and Navicula suggests a greater predominance of an indigenous sediment flora. These genera are often very tolerant of extremes in their environment; they are frequent in wet soils. With the predominance of Chrysophytan cysts, which are life cycle stages capable of carrying rather delicate, otherwise naked-walled species through unfavourable conditions such as drying out, they suggest an environment periodically flooded and alternately exposed. Such conditions could be consistent with natural deposition by the flooding river, but in that case the deposit might be expected to have included elements of a diatom flora washed from a greater range of river habitats by the floods. Alternatively the habitat could have been one in which the water supply to the surface of the sand might have been mostly by capillary action in artificially placed deposits, with only occasional river flooding. The relatively greater abundance of both Chrysophyte and diatom remains in contexts 46 and 51 might be consistent with a suggested period of increased flooding in the thirteenth century. However, the large amounts of fine inorganic material in the samples made the finding and counting of the diatoms very difficult and the number of diatoms examined were small compared with those available in lake sediments. Such conclusions must be regarded therefore as tentative.

MOSSES
by Peter Lambley

Only small quantities of mosses were recovered, mostly from the permanently wet deposits of Periods I and II. Specimens identified are listed in Table 11 (fiche).

Species from several types of habitat are present. Thuidium tamariscinum is a woodland moss characteristic of heavy clay soils, common in the woods of central Norfolk. Thamnobryum alopecurum is a common moss of dry calcareous woodlands. 92 produced moss fragments tentatively referred to Amblystegium riparium, a common waterside species. This deposit is interpreted as a layer of litter or flooring material, dumped at the riverside. The remaining mosses have not been closely identified due largely to poor preservation, but appear to be of the genera Bracythecium and Eurynchium.

POLLEN
by Rob Scaife

Samples from context numbers 90 (sample 1, 114 cm), 74 (sample 2, 110 cm and 3, 106 cm) and 30 (sample 4, 42 cm), have been analysed for pollen. Samples 1-3 are from the relatively more organic basal deposits, whilst sample 4 is from the 'dark earth'. These results are given in Table 12 (fiche) where pollen has been calculated as a percentage of total pollen, and spores as a percentage of total pollen plus spores.

The pollen spectra are dominated throughout by herbaceous types. Tree and shrub pollen percentages in contrast are much lower, being dominated by Quercus and Corylus type pollen. This may be suggestive of a regional input of pollen from oak-hazel wood-

land outside of the town. Other arboreal taxa may similarly result from a regional or more long distance element rather than localised pollen input. The herbaceous pollen assemblages are possibly representative of three main groups of plant communities and/or mode of origin and deposition. These are:-

1. Ruderal pollen from many of those plants which typically grow on waste ground in urban areas. Although recognition to species level is not possible with many types, this category appears to be dominant. The following might be included in this group: Ranunculus type, Chenopodium type, Papilionaceae, Rosaceae, Rumex, Urtica type, Solanum nigrum, Plantago lanceolata, Galium type and Compositae types.

2. Pollen from marginal aquatic plants might be expected from such a riverine/estuarine situation. These were present but, however, not in abundance. Taxa recorded include Alnus, Salix, Hydrocotyle, Typha angustifolia type (which includes Sparganium) and Cyperaceae. As in category (1), pollen from such genera as Mentha may have been produced by plants from this niche.

3. Cereal type, Sinapis type, Centaurea cyanus and possibly other types are indicative of arable agricultural environments. This raises the problem of interpreting pollen spectra obtained from urban archaeological contexts. The presence of arable pollen types does not necessarily indicate cereal cultivation in proximity to the site sampled for pollen analysis. It is more likely that the presence of these pollen types is due to secondary anthropogenic causes. These may be varied and include the possibility of human faecal material being present in the sediments sampled. The transport of cereal pollen in bracts has been shown (Robinson and Hubbard 1977) and results in the presence of pollen in cess pits and river sewage channels indicating that wholemeal bread has been consumed (Greig 1978; Scaife 1980a, 1980b). The presence of the intestinal parasite/nematode eggs of Trichuris to some extent substantiates this view. Alternatively cereals may have been used in animal feed. Animal dung may have been incorporated into floor sweepings which were later dumped at the site. The unloading of grain crops from boats at this point on the river bank is a further plausible explanation. The interpretation is therefore problematical in that one or more factors other than those normally associated with natural pollen transfer and deposition are involved.

It is apparent from Table 12 (fiche) that Gramineae pollen is dominant. This similarly may be interpreted as regional pollen incoming from extensive pastoral areas outside of the urban area. Conversely, and equally likely, the use of grasses in thatching, animal fodder and as floor covering may be the contributory factors.

Pollen sample 4 is taken from the 'dark earth' deposits at this site. Pollen analytical investigations have been carried out on other such materials (Scaife in MacPhail 1981). Low absolute pollen frequencies, poor preservation and the relatively high totals of pollen having thicker exines (Taraxacum type and Sinapis type) indicate that differential preservation may have occurred in this sample. It seems likely therefore that less robust pollen taxa may have been destroyed, suggesting that sample 4 is similar to the lower more organic samples 1-3.

It is unfortunate that a more detailed regional environmental picture cannot be obtained from this series of pollen samples. The diverse herb pollen assemblage is one which is largely associated with plants growing in urban waste ground areas and from the usage of plant materials brought into the urban area for use by man.

PLANT MACROFOSSILS (excluding wood and mosses)

Fruits, seeds, spikelet fragments, leaves and stem fragments extracted from soil samples in the laboratory are listed in Table 13 (fiche). Large plant remains recovered by means of the 'bulk sieving' tank on site are shown in Table 14 (fiche).

Plants of economic importance

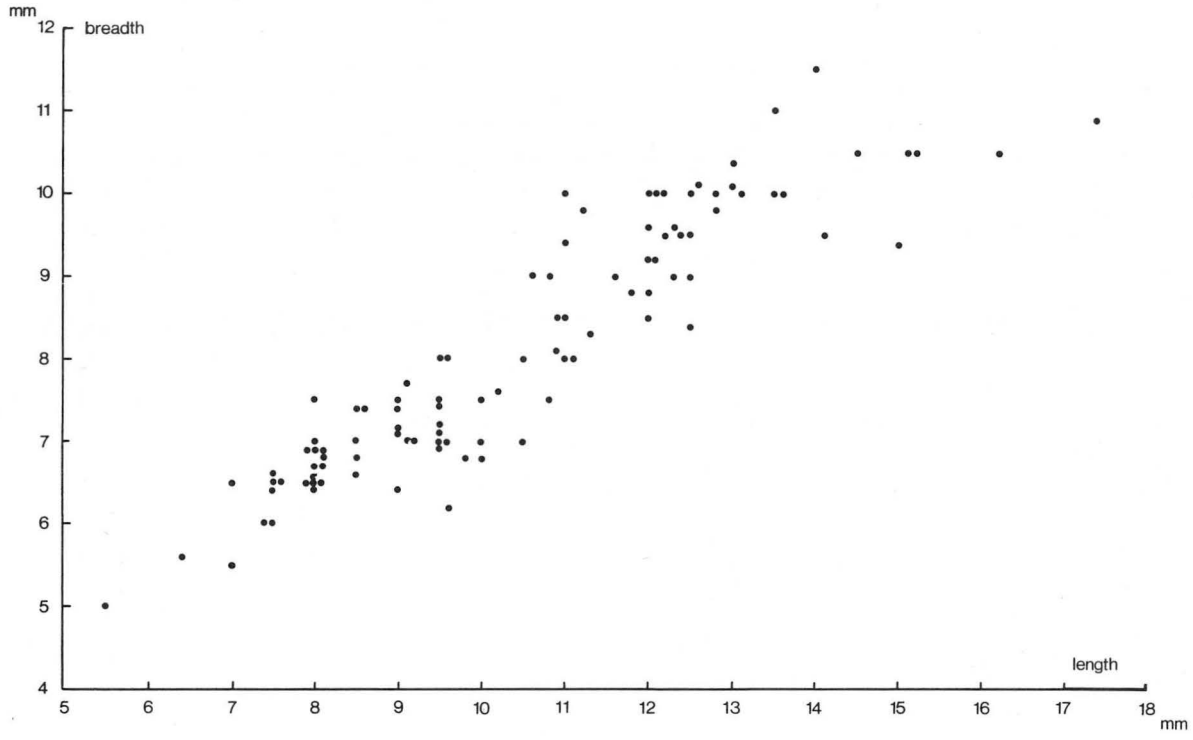
The charred cereals and pulses from the site comprise hulled and possibly naked barley, oats, bread/club wheat, rye and horse-bean. The rarity of charred rachis fragments is thought to indicate that the grains represent domestic food debris rather than crop processing waste. Uncharred oat caryopses were present in 92, a layer of litter, discussed further below.

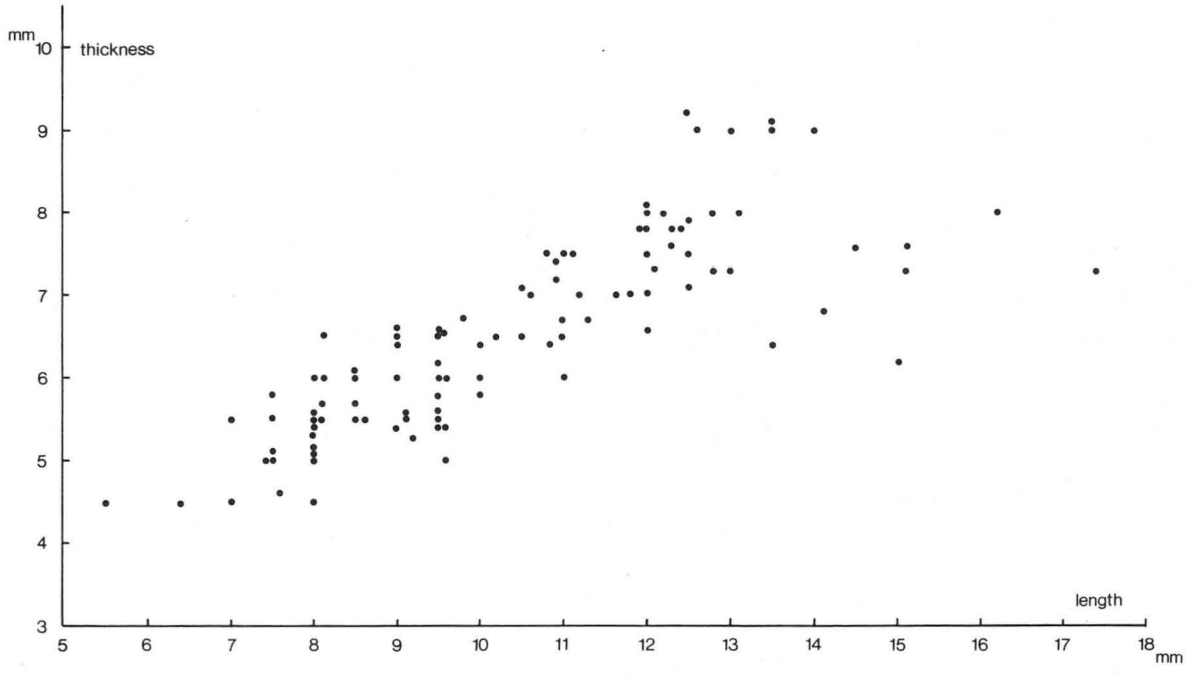
Fruitstones and seeds of succulent fruits are common. Seeds of grape (Vitis vinifera) were recovered from 55 (Period III) and 74 (Period II). The latter gives the earliest post-Roman record of the grape in Norfolk, but need not necessarily be related to the beginnings of medieval viticulture in the Norwich area. Local cultivation would have been possible during the 'Little Climatic Optimum' of this period when mean summer temperatures were about 1°C higher than those of today (Evans 1975, 175) but the importation of dried fruits is equally likely. The Prunus fruitstones are mainly of sloe (Prunus spinosa), but large flat endocarps of cultivated plums (Prunus domestica) and intermediate forms comparable to stones of bullace and to small cultivated damsons are also present (Fig.27). Cherry stones (probably P.avium) occur in small numbers. Fruitstones and seeds of wild species, notably strawberry and bramble, but also apple, hawthorn, raspberry and elderberry, were recovered from several deposits. The presence of these species in refuse layers suggests that some, or all, of them were consumed. Although negative evidence is necessarily suspect, the complete absence of fig achenes, (which are abundant and ubiquitous in later medieval deposits at Norwich), is of some interest. The earliest record of figs from the city comes from a twelfth century well at 31 Colegate (172N), and it now appears that this may provide a date for the beginning of the importation of dried figs to the area.

Fragments of walnut (Juglans regia) came from three contexts (74, 82, 86: Period II), giving another earliest post-Roman record for the area. Hazel nut shell fragments (Corylus avellana) are, however, much more abundant and apparently formed a more significant part of the diet.

Seeds and fruits of the two main fibre crops, flax (Linum usitatissimum) and hemp (Cannabis sativa) were present in several samples. Pollen of Cannabis and Linum (L. bienne-type) occurred at relatively high frequencies in lake sediments thought to date from the Anglo-Saxon period at Old Buckenham Mere, Norfolk, implying that the cultivation of these crops was of some importance in early medieval East Anglia (Godwin 1968). Macroscopic remains of these plants from archaeological sites in the area are, however, relatively rare. A single hemp fruit was recovered from a Late Saxon ditch at the St. Barnabas Hospital site, Thetford (Murphy forthcoming).

Fig.27. Prunus spinosa and Prunus domestica sensu lato.
Scattergrams showing dimensions of 100 fruitstones from context 84. These were randomly selected from specimens extracted by wet-sieving and were measured after slow gentle drying. Note particularly large fruitstones of P.domestica subsp. domestica forming a distinct group on the basis of their thicknesses. Dimensions of P.spinosa cluster around length 7.5-10.0 mm; breadth 6.0-8.0 mm; thickness 4.5-6.5 mm. The intermediate forms are of Prunus domestica subsp. insititia, and small varieties of subsp. domestica.


mm
breadth
length
mm


mm
thickness
length
mm

Small numbers of flax seeds, often individual specimens, have come from Late Saxon deposits at Ipswich, 22 Wensum Street, Norwich, Anglia T.V. extension, Norwich (all Murphy forthcoming) and Great Yarmouth (Jones 1976). The only site in East Anglia at which flax seeds have been recovered in quantity is the Middle Saxon settlement at Brandon, Suffolk, another riverside site (Murphy forthcoming). According to Percival (1918, 397), flax grown for its bast fibres is often, but not invariably, harvested before the seed is fully ripe. After drying, the capsules and roots are removed and the stems subjected to controlled decomposition - 'retting' - before 'breaking' and 'scutching' to release the fibres. The retting has often been done by submerging bundles of stems in rivers. Bast fibres from stems of hemp are separated by a similar method. The initial processes clearly provide opportunities for the incorporation of flax and hemp seeds, ripe or unripe, in riverside deposits. Although no capsules or stem fragments were observed at Whitefriars Street, the presence of flax and hemp seeds at this riverside site provides some grounds for suggesting that fibre crops were being processed in the vicinity. This would, incidentally, provide a possible explanation for the function of some of the stakes and posts at the site: to tether the submerged bundles of stems (p. 55).

Fruits of hop (Humulus lupulus) occurred in eleven samples. The hop is often common in alder carr in East Norfolk (Tansley 1953, 660), and there are pollen records spanning most of the Flandrian (Godwin 1975). Cultivation of the crop in this country is not thought to have been widespread before the early sixteenth century, but there are documentary records of imports for brewing before this date. The early medieval boat from Graveney contained large numbers of hop fruits and bracts which probably represented the remains of an imported cargo (Wilson 1975). The hops from Whitefriars Street may likewise be related to imports of the crop, but it is also possible that female inflorescences containing ripe fruits could have been gathered in nearby carr or carried to the site by the river.

Although many of the wild plants identified have traditionally been used as potherbs, more reliable evidence for the consumption of vegetables and herbs is provided by fruits of only four species: Apium graveolens (celery), Pastinaca sativa (parsnip), c.f. Anethum graveolens (dill?) and Calendula officinalis (pot marigold). Apium is common in marshes near the sea and along brackish ditches (Petch and Swann 1968, 161), but the large numbers of fruits from refuse deposits at this site suggest that cultivated celery is represented. The few fruits of Pastinaca may likewise be from a cultivated parsnip since the wild species is most common on chalk soils and in the Breckland (Petch and Swann 1968, 163). The possible dill fruits are poorly preserved and have not been definitely identified. The achene of Calendula is of particular interest, providing an early record of a species not indigenous to Britain. It has been reported from Sewer Lane, Hull, in late medieval contexts, and its history is fully discussed by Williams (1977, 19), who notes that 'goldeworte' or 'Calendula' is mentioned in Anglo-Saxon Leech books. The specimen from Whitefriars Street provides definite evidence for its presence in pre-Conquest Norwich, though the achene is poorly developed and may perhaps represent an accidental escape rather than intentional cultivation.

The seeds of opium poppy from 102 and 113 may, again, represent accidental importation; the species is nowadays an established alien. However, opium preparations made from the unripe capsules have been used in East Anglia to alleviate ague (malaria); in the nineteenth-century Fenland for example, opium-chewing was common (Godwin 1978, 156). The seeds are commonly used for flavouring.

Wild Plants

The deposits at the site contained seeds representing several distinct plant communities. Not all of these would have been present locally: seeds have clearly been

imported to the site both by human activity and also by the river from further upstream.

Seeds of coastal plants including Suaeda maritima (herbaceous seablite), Armeria or Limonium (thrift or sea-lavender) and Triglochin maritima (sea arrow grass) occur sporadically. Salt-marsh was certainly not present this far upstream; nor, since halophytic diatoms are absent (p.37-8), is it probable that these seeds were brought to the site on tidal surges. It thus appears that the seeds were imported by some human activity. A possibility is that they arrived on the hooves or in the guts of stock fattened on salt-marsh or sea-meadow before transportation by river to Norwich for slaughter. Darby (1935, 443) has inferred that conditions on former intertidal mud flats and marsh in the lower part of the Yare valley were dry enough to provide grazing for sheep at the time of the Domesday survey.

The group of freshwater aquatics includes Chara sp. (stonewort), Ranunculus subgenus Batrachium (crowfoot), c.f. Myriophyllum sp. (milfoil ?), Alismataceae (water plaintain family), Potamogeton c.f. perfoliatus (perfoliate pondweed) and Zannichellia palustris (horned pondweed). Nowadays dense beds of water crowfoot are characteristic of the upper reaches of the Wensum around Fakenham, whilst pondweeds (P.crispus and P.perfoliatus) predominate in the middle and lower reaches (Wortley 1976).

Many of the seeds of wetland plants must have been transported to the site by the river or by artificial means. This, together with the fact that some species occur in several types of wetland community, makes the detailed reconstruction of vegetation-types difficult. However, seeds of species common in reedswamp and carr are not abundant and the majority of the wetland plants represented could occur in wet meadows and other open riparian habitats. The commonest wetland taxa in the Whitefriars Street deposits are Eleocharis sp. (probably E.palustris), species of Carex, Polygonum hydropiper (in 100) and Urtica dioica. These plants probably grew in the immediate area as part of a relatively shade-free, disturbed type of wetland vegetation. Reedswamp was present further upstream, however: peat deposits underlying the Late Saxon causeway at 22 Wensum Street (171N) contained abundant Phragmites culm nodes, with fruits and seeds of sedges, rushes and Typha, as well as seeds of segetals and flax (Murphy forthcoming).

Dry soils developed on fluvial and glacial gravels above the river would have provided suitable conditions for a small group of species including Dianthus c.f. armeria, Stellaria c.f. graminea, Aphanes spp, Rumex acetosella, Calluna vulgaris and Achillea millefolium. D.armeria is nowadays a rare plant, most frequently found in hedgerows and dry pastures on light sandy soils (Clapham, Tutin and Warburg 1968, 100; Petch and Swann 1976, 116).

The majority of the fruits and seeds of scrub and woodland plants are of the edible types: bramble, raspberry, sloe, bullace, hawthorn, apple, elderberry and hazel. These may represent seasonal gathering, perhaps from some distance. Both leaves and fruitstones (as well as twigs: p.45) of holly (Ilex aquifolium) were recovered from (100). The single Betula (birch) fruit could have been wind-transported.

The ruderals and segetals are mainly species common at medieval urban sites and do not require detailed consideration. It is interesting, however, to note that two of the three deposits producing Thlaspi arvense also contained flax seeds; T.arvense is a common weed of flax (Hjelmqvist 1950).

Composition of the assemblages

The assemblages exhibit variations in species composition which can in some cases be related to processes of formation.

The lowermost deposits examined (88, 98, 114: Period I) were generally very dark greyish-brown (10YR 3/2) sands and gravels, including some wood and other organic debris; essentially they are natural river sediments. 114 included a significant proportion (20.2 per cent numerically) of seeds of aquatics (mainly Ranunculus subgenus Batrachium, P.perfoliatus, and Zannichellia), confirming the fluvial origin of the deposit. Samples 88 and 98 contained assemblages in which Urtica dioica was the most abundant species, probably derived from riparian vegetation. Human activity in the area during the formation of these deposits is indicated by seeds of segetals (e.g. A.githago, S.arvensis, P.convolvulus, A.cotula etc.), and by the presence of flax seeds in all three deposits. Samples 114 included the three halophytes discussed above.

Context 92 was a dark brown (7.5YR 3/2) very compacted organic deposit consisting largely of laminated crushed and fragmentary grass culm. It included seeds of several species found in reed-beds (e.g. Filipendula ulmaria, Iris pseudacorus), as well as oat (Avena) caryopses and cereal weeds (e.g. Anthemis cotula, Centaurea cyanus) and a small fragment of heather (Calluna vulgaris). The deposit probably represents discarded flooring material or litter including reeds, oat straw and heather.

The remaining deposits are very mixed in character and can only be interpreted in general terms. Most appear to consist of domestic refuse, including the remains of food plants, upon which transient ruderal and disturbed wetland vegetation developed. Seeds of aquatic plants are present in small numbers and may have been deposited during flooding episodes or after transportation on fishing nets, footwear etc. The uppermost deposits examined (46 and 55 from Period III), contain no aquatics and only a few Carex and Eleocharis nutlets. Carbonised cereals and other food plants are common in these deposits as are seeds of Sambucus nigra and Urtica dioica. These are typical urban refuse assemblages, apparently formed in moist conditions. The absence of aquatics suggests that there was little or no flooding at this stage.

Prospects for future work

The botanical remains identified at this site have produced a provisional list of cultivated plants and provide information about wild plant communities and the origins of certain deposits. Further work on similar types of deposit at future sites is unlikely to produce significantly more information, though it is possible that at other sites within the Late Saxon commercial centre a different set of activities involving different crop plants was taking place. There is, however, a greater chance of detecting such variations between sites if a wider range of contexts can be examined. Those sampled at Whitefriars Street - primarily river deposits and tipped layers of refuse - are 'open contexts', steadily accumulating, into which seeds from many sources may be incorporated. Consequently the seed assemblages are very mixed and generally are not easily interpretable in terms of the processing and utilisation of plant material. Hence it will be important to examine 'closed contexts' such as refuse pits, cess pits, hearths/ovens, floor deposits etc. which may be expected to contain plant remains produced by one activity, or at least by a restricted range of activities. If the 1981 excavations at the Magistrates' Courts site produce an adequately wide range of context-types for sampling it should be possible to produce a much more detailed picture of the plant economy of the settlement.

WOOD
by Jennifer Hillam

Large timbers were sent to the Sheffield Dendrochronology Laboratory for tree-ring analysis. The remaining wood collected at the site was examined and identified in Norwich.

All the timbers sent for tree-ring analysis were oak (Quercus sp.). Some were radially-split sections of wood, e.g. 99A, and others were halved trunks, e.g. 34B. Occasionally, whole trunks had been used, e.g. 34C, whilst 30 SF3 was a tangentially-split plank (Table 15: fiche). Ring measurements are listed on fiche following Table 15.

The four timbers from 34, plus 30 SF3, came from young trees which must have been forty to fifty years old or less when felled. These had wide annual rings (3-5 mm), suggesting that the trees had grown under favourable conditions in a fairly open environment. The timbers from the lower layers, on the other hand, were narrow-ringed (widths less than 1 mm). The outer rings of 78B, for example, were so narrow that they could not be measured with any accuracy: the last c. 88 rings had an average width of only 0.2 - 0.3 mm. The trees producing these lower timbers therefore must have grown under less favourable conditions, probably with much shading from other trees. They were longer-lived than the upper timbers: 99A and 78B were 100-150 years old when felled, whilst 49 was probably as old as 300 years. (53 was also very old, but knots in the cross-section made it impossible to determine the exact age.)

Tree-ring analysis produced no positive results, most of the samples being unsuitable for measurement. The ring widths of 99A, 78B and 49 were measured and compared with dated reference chronologies covering the tenth to twelfth centuries. No acceptable cross-matching was found, even for 49 which had a ring sequence of 244 years and appeared ideally suited for tree-ring work. A similar situation occurred when medieval oak timbers from Cecilia Street in Ipswich were examined: no cross-matching was possible. East Anglia seems to be a problem as far as the tree-ring dating of medieval timbers is concerned. However, Saxon timbers from Mersea Strood near Colchester have recently been absolutely-dated so that the use of dendrochronology for East Anglian timbers cannot yet be ruled out. The tree-ring data is appended on fiche.

The remaining wood from the site consisted of twigs, branches and timbers of several species. In general, the larger pieces were well-preserved, though some were strongly compressed. The twigs collected from the layers of brush-wood were not identified, since many were badly crushed or partly decayed and the remaining specimens showed only a few growth rings in which characteristic features used in identification were not always well-developed. Some of the wood samples contained vivianite and orange-brown iron oxides in vessels and cracks.

The wood identified is listed in Table 16 (fiche). The material falls into three main groups:-

1. Mature oak timber. This occurs mainly in the form of stakes, produced by radial splitting, but pieces of ill-defined shape are also present.
2. Poles and stakes made from straight, untrimmed young growth of oak, ash, hazel, holly, willow, willow/poplar and Prunus sp.
3. Branch fragments of willow/poplar.

The second group is perhaps the most interesting. Young straight growth of fairly uniform size (here generally 2.5 - 3.5 cm) has traditionally been produced by systems of woodland management from coppice, pollards or suckers. It seems probable that by the tenth and eleventh centuries management of local woodland would have been necessary to meet the demands of the settlement for wood and timber. There are references to pollarding at this period in Anglo-Saxon charters (Rackham 1976, 53).

Which of these trees were growing in the immediate vicinity and which were imported from further afield cannot be determined directly, though it should be noted that holly is represented at the site not only by wood but also by leaves and fruitstones. Nuts and fruitstones of hazel and Prunus spp. have also been identified.

SOILS
by Richard Mac Phail

A box-monolith was received containing a sample from Periods III and IV relating to the late eleventh/early twelfth century onward. As this was an anthropogenic deposit it was treated in the same way as 'dark earth' samples had been investigated previously. (See Ancient Monument Lab. Reports Nos. 3055, 3057, 3059, 3060 and 3061). It was tested for alkali soluble humus, loss on ignition and pH. Additionally, thin sections were manufactured from level 30 to study in detail features of this wet anthropogenic deposit, as the dark colour of the material tends to obscure most pedogenic characteristics.

Results

The layers examined, namely 51, 46, 30 and 27 have a uniform, neutral pH. (See Analytical Data: fiche). Alkali soluble humus decreased from levels 51 and 46 to levels 30 and 27, perhaps through the oxidation of material in the upper part. Loss on ignition, strangely, increases in level 27, although washing for inclusions revealed far more charcoal in the underlying level 30. Mixed with the silt and sands, inclusions included pot fragments, mortar, plant remains, carbonised wheat grains, charcoal, a variety of bone and fish bone, slag, shell, one struck flint, and Bryozoa.

Three thin sections of level 30 were scrutinised. They revealed the relatively organic character of this deposit. The fabric is generally agglomeroplasmic in character (see Micromorphology on fiche) in that soil material is clustered as fine peds between large skeletal grains. The latter comprise quartz grains, shell fragments, charcoal, and a variety of plant material.

Most of soil matrix contains high proportions of organic matter, probably including fine charcoal, which together with the organic matter leads to the deposit having a dark colour. Skeletal grains reflect the variation in dumped material, as noted in the inclusions earlier, and this includes plant material. The preservation of recognisable plant material, but more pertinently of amorphous organic matter, clearly suggests the effects of anaerobism. This accounts for the lack of faunal mixing or droppings, but nevertheless poor pollen preservation (R.G.Scaife, pers.com.) and well structured peds, channels and metavughs suggest wetting and drying, and the movement of soil water. A high pH and any oxygenation would accelerate pollen destruction by microfauna, and obviously the upper deposits seem to have been oxidised to some extent.

The amorphous organic matter, the probable presence of vivianite, and the occurrence of parasite eggs in this level (R.G.Scaife, pers.com.) suggest that some of the input into this deposit may be cess or dung, as described from similar urban environments, as at York.

In comparison to probable Late Roman 'Dark Earth' from London, which has already been studied in thin sections (Mac Phail, 1980), the anthropogenic deposits at Whitefriars Street differ by being far more organic, with a uniform soil fabric. This relates to the absence of earthworms reworking the soil, as in London, where there is the loss of much organic matter due to oxidation. Nevertheless, the variety of inclusions in both the 'Dark Earth' of London and the deposit at Whitefriars Street is illustrative of soil formation in dumped material; although at Norwich inwash may also have supplied additional matter. The deposits at Whitefriars Street are thus acting as a wet base-rich Bg horizon, while in contrast 'Dark Earth' can be described as a dried-out base rich B horizon. In summary, the deposit at Whitefriars Street seems to be very heterogenous, and is mainly comprised of dumped material although inwashed material may well be included. Its wet character has preserved much organic matter, which

may be in part derived from cess.

THE ENVIRONMENTAL EVIDENCE: A GENERAL DISCUSSION

The purpose of this concluding discussion is to provide the general archaeological reader with an outline account of the environment of the site and of the types of human activity represented. These activities may broadly be divided into three groups: the importation and use of agricultural produce, the exploitation of marine resources, and the modification and exploitation of local habitats.

The samples of large mammal bone and crop plant remains recovered at Whitefriars Street are the products of a set of activities and processes specific to this site. Only further excavation and research can establish whether this material is truly representative of the complete range of agricultural produce entering the Late Saxon town. Nor is it known how extensive an area was supplying the city with foodstuffs and other raw materials. It follows that the interpretation of this material must at present be in terms of this particular site rather than the complete economy of the city and still less the agriculture of the region.

Some problems in the interpretation of the bone data have been discussed above, not the least of which is the relatively small size of the sample. However, the available evidence is thought to indicate that the bulk of the bone is food refuse, with cattle providing the most meat overall, followed by sheep/goat, whilst pigs contributed a relatively small amount. Bones of horse are rare, and horseflesh may not have been consumed. There are, however, changes in the composition of the bone assemblages between successive site periods. In particular, cattle bone fragments predominate in Periods I, II and IV, whilst in deposits attributed to Period II (when activity on the waterfront was at its most intensive), sheep/goat bone fragments are most abundant. Furthermore, there is a change in emphasis of bone types, so that whilst in Period I a large proportion of the cattle and sheep/goat bone consists of waste material (skull bones and metapodials), by Period IV this proportion had been much reduced. It is thought that this reflects a change from the deposition of butchery waste to that of domestic waste related to the shift of the commercial centre of the town from the Whitefriars Street/Tombland area in later periods. Avian bones make up a minor, but significant, component of the samples, but have not, as yet, been assigned to species.

The plant macrofossils recovered give a minimum range of cultivated plant foodstuffs available, including cereals (barley, oats, bread/club wheat, rye), pulses (horsebean), succulent fruits (grape, plums, cherries), nuts (walnut, hazel-nut), flavourings (hop, dill (?), opium poppy), vegetables and pot-herbs (celery, parsnip, pot marigold). It cannot be determined on the present evidence whether the more exotic species were cultivated locally or were imported. However, it is remarkable that almost all the crops known from later medieval contexts at Norwich (with the principle exception of figs) occur in the deposits of Period I and II. The composition of the seed assemblages recovered suggests that these deposits include spillage from fully processed crops and domestic food refuse, rather than crop processing waste. However, the types of 'open' context available for investigation at this site rarely produce useful information about the utilisation and processing of crop plants but rather a bare species list. A priority in future excavations must be, therefore, to study a wider range of contexts related to specific types of activity.

After foodstuffs, one of the most important of agricultural products was fibre for use in textile and rope production. Remains of both flax and hemp have been identified and the presence of seeds of these two species has been interpreted as indicating local processing of fibre crops in Period I. At present the importance of wool production is unclear. However, more detailed studies of the age structure of the sheep populations

represented by bones at the site may be expected to indicate more clearly whether the emphasis in sheep-rearing was on meat or wool; at present the evidence seems to indicate that meat production was a priority.

Marine resources clearly provided a significant proportion of the animal protein consumed at the site. The interpretation of the fishbone is subject to problems similar to those restricting interpretation of the mammal bone and food plant remains, in that the samples are of unknown and probably diverse origin, and may well not be representative of fish consumption in the town as a whole. In these particular deposits cod, whiting and herring are most abundant with lesser amounts of cartilaginous fish, eel and flatfish (plaice and flounder) and some mackerel, horse mackerel and bass. All these taxa are known from contemporary deposits at Great Yarmouth.

Large quantities of marine mollusc shell were present at Whitefriars Street, some layers (e.g. 82) consisting almost entirely of crushed shell. The species composition of the mollusc sample is provisionally thought to indicate specialised shellfish exploitation of estuarine mussel and oyster beds in the Breydon Water area, in contrast to diversified shellfish exploitation at Yarmouth. Quantitative assessment of the contribution to diet by shellfish was not possible due to shell fragmentation, but, given suitable deposits of material, will be attempted in 1981. Studies of the epifauna of the shells have not produced useful habitat information due to the wide ecological tolerances of the taxa present, but will also be pursued further in 1981.

A further 'marine' resource thought to have been of importance by the time of the Domesday Survey, if not before, was grazing marsh on the former intertidal mudflats and salt marsh in the lower part of the Yare Valley. Indisputable evidence for the use of such pasture is unlikely to be obtained at an urban site of this type; but the few seeds of coastal plants recovered are plausibly, though tentatively, interpreted as having been imported to the site on the hooves or in the guts of stock pastured in such areas.

The development of Norwich inevitably resulted in the modification of local habitats, some changes simply being accidental side-effects of human activity, whilst others resulted from deliberate attempts to increase the production of necessary commodities or to alter conditions to human advantage in other ways. At Whitefriars Street attention naturally centres on the river. In the Late Saxon period two main forms of modification may be expected to have occurred: pollution by organic matter, and the alteration of river flow.

From the nature of the riverside deposits and the biological remains which they contain it is clear that organic refuse was being dumped along the river bank; and there is no doubt that the amounts of phosphates and nitrates reaching the river in solution as run-off and from stock-yards, slaughterhouses and sewage would have increased with the development of the city. However, palaeolimnological studies at Strumpshaw Broad, on the Yare downstream from Norwich have shown that nutrient inputs to the river and adjacent bodies of water were relatively low before 1800 (Moss 1980, 287) and it therefore seems improbable that effluents from the early medieval town would have had significant effects on water quality. Indeed, the remains of a diverse aquatic flora and fauna from the river sediments at Whitefriars Street show that at this early period the influx of pure water was sufficient to prevent any general de-oxygenation resulting from this localised pollution.

As will be noted below (p.56) there is reason to believe that a pre-Conquest bridge existed at Whitefriars. The known Late Saxon causeway upstream at Fye Bridge was built of piles with a central gap of less than 2 m (Hudson 1898) and any contemporary bridge on Whitefriars Street may well have been built in a similar way. Besides the potentially disastrous effects after heavy rain of such constructions, there would

obviously have been effects on mean current speeds and hence on aquatic plant and animal communities. By analogy with modern dams, weirs and bridges in the area one would expect tranquil slow-flowing water upstream of such a barrier, containing a well-developed vegetation of aquatic macrophytes, in turn providing substrates for many invertebrates and epiphytes; whilst current speeds of more than 60 cm per second producing a non-silted bed with sparser vegetation and more restricted faunas would occur downstream (Wortley 1976).

In interpreting the remains of aquatic organisms from the river sediments the possibility of such artifical modification must be borne in mind. Interpretation is further complicated by the fact that the assemblages will contain a component of plant and animal remains which have been transported to the site from other localities, although the high proportion of intact diatom frustules and the presence of paired Pisidium valves seem to suggest that transportation may not be a major problem.

In summary, the biological remains do suggest deposition in a tranquil environment as might be expected in bank deposits of a lowland river. The river sediments contained an indigenous mud flora of diatoms together with some frustules derived from nearby solid submerged substrates and a very small planktonic component. The fruits and seeds of aquatic macrophytes include a relatively wide range of taxa indicating a diverse flora of the type formerly characteristic of the slow-flowing middle and lower reaches of East Anglian rivers. These higher plants provided substrates for freshwater snails, predominantly 'ditch' and 'moving-water species'; but shells of species such as Ancylus fluviatilis indicating swifter current-flows were not observed. This range of organisms would be consistent with the type of community to be expected just upstream from a bridge, but equally could occur in naturally quiet reaches. It will be interesting to see whether the organic remains from comparable contemporary riverside sediments at the 1981 excavations downstream from the bridge will be similar or whether any indications of increased flow-rates can be detected.

Although some of the bones of freshwater fish may be derived from moribund animals stranded at high tide or after floods the majority of the material is thought to be food refuse, and thus provides some evidence for the exploitation of freshwater fisheries. Pike, eel, Cyprinids (carp family) and Salmonids (possibly trout) have been identified, but in the samples from this site bones of exclusively marine fish were much more abundant.

Remains of aquatic organisms were most abundant and best preserved in the deposits of Periods I and II, which clearly consisted of natural and semi-natural river deposits or layers of shell, brushwood or refuse incorporating some sediment of fluvial origin. The source of the uniformly dark deposits of Periods III and IV was initially much less obvious: it was unclear during excavation whether these deposits were dumped material or whether they included a significant component of flood loam. This distinction is clearly of importance for an understanding of the utilisation of the site in its later phases. Studies of soil micromorphology have shown that a typical deposit (30) was very heterogenous, probably consisting largely of dumped material perhaps with some inwashed sediment. The presence of amorphous organic matter and probably of vivianite, together with the occurrence of parasite eggs (Trichuris), is thought to indicate that the deposit was partly formed of cess or dung. The algae from these upper layers include some diatom genera tolerant of extreme environmental conditions, such as occur in wet soils, as well as many cysts of Chrysophyta. The high proportion of fragmented diatom frustules is thought to indicate mechanical disturbance. Taking into account the results of the soil investigations, the most probable of the alternative interpretations of the samples of algae suggested above is that these artifical deposits remained wet primarily by capillary action with occasional river flooding. The absence or rarity of seeds of aquatic plants and molluscs in the later deposits provides further

grounds for thinking that, though these deposits formed in damp or wet conditions, they were rarely flooded. Thus, this accumulation of deposits is seen to result almost entirely from the dumping of material after the main phase of commercial activity at the site had ceased.

This dumping obviously resulted in a major change in the types of habitat present along the waterfront, but it appears that the natural wetland vegetation of the valley floor had already been largely obliterated at the site in Periods I and II. Although peats containing macroscopic remains of Phragmites, Carex, Juncus and Typha, representing riverside reedswamp, are present beneath the Late Saxon causeway crossing the river along the line of Wensum Street (171N), remains of reedswamp plants were rare at Whitefriars Street. This may be partly attributable to the use of reeds for thatching and litter, but disturbance resulting from the occupation of the site was probably a more significant factor in the long term.

Most of the biological remains so far discussed are derived from local habitats. Samples from 90, 74 and 30 were analysed for pollen in an attempt to provide information about regional vegetation. However, it appears that localised pollen input from herbaceous plant communities is of greater importance than regional input in all these samples. The range of ruderal taxa determined from pollen shows good correspondence with the species list of ruderals from macrofossils: such vegetation was clearly well-developed on disturbed ground in and around the site. Similarly, the pollen evidence conforms with macrofossil evidence in that wetland taxa are relatively poorly represented. The significance of the cereal-type pollen and pollen of cereal weeds is not easily assessed: local cereal cultivation could be indicated but equally these pollen-types could be derived from human faecal material, from animal feed or from the unloading of grain crops. The abundance of Gramineae pollen may likewise be interpreted as a regional input or a local anthropogenic effect. Cannabaceae pollen was present in samples from 90 and 74: both Cannabis and Humulus were identified from macrofossils at the site. Pollen of Erica and Calluna is present but rare, never comprising more than 2 per cent of total pollen. These low levels of Ericaceae pollen appear to confirm historical evidence indicating that Mousehold Heath, overlooking the site, was forested in the early middle ages and that the open heath was a product of later medieval overgrazing and deforestation (Rackham 1976, 136). The arboreal pollen percentages are low and dominated by Quercus and Corylus, with some Betula, Pinus, Tilia, Alnus, Fagus and Salix. This is thought to indicate a regional input from oak-hazel woodland outside the town, with some pollen from valley-floor trees such as alder and willow.

The demands of the developing city for fuel and constructional timber would eventually have depleted local supplies unless techniques of woodland management were adopted. It is tempting to see the results obtained from tree-ring studies as evidence for such a development. The oak timbers from the lower layers at the site had very narrow rings, having grown probably in shaded conditions, and were from old trees, as much as 300 years in one case. Timbers from the upper layers had wide annual rings, suggesting that the trees had grown in open conditions, and were from young trees, forty to fifty years old. This could be thought to indicate a change from an initial felling of primary woodland to the use of timber produced by the medieval woodland system of 'coppice-with-standards', but obviously more data will be required before such an interpretation can be accepted without reservation. However, the young straight poles and stakes of oak, ash, hazel, holly, willow, willow/poplar and Prunus sp. may be from managed woodland, produced by coppicing, pollarding or from suckers. Mosses derived from at least two distinct types of woodland were identified in soil samples: Thuidium tamariscinum, common in woodland on heavy clay soils and Thamnobryum alopecurum found in dry calcareous woodlands. How these mosses reached the site is unclear, but since both are forest-floor plants rather than epiphytes it is improbable that they arrived attached to timbers.

There is evidence for hunting and gathering in both woodland and open habitats. Bones of roe and red deer and hare were identified at low frequencies in the bone samples, but on the present evidence there is no reason to suppose that hunting provided a significant proportion of the meat consumed at the site. Wild plant foods, in particular fruits and nuts from woodland and scrub (sloe, strawberry, bramble, apple, hawthorn, raspberry, elderberry and hazelnuts) were evidently gathered seasonally and are numerically more important in these samples than cultivated fruits and nuts.

Studies of sediments and biological remains have, then, produced information relating to the exploitation of a wide variety of resources and to the effects of human activity on the local environment. It should be noted in conclusion, however, that the area excavated was only some 30 m^2. It is highly improbable that such a small area would produce material reflecting the full range of economic activities involving plants and animals. A primary objective during the forthcoming excavations at the Magistrates' Court site must, therefore, be to assess the degree of variability between sites at the commercial centre of the Late Saxon town.

VI. RESULT OF RADIOCARBON ANALYSIS

Three samples of timber were sent to Harwell Low Level Measurements Laboratory for radiocarbon analysis. All three were taken from one Period I oak stake (99E). The average result of 1040 $\pm$ 40bp (910 ad) gives a considerably reduced error term.

Results:				
	HAR-3852	421N99EA	1070 $\pm$ 70	(880 ad)
	HAR-3877	421N99EC	1080 $\pm$ 80	(870 ad)
	HAR-3878	421N99EB	970 $\pm$ 70	(980 ad)

VII. EXTRACT AND DOCUMENTARY RECONSTRUCTION FROM THE ENROLLED DEEDS 1285-1340

by Serena Kelly and Margot Tillyard

INTRODUCTION

A study of the medieval documentation of the city of Norwich was undertaken by the documentary team of the Norwich Survey in order to gain a clearer understanding of the topography, economy and social structure of the medieval town and to provide the archaeologist with the means for choosing and interpreting profitable excavation sites. For these purposes the tenement pattern of the medieval town has been reconstructed by linking together information contained within the property deeds enrolled in the city court between 1285 and 1340, after which date the source is discontinuous and far less useful. With the aid of topographical references such as churches, roads and the river the reconstructed map can be anchored firmly to the street pattern that exists today. The whole of the medieval town has been reconstructed in this way, but financial constraints have delayed publication. The following extract is relevant to the Whitefriars Street excavation and forms a representative sample of the entire project.

THE SITE
(Fig.28)

The block of land to be discussed lies in the parish of St Martin-at-Palace and is defined by the river on the north and by roads on the other three sides. The road on the west is described in the deeds as leading to the quay of Fybrigge; the road to the south as the road to the cemetery of St Martin's; and the road which forms the eastern boundary of the block as that leading to St Martin's bridge (now called Whitefriars bridge).

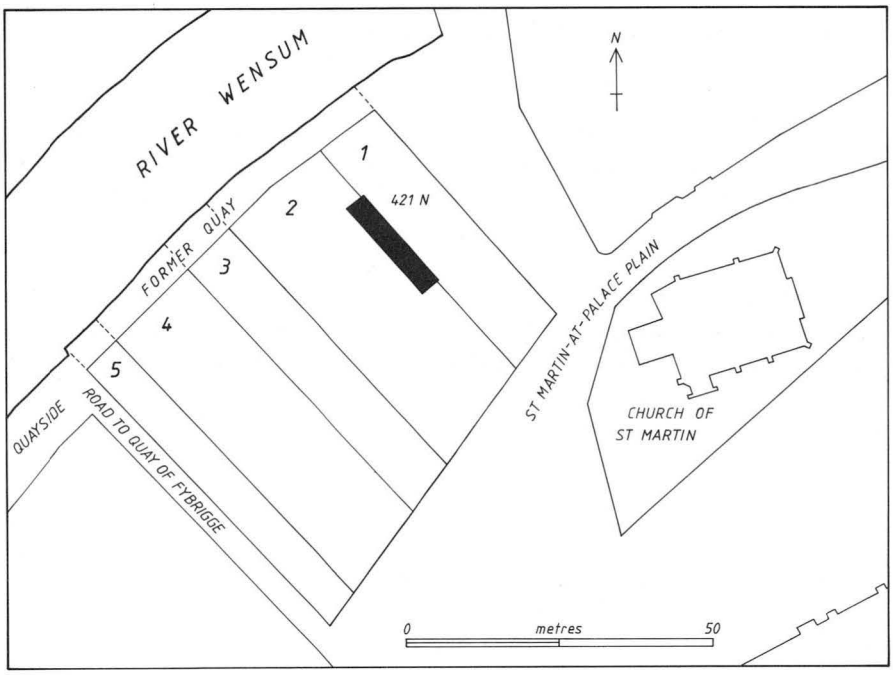


Fig.28. Map to show tenements and purprestures in 1286.

The first indication of the tenement pattern which can be gleaned from the enrolled property deeds shows the area in the late thirteenth century divided among four individuals: Matilda de Catton; Adam de Irstead; Simon le Cunte; and a messuage described as once belonging to Richard le Moneye. These properties ran from north to south across the block of land, each with a frontage on the road to the south and a border with the river.

There is evidence that these properties once stopped 16 ft (5 m) short of the river and abutted against an extension of the Fybrigge quay. Kirkpatrick refers to a court case of 9th September 1250 when Roger de Burg was fined for obstructing 'the King's way upon the Key from the Bridge of St.Martin to Fybrigge, where Carts were used to pass with Merchandises' (Hudson 1889, 69). Although he was fined, a repeat presentment in 1285/6 would suggest the obstructions were not removed. On this occasion:

> It was p^{r}sented that Maud de Catton held one House situated upon the common Key between St.Martin's Bridge and Fybrigge, in length 100 feet and breadth 16 ft ... and that Adam de Irstede held upon the said Key one place, in length 32 feet and Breadth 16 feet, and Simon le Cunte held there one place, in length 54 feet and breadth 16 feet, and that Willm le Moyne held there one House made there upon the sd Key, in length 22 feet and breadth 16 feet, wch sd Key and wch sd way they have obstructed now 30 years agoe and have built Houses there to the nuisance of ye whole City & of all Passengers and Boats there arriving ... (Hudson 1889, 69)

Fines were again levied and the obstructions ordered to be demolished but as all subsequent deeds referring to this block of property have the river as the northern boundary it would seem that no action was taken and the quay, as such, fell out of use and the land was incorporated into the properties to the south. Measurements are seldom given in the Norwich deeds, so those mentioned in the court case enable the areas of the separate properties to be defined with an accuracy that is usually not possible.

DESCENT OF OWNERSHIP OF PROPERTIES 1285-1340

Plot 1

In 1288 Matilda de Catton divided her property by a grant of the eastern 37 ft (11 m) of her messuage to Robert de Martham. The northern abuttal of this deed mentions a fish-house in her possession which would suggest that she retained her encroachment upon the quay.

There is no record of any grant that Robert de Martham may have made of this property but the fact that his daughter's name was Custance and the wife of the next owner of the property, John Biship of Wymigton, was also called Custance, would suggest that it passed from Robert to his daughter, perhaps on her marriage. In 1321 John and Custance granted this land with buildings to Nicholas de Blofeld and his wife Margery. This and all subsequent grants of the plot give the river as the northern boundary.

In 1322 this property was still owned by Nicholas de Blofeld but Thomas de Greymeston and his mother Matilda granted to Henry de Thirston and his son John, 4s $5\frac{1}{4}$d annual rent which was derived from the messuage of Nicholas de Blofeld.

Five years later in 1327 the property changed hands again when Nicholas de Blofeld granted it to William Soneman of Oulton, who was described as a dyer.

By means of a quitclaim in 1339 William Attechirchyerd of Norwich renounced to William Soneman all rights or claims to this property.

Plot 2

In 1290 Matilda de Catton, who was always described in the deeds as the widow of Alexander de Birlingham, granted the western section of her property, including the encroachment on the quay, to Jordan, called le Verrer, for cash. In the same year Jordan granted it to John de Rudham, a bellringer, and his wife Matilda.

By 1305 a clerk, Rado de Verly and his wife Cristiana, held the messuage, as in this year another clerk, John, the son of Alice de Couteshalle, renounced to him all rights he held in the property. By a further quitclaim in 1314 Robert de Drayton, the rector of St George Tombland, renounced any claim he had in 'the messuage with buildings and appurtenances held by Rado de Verly'.

In 1316 Rado and his wife granted the property for cash to Henry, son of John and Beatrice de Therston, and his son John. Three months later Roger de Bokynham and his wife Emma renounced by a quitclaim any rights they held in the property, presumably resulting from Emma's connection as daughter of Alexander de Birlingham.

Thomas de Greymeston and his mother Matilda, who had held an interest in the rent from the property to the east (plot 1), also received an annual rent of 8s $10\frac{1}{2}$d from this property which they granted to Henry de Thirston and his son John in 1322.

By 1336 this property was in the ownership of Thomas, the son of William Richard of Plumstead, and his wife Joan, as in September of that year they granted it to Peter de Attilbrigge and a chaplain, Edmund Pie of Stalham.

In 1339, William Attechirchyerd of Norwich, who also held an interest in the neighbouring property, renounced by quitclaim all interest in this property to Peter de Attilbrigge and Edmund Pie of Stalham.

Plot 3

In 1288 this block of land, including the encroachment on the quay, passed from the executors of Adam de Irstead to John le Blexester for the very high price of 24 marks, and remained in the possession of the family of John le Blexester until 1327 when Michael le Blexester and his wife Marion granted it to a fisherman, Adam Godinge.

Plot 4

This block, together with the encroachment on the quay, remained in the possession of Simon le Cunte and his wife Agnes until they granted it in 1286 to George de Yelverston and Walter de Welleford, a shoemaker.

The next enrolled transaction involving this property occurred in 1319 when Thomas Samoun, a fisherman, and his wife granted it to another fisherman, Adam Godinge (who bought the property plot 3 in 1327).

Adam Godinge and his wife Isobel granted it to John Silveron, another fisherman, in 1328.

Plot 5

There are no enrolled deeds for the period 1295 to 1340 which refer to property number 5. The court presentment mentioned by Kirkpatrick states that William le Moyne had encroached upon the quay and it is likely that, in common with the other blocks of property, he owned the land from the quay to the street frontage. This property is mentioned in the abuttals of deeds referring to plot 4 as being in the possession of Richard le Moneye in 1286 and Roger de Attlebrigge in 1319 and 1328.

CONCLUSIONS

The active property market, the extensions on to the quay, and the subdivision of the large block of property owned by Matilda de Catton suggest that this area was widely felt to be worthy of exploitation in the thirteenth and fourteenth centuries. This was a period of high population pressure when open land throughout the city was settled for the first time; by-name evidence suggests large scale migration into Norwich from surrounding rural areas.

The most difficult problem in the interpretation of the topographical evidence lies in distinguishing owner-occupied properties from those which were rented out. The population pressure of this period encouraged individuals to speculate in property throughout the city, buying up tenements for investment and renting them out to others. If a property is known to be the only one in the possession of an individual it can be stated with reasonable confidence that this was his residence and possible workplace. For this purpose a name index of property holders has been completed for the period 1285 to 1311. Information provided by this index reveals that Matilda de Catton, Adam de Irstead, Simon le Cunte and William le Moyne were not involved in property transactions elsewhere in the city in the late thirteenth century. It is, therefore, likely that they were living on the properties they held in this block. Of subsequent owners to 1311 only John de Rudham, the bellringer, and Robert de Martham did not own property elsewhere in the city. Thus, although it would seem likely that the fishermen, the dyer and possibly John le Blexester, whose name suggests he was engaged in bleaching cloth, were all exploiting these riverside tenements for commercial purposes, it is impossible to be absolutely certain. We can be sure, however, that individuals involved in quitclaims did not live here as this legal process involved renouncing all rights or claims to the property in question.

It cannot be established from the deeds how the properties in this block were used although it is clear that plots 1, 2, 3 and 4 at least were built up. Descriptions of these plots include the words 'with buildings' or 'with buildings and appurtenances' after the rather imprecise term 'messuage'. It is likely that plot 5 had also been built upon but this cannot be confirmed from deed evidence alone.

VIII. HISTORICAL AND TOPOGRAPHICAL CONCLUSIONS

The variety of archaeological material recovered can be seen to provide a reasonably coherent general picture of the development of the area. The following discussion, however, while taking into consideration the documentary evidence, only uses environmental data where this directly affects the interpretation of the site. A more thorough discussion of the environmental material as a whole is given on p.47.

Initial utilisation of the Palace Plain section of the waterfront west of the present-day Whitefriars Bridge seems to have occurred during the proto-urban stage of the city's development, that is to say in the later ninth or early tenth centuries. Although the excavation lay off the slight rise of Bichil (p.4) it was evident from the gravel and silty deposits which were uncovered that the area, if not part of the river bed proper, was at least a shelving riverside beach. This beach was inundated on numerous occasions, the main high water mark probably being near the south end of the trench. Small rivercraft may have berthed here, possibly tied to posts such as the one (70) recovered at the north section (Fig.9) and ridden in shallow water at high tide. Other activities are also hinted at by a number of oak stakes which were clearly of insufficient bulk to be of structural use. It is possible that they were used to tether flax which was then retted in the river. Quantities of flax and hemp seeds were found in the soil samples (p.42). One of these stakes has been dated to the first quarter of the tenth century by radiocarbon (p.51).

In the late tenth century initial steps were taken to facilitate the berthing of boats on land. The gravel beach, combined with sand and silt in wet conditions, has a propensity to churn when walked upon. A layer of brushwood (Fig.4) was therefore laid to provide a firmer footing for work at the waterfront and it is likely that small vessels were beached onto this surface. Occasional inundation caused silt to accumulate above the brushwood and a second surface had to be constructed. This, however, was laid further to the north (Fig.5) implying that the mean high water level was receding. Recent studies have shown that a lowering of the water table did indeed take place in the Saxo-Norman period, possibly coinciding with a slight land emergence as noted by Green (1961, 21) but generally being effected by relatively low rainfall between 900 and 1225 A.D. The Yare and Wensum valley area in particular was also afforded some protection from salt water by the Yarmouth sand spit which impeded tidal flow upstream (Coles 1977, 298). A recession of water level in Norwich would have been gradual (tidal difference at the present day being only c. 85 cm) and this is reflected by the northward advance of the brushwood levels within the excavation itself. The Period II Phase 2 brushwood only occupied a small area between the Period II Phase 1 surface and the north section. When this needed to be replaced its successor was constructed further north again.

As the brushwood surfaces were moved northwards they left uncovered the area to the south occupied by their predecessors. This seems to emphasize that the surfaces were intended as a specialised facility at the waterfront itself, extending the length of the river frontage but not necessarily covering its breadth. A similar surface was almost certainly seen to the north of the river in the early eighteenth century. Kirkpatrick, making a note in April 1716, records that '... Mr.Humphreys says that in digging of a Well in the yard where He dwells in St.George's of Colegate They found a great

Number of Shells of sea fish and dug through a great deal of Brushwood which He supposed had been laid for a fence against the River...' (Rye Ms.9 (2) f.135). Recently (1981) other surfaces have also been located on the new magistrates courts site east of Whitefriars Bridge (Ayers forthcoming). Further surfaces are known elsewhere in the country. A brushwood raft overlay marsh in the Anglo-Danish levels at Hungate, York (Richardson 1959, 59) and brushwood was used, more elaborately, to level an embankment at New Fresh Wharf, London (Miller 1977, 50-59). In a later context 'great rush mats' adjacent to the River Hull are referred to in the Chamberlains' Account for Hull of 1464/5 (Kingston-upon-Hull Record Office, BRF 2/373).

The surfaces themselves were loosely intertwined although often with the larger branches being orientated in one direction. They were usually laid above a thick deposit of organic waste which acted as an adhesive for the individual pieces of brushwood. It was noted, on this very wet site, that the combination of these materials was most effectively waterproof, the organic level acting as a sponge or a diaphragm and, with the brushwood, providing a resilient, almost sprung, footing. The use of this material was apparently continued until recent times when contractors were faced with waterlogged trenches.

The succession of some five phases of these brushwood surfaces indicates that this part at least of the waterfront area was being intensively used. It is possible that only rivercraft were beached here although some shipping capable of crossing the North Sea would have been of sufficiently shallow draught to allow them to be beached as well. However, it is unlikely that larger ships could have reached this far upriver in the eleventh century. The site lay immediately upstream of a primary north-to-south route which probably connected Cowgate to St Faith's Lane (p.2) and which would have crossed the river at or near this point; excavation by the Norwich Survey on Whitefriars (site 36N: Atkin and Sutermeister 1978, 22) and at St James Church (site 415N: Atkin 1982) suggests that the line of Cowgate originally ran c. 3 m to the east of the present alignment (Fig.1). A bridge at St Martin's (i.e. Palace Plain) is mentioned as early as 1106 (Johnson and Cronne 1956, 55), being the earliest reference to a bridge in Norwich, although a bridge of causeway type is known to have existed on the site of Fye Bridge around the time of the Conquest (Hudson 1896, 217-232; Roberts 1975, 101). It is unlikely that the 1106 reference concerned a newly-built bridge as the importance of this area as a crossing had already been reduced by the creation of the Cathedral Close in the late eleventh century. It is more likely to refer to a pre-existing bridge and probably one that was pre-Conquest in origin. The parish of St Martin is one of only two parishes in the city whose boundaries cross the river (the other, St Michael Coslany, also being associated with an early river crossing). It enclosed a significant area of land on the other bank, emphasizing the importance of the location of a river crossing. Therefore, if a bridge did exist before the Conquest, it is possible that only smaller craft could have reached the waterfront area sampled by the excavation. This would be especially true if the bridge was of similar construction to the Fye Bridge causeway where the gap left for shipping was less than two metres wide.

It is thus possible that most vessels trading with the Continent berthed downstream of this crossing although the area of the excavation was certainly affected by international trade as testified by the variety of imported pottery recovered from the site. Construction of a bridge, however, must have caused a decline in use of the river frontage upstream, a decline that would have been rapidly accelerated after 1096 when work on the Cathedral and its Close began and the route system of this part of the town was severely truncated. The north-to-south axis shifted firmly to the Fye Bridge line taking most transpontine traffic. The main commercial waterfront, isolated from the new Norman market-place and with outmoded berthing facilities for the larger vessels of the twelfth century, moved downstream to the deeper water of King Street, below the sharp bend in the river and the line of Holme Street or Bishopgate which was eventually bridg-

ed without fear of impeding shipping. The consequent lack of mercantile interest in the Palace Plain area meant that infilling above the earlier waterfront deposits in order that properties might enjoy a good river frontage did not occur. Norwich, in this respect, did not emulate a feature characteristic of many other medieval sea and river ports such as London, King's Lynn and Hull (Milne and Milne 1978; Parker 1965; Ayers 1979). Instead, haphazard rubbish disposal with some waterborne silt from a river slowly recovering from marine regression obscured the brushwood surfaces and accumulated as levels above them.

Although the size of the excavation meant that only a small sample was uncovered, the archaeological material from these twelfth and thirteenth century deposits was seen to be relatively slight. The nature of the deposits did not suggest intensive use and this may be due to activity hinted at in the documentary records (p. 52) but unfortunately not present within the confines of the excavation. It has been seen that the southern bank of the river consisted of a sloping beach and that the edge of the main channel lay to the north of the excavated area. Whilst Palace Plain was now commercially sterile it still provided a useful landing place for smaller craft coming upstream as far as St Martin's (or Whitefriars) Bridge. Cargoes that were offloaded here, that is immediately downstream of the bridge, could be afforded ease of access to the city by way of a quay from Whitefriars Bridge to Fye Bridge. Kirkpatrick implies as much when he says that 'from the North end of this Street (Wensum Street) near the (Fye) Bridge, a Street runs Eastward towards White friers Bridge ... This is called Fybridge Key or Stath ...' (Hudson 1889, 67) and shows this 'Key' on his map opposite page one as extending as far as Whitefriars Bridge (the present day Quayside only extends to Bedding Lane). This is probably a post-medieval quay but such a structure certainly existed in 1250 as one Roger de Burg was fined for obstructing the King's way upon the Quay (p. 52). The court records as quoted by Kirkpatrick (Hudson 1889, 69) suggest that a quay had been constructed for the entire length of the riverbank between the bridges by the thirteenth century. This quay served in part as a wharf for fishermen, as it is known that shellfish boats landed there in the medieval period (Hudson and Tingey 1910, xxxvi). De Burg was fined but it is likely that obstruction remained a problem as four further defendants were taken to court in 1285/6 (p. 52). This repeat presentment mentions buildings on the quay which Kirkpatrick (who records the action) does not firmly locate although he suggests their location by saying that '... although Houses are now standing on the North side of this (Palace) Plain next to the River (my italics), yet it seems that in the beginning of Henry 3rds time there were none between the Bridge East and the Lane called now the 3 Privy Lane (Bedding Lane) West' (Hudson 1889, 69).

Recent work on the enrolled deeds of the city (p. 52) shows that he was correct. Tenement holders on Palace Plain seem to have taken advantage of an underused quay and incorporated it into their own properties. One of them, Maud de Catton, appears to have built herself a fish-house on the quay itself. These obstructions of the quay may well be the predecessors of buildings shown on the 1558 Cunningham map of Norwich at the river frontage immediately upstream of the bridge but not north of Quayside and not on the west side of Whitefriars Street (Plate I). Furthermore, the awkward right-angled bend southwards where Quayside meets Bedding Lane suggests that the location of buildings on the river frontage east of this point, whilst implying a situation of some antiquity, is also topographically anomalous.

Although it must be emphasised that there is, as yet, no archaeological evidence it does therefore appear that a quay existed to facilitate the dispersal of any goods which continued to arrive at Palace Plain after the creation of the Cathedral Close. It was constructed adjacent to the main river channel and need not have been a substantial structure; a low consolidation of the river's edge was probably adequate except during times of flood when water would have mixed silt into the levels above the brushwood layers found in the excavation. The numerous floods recorded in the thirteenth century,

notably those of 1287 and 1290 (Carter 1981, 141), may be represented in these deposits. By the mid-thirteenth century the quay was underused if not disused, possibly due to a further decline in shipping which was finally concentrated downstream after the construction of Bishopbridge. Maud de Catton and her fellows, whose properties abutted the quay, took advantage of this state of affairs to gain frontages for themselves at the river's edge. The location of their obstructions is emphasised by their dimensions which have survived, being up to 100 feet in length but all only sixteen feet in width, presumably the width of the quay. Such a situation might explain the general lack of medieval deposits within the area of the excavation. Houses on Palace Plain had immediate access to the river through their yards and via their purprestures on the quay. Accordingly, the area in between, that is the excavated area, lay fallow although subject to intermittent use such as the dumping of rubbish and the digging of pits. However, the excavated trench was so limited that it is also quite possible that the site merely uncovered 'dead' ground to one side of a well-used tenement.

The lack of archaeological evidence makes difficult any interpretation of the method of construction for the quay. The immediate implication is of wholesale encroachment of part of the floodplain of the river. This is unusual and markedly dissimilar to the gradual infilling of waterfront sites noted by research work elsewhere in Britain and Europe during the last twenty years (Milne 1979; Herteig 1959; Sarfatij 1973). Nevertheless, such an undertaking is not unknown. At York both documentary and archaeological evidence point to a large bend in the River Ouse being removed in the first quarter of the fourteenth century by the construction of a massive quay north of Skeldergate (MacGregor 1975, 225). This would, however, have been a much greater operation than any similar enterprise in Norwich and a more plausible interpretation for the Norwich quay could be that it grew from the gradual amalgamation of private quays or from a recognised route along the river's edge which became accepted as the 'common quay'. A gradual decline in use enabled adjacent tenement holders to exploit this quay as private frontages on to the river. The fallow yards between the houses and the purprestures were only thoroughly exploited when the post-medieval increase in population placed new values on land, not those of access or commercial possibility but those of space. Infilling thus eventually occurred to create more room for housing.

Such an interpretation thus explains the archaeological evidence. The Period II brushwood levels, which had been used as a firm working surface adjacent to a commercial waterfront, gradually fell into disuse as trade itself moved elsewhere. The yard areas became semi-derelict land within tenement plots, connecting street frontages to the river frontage. Dumped material accumulated in Period III, occasionally mixing with waterborne silts but eventually rising above the water table in Period IV. Attempts were made on occasion to utilise the land (hence, presumably, the posts in Period III), and rubbish dumping undoubtedly took place although it was singularly ineffectual in the area of the excavation where the central and probably boggy location rendered it less accessible. Only large scale infilling could reintegrate the area as a viable part of the community and the impetus for such an operation eventually came when the post-medieval city, faced by the housing needs of a growing population (Campbell 1975, 17), had to utilise previously derelict open space. Maps again tend to confirm this. Croshold's map of 1727 shows the west side of Whitefriar's Street as built up and Hochstetter's of 1789 depicts the whole area as developed.

The material recovered by the excavation also throws light on the importance of Late Saxon Norwich as a commercial and manufacturing community. Pottery finds indicate the spread of Norwich's commercial net by the eleventh and twelfth centuries. Contacts with the Rhineland and the Low Countries were supplemented by trade with northern France while some evidence, such as shoe styles, implies links with Scandinavia. Within the town itself, although it had yet to develop into the major manufacturing centre that it became in the medieval and post-medieval periods (Pound 1976, 141-2), it

was a settlement of considerable status by the time of the Conquest. Pottery kiln sites producing Thetford-type ware are known in the Pottergate/Bedford Street area (Atkin, Ayers and Jennings this volume) and it is likely that the quantities of this pottery found on the excavated site were generally made locally. Large scale iron-working is known from elsewhere in the city (Atkin forthcoming). The fragments of animal skins with pieces cut away are probably the discarded waste of a shoemaker. This latter may also have doubled as a cobbler, reusing and then throwing away the uppers of shoes. Lathe-turning was also practised, as shown by the waste core from a wooden bowl. It is possible that bone-working into pins, knife handles and even combs was a local activity, although the bone comb may possibly have been an import, perhaps from the north of England, where many similar examples, and manufacturing waste, have been found at York (MacGregor 1978, 46-8). Nevertheless the evidence is further demonstration that the settlement was supplementing its economic base as a port and market with manufacturing industry.

Such local manufacture cannot be substantiated for the later periods although the dearth of leather may merely reflect changing soil conditions; deposits of Periods III and IV were generally above the waterlogged horizon. Commercial activity seems to have dropped away, butchered bone being noticeable by its absence, and the area perhaps became something of a backwater. Nevertheless, occupation continued and fishing may have been an important part of the local economy. Quantities of fishbone were recovered - as indeed they had been in Period II - and an adjacent property is known to have contained a fish-house in the thirteenth century (p.53). Indeed, the area lies directly opposite Fishergate and it has already been noted that the shellfish boats berthed near here (p.57). As has been mentioned, however, it is likely that the excavation itself lay within a yard to the rear of a property on Palace Plain and that little attempt was made to capitalise upon the waterfront location.

In summary, therefore, the excavation has provided extremely useful information concerning the manufacturing and commercial status of the Late Saxon and Saxo-Norman town as well as demonstrating the type of features to be encountered at the waterfront. The limited area which could be uncovered inevitably increases supposition as to the exact function of the features located but there can be little doubt as to their general purpose, that of providing firm, reasonably dry, working surfaces under foot at the river's edge. In addition, as the above discussion shows (p.47) the excellent organic preservation of these brushwood deposits, combined with similar preservation of microscopic flora and fauna, has proved of great value for the study of the environmental conditions prevailing within a newly-urban Late Saxon settlement.

IX. ACKNOWLEDGEMENTS

Thanks are due to the Department of the Environment which funded the excavation; to Norwich City Council for making the site available, providing much of the equipment with which the site was dug and entrusting the finds to the care of the Norfolk Museums Service [2]; to the Norwich Historic Churches Trust for the use of the church of St Martin-at-Palace as a store and finds office for the duration of the excavation; and to Project 79 for the help of two school leavers on the site.

Work on a difficult and dangerous excavation was greatly assisted by Mr Ferris of City Engineers and Mr Osborne, the City Safety Officer, both of whom gave very helpful advice on the shoring. The excavator was helped immensely by Daryl Garton who acted as site supervisor and took most of the responsibility for recording; by Jayne Bown and James Heathcote who undertook much of the planning; by Peter McAllister who surveyed the excavation; by Ray Britt who took most of the photographs; and by William Burroughs who regularly turned out in the early light of day to assist with the pumps. All

these people also excavated the site and helped to shore the trench. Lynn Ayers catalogued and processed the finds, helped by Elizabeth Harvey. Additional help was also given by several local volunteers, notably Francis Holmes. The finds were conserved by Karen Wardley. The plans, sections and pottery drawings in this report were prepared by Steven J.Ashley with Clare Goff. Steven J.Ashley also drew the wooden objects. All the other objects were drawn by Ryszard Hajdul.

Malcolm Atkin, Alan Carter, Carolyn Dallas, Barbara Green, Jennifer Hillam, Richard Hodges, Susan Jackson, Sarah Jennings, Serena Kelly, Kathy Kilmurry, Peter Lawrance, Louise Miller, Bill Milligan, Carole Morris, Andrew Rogerson, Dan Smith, June Swann, John Thornton, Margot Tillyard, Keith Wade, Peter Wade-Martins and Sue White have all kindly discussed aspects of the material with the writers and have helped them to avoid many of their errors. Brian Ayers is also grateful to Dr Rosemary Horrox for bringing the Hull reference to rush mats to his attention. Peter Murphy wishes to thank the staff of the Environmental Archaeology Unit at York University who read an earlier draft of his text and provided constructive criticism. The manuscript was typed by Doreen Smith. Finally the authors of the specialist reports must also be thanked for their lucid and useful contributions.

June 1982

REFERENCES

1. Brian Ayers wrote sections I-IV and VIII. Peter Murphy edited section V and contributed the reports on the mollusca and plant macrofossils. He also co-authored the report on the wood and wrote the general discussion of the environmental evidence.

2. Accession number 287.982.

Thetford-Type Ware Production in Norwich

by Malcom Atkin, Brian Ayers and Sarah Jennings

I. SUMMARY AND INTRODUCTION

This report contains the results of the investigations of four Thetford-type pottery kilns found within a restricted area in Norwich, dating from the tenth to twelfth century. The finds from these have been analysed together with unstratified finds from a series of possible kiln sites and waster dumps as well as stray waster finds from elsewhere within the city. Despite the limited evidence, tentative conclusions have been drawn on the development of the kilns themselves and also the more general changes in the pattern of the pottery production of Norwich during this time. This information is placed in its context within the known historical development of the Pottergate/Bedford Street area.

In summary it would appear that the main focus of the early industry was on modern Bedford Street, with an extension into East Pottergate (Lobster Lane) at some point between the eleventh and twelfth century, probably related to a realignment of settlement following the Norman conquest and possibly associated with a change in kiln type. The range of forms of pottery produced in the kilns appears to have been extremely limited, suggesting that this was essentially a local industry serving basic local needs augmented by other vessels of Thetford-type ware from elsewhere in the region and by pottery from further afield, including Europe.

II. METHOD OF STUDY

The information has been gathered from a series of watching briefs carried out on building sites in Norwich during the period 1963 - 1980. In the cases of the sites at 5 Lobster Lane (336N) and 27 Bedford Street (424N) it was also possible to carry out a limited excavation after workmen had disturbed pieces of kiln structure. Only the investigation of 27 Bedford Street, however, can be considered as extending beyond the recording of commercial foundation trenches. Thus the evidence is very fragmentary. It was only possible to record stratigraphic relationships on 5 Lobster Lane and, in no case, could the operation of the kiln be related to the development of the tenement on which it was found.

As none of the kilns was found loaded it could not be proved that the wasters found in the associated fill originated from that particular kiln. The general distribution of such finds and possible kiln assemblages is considered in Section V in an attempt to define the likely extent and development of Late Saxon pottery manufacture in the city.

Despite the above limitations, it has been thought worthwhile to bring together such fragmentary strands of evidence in this publication. Much of the data would not warrant publication in its own right but is important in building up a corpus of evidence. In the absence of more complete information this must serve as an interim statement for Thetford-type pottery production in Norwich. It is hoped that this approach will form the basis for a more definitive study when an opportunity to investigate suitable sites finally arises. Only the material from the sites which relates to the Late Saxon and

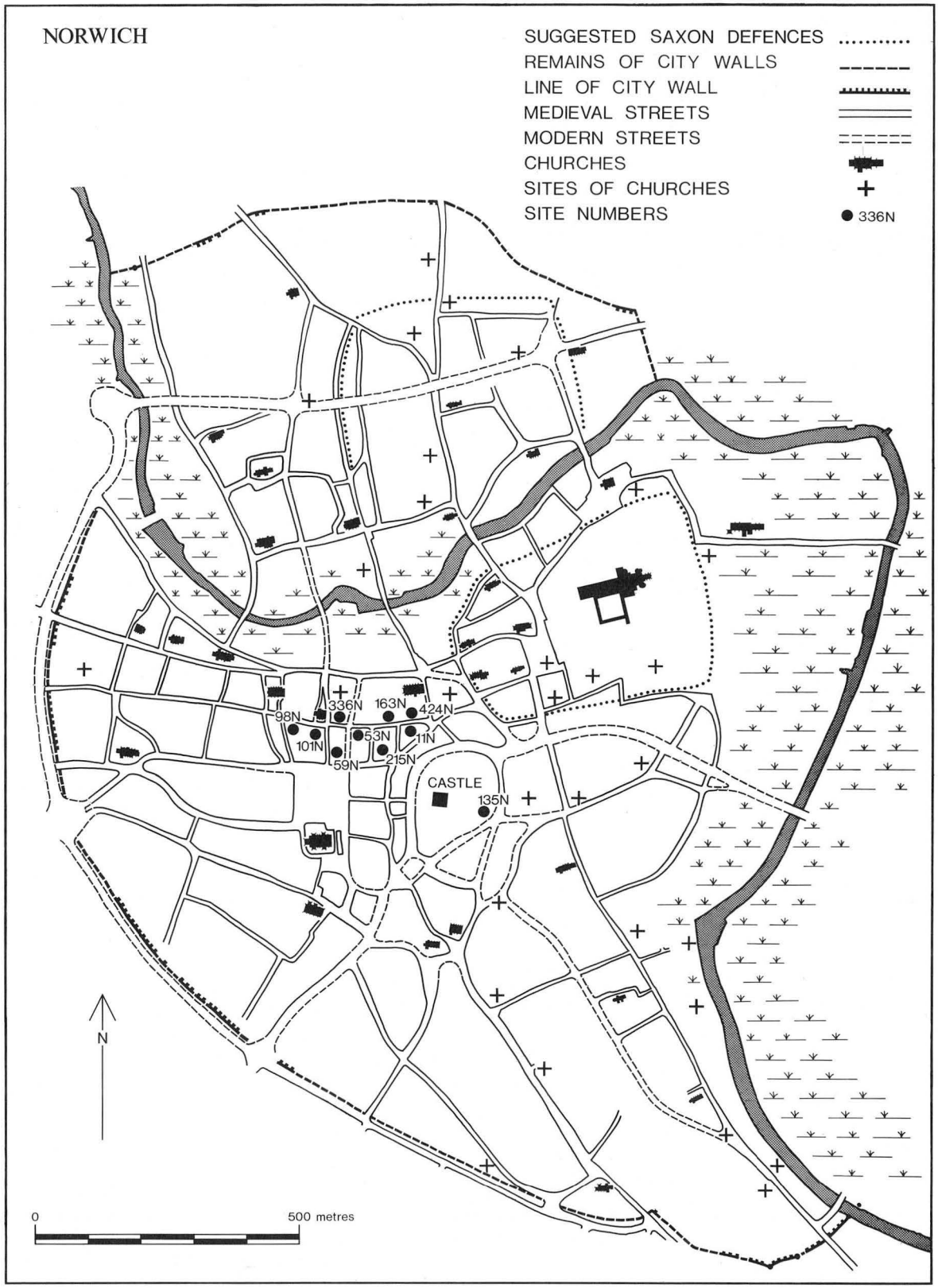


Fig.29. Site location plan and the reconstructed Saxon defences of Norwich.

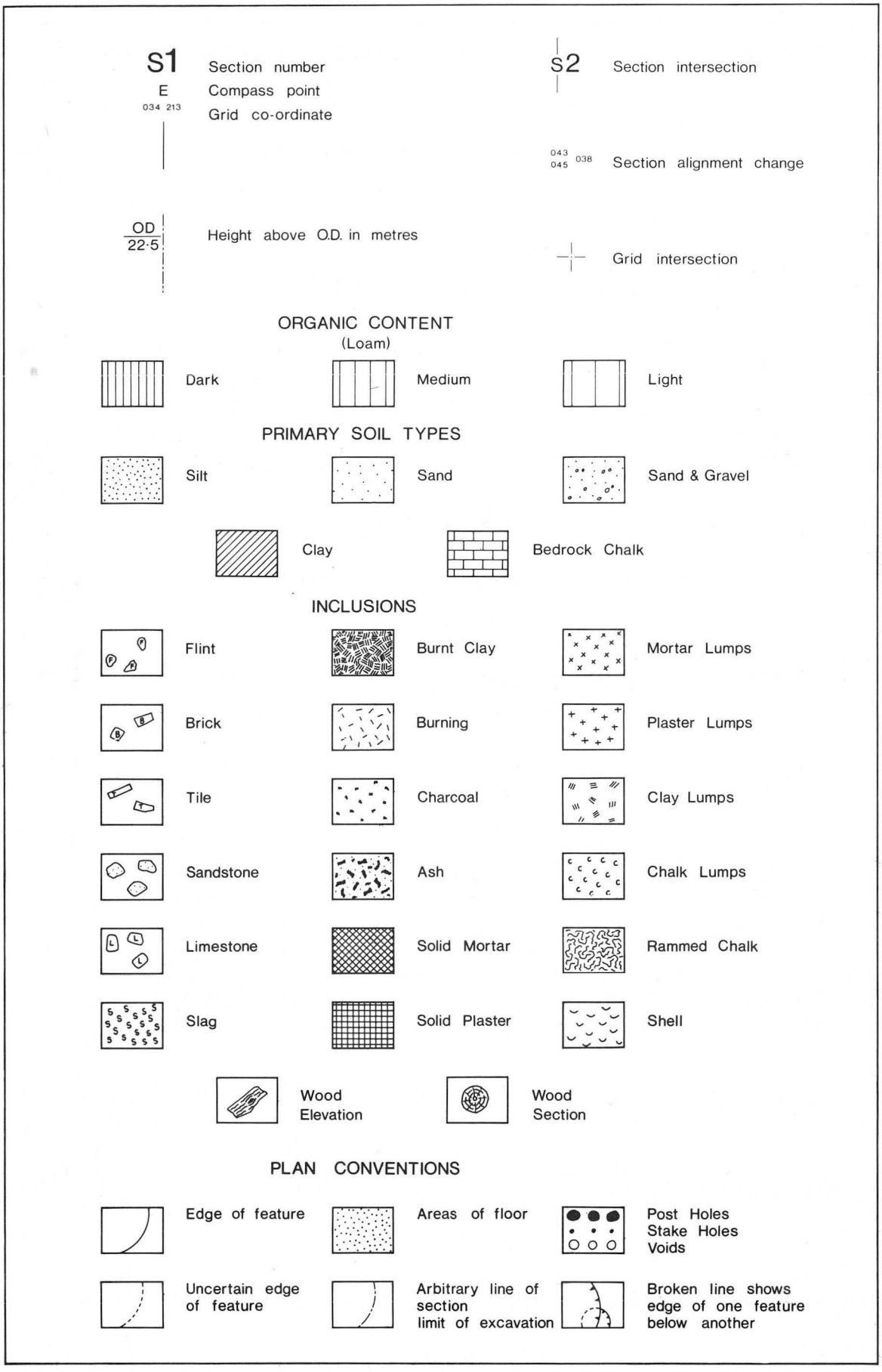


Fig.30. Standard drawing conventions on plans and sections.

early medieval periods is dealt with in this report. The records of finds of later periods are stored in the Sites and Monuments Record at Norwich Castle Museum.

The four main sites are described in probable chronological order, although it should be emphasised that dates can only be attributed to the first and last sites. Discussion of other finds' spots is confined to Section V, the pottery.

III. HISTORICAL AND TOPOGRAPHICAL INTRODUCTION TO THE POTTERGATE AREA

by Brian Ayers and Malcolm Atkin

Pottergate is one of the longest streets within the medieval walled city of Norwich (Fig.42). It extends from the city wall at Grapes Hill eastward to the church of St John Maddermarket and, originally, included an eastern section now subdivided into the streets of Lobster Lane and Bedford Street. Its overall length was thus approximately 600 m (660 yards) although it is possible that it extended even further prior to the Norman Conquest, perhaps in the direction of Market Avenue and King Street, skirting the north-eastern corner of the chalk spur subsequently emphasised by the Castle Mound. The name of Pottergate is first recorded in the time of Henry II (second half of the twelfth century) and Kirkpatrick, writing in the early eighteenth century, concluded that it was 'so called either because antiently there was a Pottery, or place where earthen Potts, etc., were made in some part of this Street, or because it lead to one without the City...' (Hudson 1889, 47). He also recorded variations in the spelling of the name; the form Potteregate of Henry II's reign still survived in 1255; it was rendered as Potteresgate about 1260; Poteregate in 27 Edward I (1298/9); and Potterregate in 34 Edward I (1305/6). This close conformity, without apparently any use of an alternative name for the street, is revealing as it will be shown that, by the thirteenth century, the term was already anachronistic. The survival of the name Pottergate in unmutilated form throughout the medieval period is thus indicative of recognition by the local community of the extinct industry implied in the prefix.

It is likely that the term Pottergate antedates the reign of Henry II. The suffix 'gate' is a common occurrence in towns and villages of eastern England, being derived from the Old Norse word 'gata' meaning a road (Ekwall 1960, 193). Such an appellation cannot, however, automatically be taken to indicate an Anglo-Scandinavian origin; several 'new towns' of the Middle Ages still display street names ending in 'gate' (the profusion of such names in the thirteenth century foundation of Hull, including a Blackfriargate which cannot predate 1303, is a good example). In this instance it certainly does not indicate a street leading to a gate in the city walls, as there was no gate provided in the medieval defences at that point.

Pottergate lies in the medieval Great Ward of Wymer and is essentially two streets, east and west of St Gregory's church. The western part was in Westwick which occupied roughly a third of Wymer Ward. Recent work suggests that this settlement originated as a Middle to Late Saxon development which, with other settlements (Coslany, Needham and Conesford), grew to form the nucleus of the medieval city of Norwich. Westwick may have had an original focus in the vicinity of St Benedict's Gate (Carter et al. 1974, 40), but it seems to have rapidly expanded in a narrow band along St Benedict's Street so that the latter was more or less continuously built up by the Conquest. It seems likely that the present parishes along St Benedict's Street (namely St Benedict's itself, St Swithin, St Margaret and St Lawrence) were created out of a sub-division of one pre-existing parish of St Gregory's (which probably also served as a secondary focus to Westwick), (Carter and Roberts 1973, 453-4). The high density of settlement along St Benedict's Street is suggested by the obvious difficulty of siting St Lawrence's

church anywhere other than on the very edge of the gravel terrace. Development seems to have continued in a similar fashion along St Andrew's Street towards the area of a possibly fortified burh centred on Tombland (Figs.29 and 42).

The extension of occupation from the Westwick area does not seem to have reached Pottergate. The earliest evidence for domestic settlement anywhere on the street only occurs in the eleventh-to-twelfth century (Carter et al. 1974, 43). However, the stretch of Pottergate east of St Gregory's church, including the parts now known as Lobster Lane and Bedford Street, appears to have developed, in the later tenth century, as an industrial suburb to supply the growing town. This industry took the form of pottery-making in the Thetford-type tradition. It lay immediately west of the main Late Saxon focus, the burh, (possibly called Conesford), centred on Tombland. This burh contained its own mint, a thriving port and a market, three important elements for the stimulation of industrial and commercial growth.

It will be argued in this paper that it is not possible to establish clearly the date at which pottery making was introduced to the area of Pottergate, although it now seems that there was certainly activity in Bedford Street by the late tenth century (27 Bedford Street - site 424N). The industry would almost certainly have been disrupted by the Norman Conquest and evidence does survive that part of it was destroyed. Excavations in 1905 beneath the Castle Mound (135N) prior to the extension of the Shirehall on Market Avenue uncovered waster sherds of a Thetford-type vessel which may imply the location of a kiln nearby (Jope 1952, 307), presumably destroyed with the construction of the castle. However, the industry seems to have survived, and even prospered, for some time after the Conquest. As regards its final decline evidence is also difficult to find, but the traditional date for the cessation of Thetford-type ware manufacture of c. 1150 (Wade 1973, 50) probably applies to Norwich, although sporadic work may have continued after this date (5 Lobster Lane - site 336N).

Documentary evidence for an industry which ceased to exist at such an early date is naturally very scarce, the best document being the street name itself. No contemporary record mentioning the manufacture of pottery, or even implying its existence, survives within Norwich. The earliest reference to pottery working in the Norwich area occurs in the time of Henry III (that is, the first half of the thirteenth century) where the neighbouring village of Eaton (3 km to the south-west) contained a Potteres Pit (Hudson 1889, 47). Nevertheless, any importance the street may have had when manufacture was in its heyday did not long outlast its decline. Its secondary nature as a thoroughfare is emphasised by the fact that, despite its length, it contains not one church (St John Maddermarket was surely intended as the church on the Maddermarket rather than on Pottergate) whilst passing through no less than seven parishes. This lack of importance was ultimately demonstrated with the construction of the city wall in the early fourteenth century, when Pottergate was not even graced with a postern. The street does not appear at all on the Cunningham map of 1558, an omission probably due to cartographic error, but possibly reflecting the contemporary unimportance of the area. Despite this, the name survived although it had been changed to Lobster Lane and Bedford Street for the eastern part by 1789. Nevertheless Hochstetter, in his map of that year, marks the road as Pottergate Street throughout so that the unity of the street continued to be recognised. At the present time, however, it remains a paradox that the greater part of the street which continues to be known as Pottergate is also that part from which least evidence (despite a number of 'watching briefs') has been recovered of its Thetford-type pottery industry.

IV. EVIDENCE OF KILN STRUCTURE

27 BEDFORD STREET (424N) TG 23115 08668
(Figs.29, 31, 36 and Plate IV)
by Brian Ayers

The Site

Following a disastrous fire in late 1978, which gutted the rear of Hovell's basketware shop, work began in 1979 on rebuilding. In the course of excavating for new foundations the site was watched for traces of archaeological material by W.F.Milligan who recovered numerous sherds of Thetford-type pottery, including wasters. In November 1979, whilst trenches were being dug to underpin the walls of the Bridewell Museum and the Wild Man public house, two features, subsequently identified as pottery kilns, were cut by the mechanical excavator. After negotiations with the site owners, the architects and the contractors it was agreed that the Norfolk Archaeological Unit should be allowed access to the site to excavate the eastern of these two kilns, most of which had been missed by the machinework; the other had been totally destroyed in the machine trench. Accordingly, a small excavation was undertaken on 1st and 2nd January 1980 by the writer.

The Excavation

Excavation was confined to the area of the kiln in the north-east corner of the site and was therefore, by necessity, devoid of context. It was not possible to see whether it was related to any building, or even to determine its relationship to the other kiln, some 2 m to the north-west, known to have been destroyed in the contractors' trench adjacent to the south wall of the Bridewell Museum. The excavated area was cut off from the street frontage by a large post-medieval cellar and from the walls of the museum and the Wild Man public house by the underpinning trenches.

The kiln itself had been damaged on its north side by the northern trench, although this partial destruction was observed in November 1979 and a section photographed. Machinework had also removed the top of the kiln (finds from this upper level, where salvaged, were accorded the context number 8).

Description of the Kiln

The kiln (1) was found to consist of a 'key-hole' shaped pit cut into the natural chalk surface. It was aligned north-east by south-west with the stoke pit to the south-west. The main chamber was oval with internal dimensions of c. 1.70 m by c. 1.50 m (measurement is imprecise due to the removal of parts of the kiln by intrusions); the stoke pit measured 50 cm in length, being 60 cm wide at its junction with the main chamber and 90 cm wide at the west end. The walls survived to a height of 30 cm and were formed of the natural chalk, except at the eastern end where redeposited chalk (3) was used to form a wall as the kiln pit cut through a pocket of natural sand.

The floor of both chambers was chalk, both natural and redeposited, beaten to give a level surface. The walls were lined with clay (2), generally 12 cm thick, of which the face, open to the kiln, was blackened to a depth of 3 to 4 cm, the remainder being burnt a bright orange-brown. Preservation of this lining was particularly good in the stoke pit where traces of the base of the chamber arch could be seen on the north wall; some burnt wattle and daub was found within the fill which could have formed part of this arch. Fingermarks were visible in the smeared clay on the south wall.

Within the combustion chamber two parallel pedestals of chalk (4) and (5) ran from

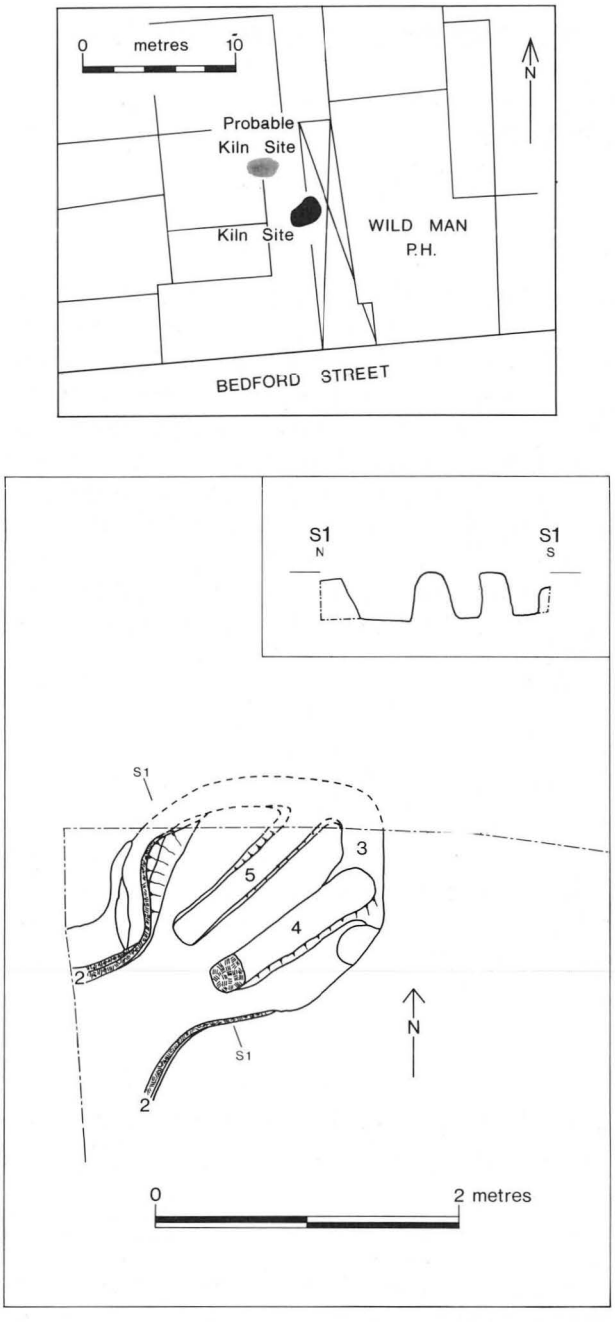


Fig.31. 27 Bedford Street (424N). Location plan (scale 1:500) and site plan and profile (scale 1:50).

north-east to south-west. These were 1.25 m in length and were joined to the east wall. At the western end, in front of the stoke pit they were rounded off. Each survived to its full height of 30 cm and averaged 20 cm in width (Fig.31). The western ends were subjected to considerable heat and the southernmost had a repair of clay which was subsequently burnt. Attempts had been made to protect them with large fragments of waster sherds packed around each end, presumably to deflect or absorb the direct heat of the stoke pit. The pedestals were probably used to facilitate loading of the kiln (p.73).

No other internal fittings were located.

The kiln therefore conforms to Musty's Type 1 (b) (1974, 44) as a single-flue updraught kiln and is closely paralleled in design and size by that excavated at Wharf Road, Stamford (Wilson and Hurst 1969, 234-5). Archaeo-magnetic dating of the clay lining of the stoke pit, undertaken by the Ancient Monuments Laboratory at the Department of the Environment, indicates a final firing date of AD 1000 + 60/-40 (p.92).

Stratification

Little stratified material survived. The fill of the kiln (6) was almost entirely composed of waster sherds in a matrix of dark-brown gritty loam containing charcoal flecks, occasional lumps of charcoal and some fragments of burnt clay. This fill was present throughout the kiln, though slightly darker, with more charcoal, in the stoke pit. The waster sherds were clearly not a kiln load which had been abandoned, but were probably part of a neighbouring waster dump which had been shovelled or pushed into the kiln pit.

The top of the kiln fill had been damaged by commercial machinework, but several deposits, with associated finds, were recorded during the 'watching brief'. Context (7) was similar to (6) being that part of the fill removed by the contractors' trench which cut the northern edge of the kiln. Context (8) formed the upper part of (6) which was removed by the machine.

No material could be recovered from the area of the second kiln destroyed in the north trench, but some waster sherds were salvaged from levels disturbed below a cellar in the south-western corner of the site, adjacent to the street frontage. These levels, unseen by the archaeologists, were accorded context (10).

21 BEDFORD STREET (163N) TG 2307 0866
(Figs.29, 32 and 37)
by Malcolm Atkin

The Site

Fragmentary remains of a kiln were found on the site of 21 Bedford Street in 1973 during the course of commercial excavations (Webster and Cherry 1974, 181). These latter were behind the street frontage range and consisted of work for the construction of a retaining wall to a new entrance to the fourteenth-century undercroft at the rear of the property. The whole area had already been extensively disturbed by later medieval and post-medieval rubbish pits and structures. The construction of cellars to the north and south had destroyed any stratification in those directions. The site therefore lay 9.5 m behind the modern line of Bedford Street.

The Excavation

Investigation was restricted to recording the finds from the commercial excavation, with small scale additional archaeological excavation. Further finds were recovered during the additional building work in 1975. The work was carried out by J.P.Roberts for the Norwich Survey. Unfortunately, the find of areas of burnt clay was not reported to the museum staff until after the brick retaining wall with its substantial concrete foundation had already been laid in place. This had cut through the centre of the feature. The combination of medieval, post-medieval and modern disturbance meant that only the plan of part of the combustion chamber could be recovered.

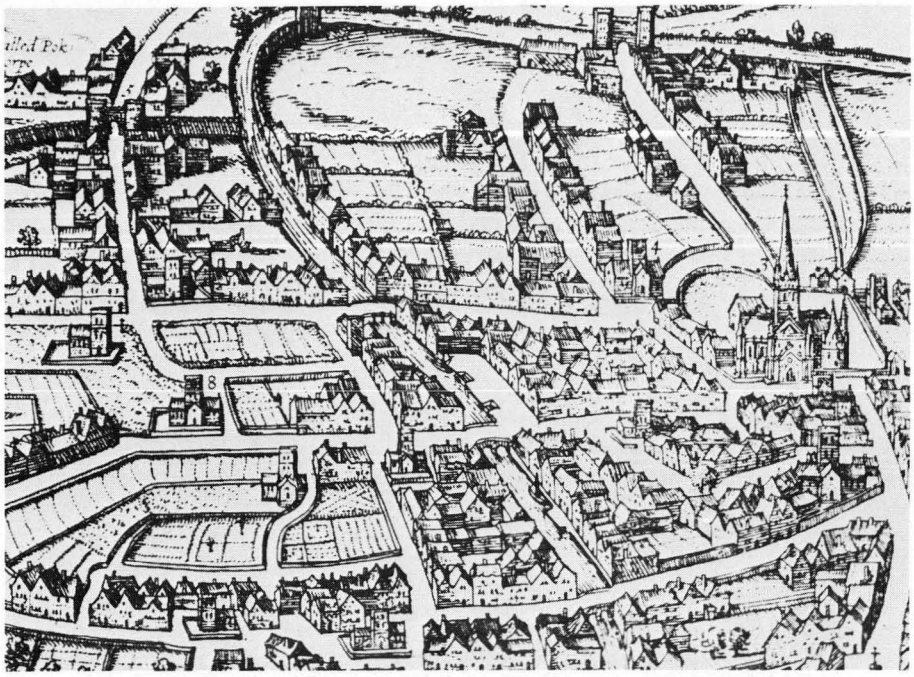


Plate I. Detail of Cunningham map of Norwich, dated 1558, looking east. The church of St Martin-at-Palace is marked as 4. Three bridges are shown, being from top to bottom, Whitefriars, Fye, and St George's. The excavation site lay south of the river immediately west of Whitefriars Bridge, behind the group of buildings adjacent to the bridge. These buildings clearly block Quayside leading from Fye Bridge to Whitefriars Bridge.

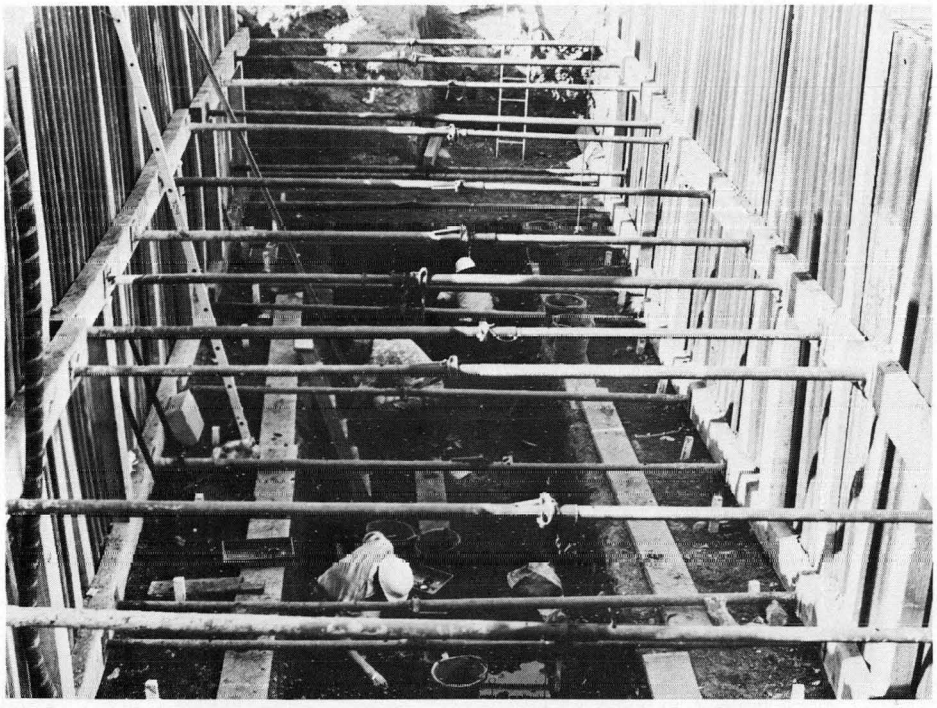


Photo: Ray Britt BKC 1

Plate II. View of excavation on Whitefriars Street Car Park from the south showing the inner trench where Period II levels were being uncovered. The shoring was erected by the excavation team.

Photo: Ray Britt BKE 17

Plate III. Detail of brushwood (66) Phase II.1 looking west. Scale is one metre.

Photo: Brian Ayers BKJ 25

Plate IV. View of the pottery kiln at 27 Bedford Street from the south west. The scale is 2 metres.

Evidence of Kiln Structure

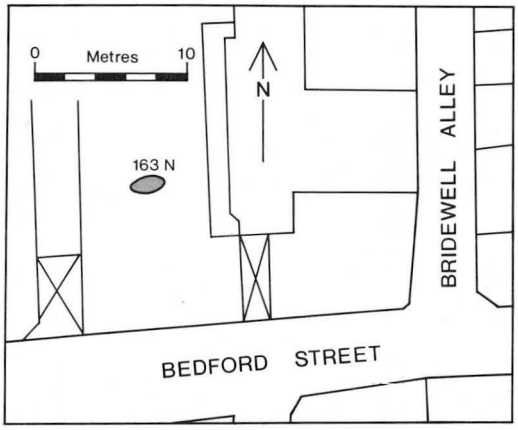


Fig.32. 21 Bedford Street (163N). Location plan. Scale 1:500.

Description of the Kiln

Not surprisingly, the evidence was fragmentary and confused. It suggested one corner and part of the floor of a combustion chamber. The latter consisted of a pit cut through a series of layers of silts and sands (18, 31), probably from an earlier pit, which was sealed by a thin layer of rammed chalk (28). The kiln pit was lined with a 2-5 cm layer of burnt clay (27). The wall of the kiln survived to a maximum height of 25 cm. Not enough evidence remained to give a true alignment, although there was an indication that the combustion chamber, 1.80 m in length, lay broadly north-to-south. A clay floor, north of the probable northern edge of the kiln proper, possibly represented a working surface.

Stratification

As mentioned above, the kiln cut a series of earlier layers (18, 28, 31). There was no evidence that these were connected with pottery manufacture and there were no finds. The kiln itself consisted of lining 27.

The kiln may have been left derelict for some time after it ceased production, with fragments of the clay lining gradually disintegrating. The earliest fill of the kiln consisted of thin layers of silt (19, 20, 25). A large pit (22) was then cut through the feature, its fill containing large fragments of kiln lining. The entire complex was subsequently back-filled with a thick layer of clay loam (17). The area of the kiln was then further cut by pit 30. Stratigraphy above this level had been destroyed by the insertion of later floors.

2-4 BEDFORD STREET (53N) TG 2301 0863
(Figs.29, 33, 38 and 39)
by Malcolm Atkin and William Milligan

The Site

Part of a kiln was discovered in 1964 during the excavation of a service basement off Bedford Street, at a depth of 9 ft (2.74 m), immediately west of the line of the Great Cockey, a former tributary of the River Wensum. The circumstances of discovery meant that the find could only be recorded by one of us (WFM) in the battered face of the commercial excavation. The site was recorded in imperial measurements; metric equivalents are given in brackets.

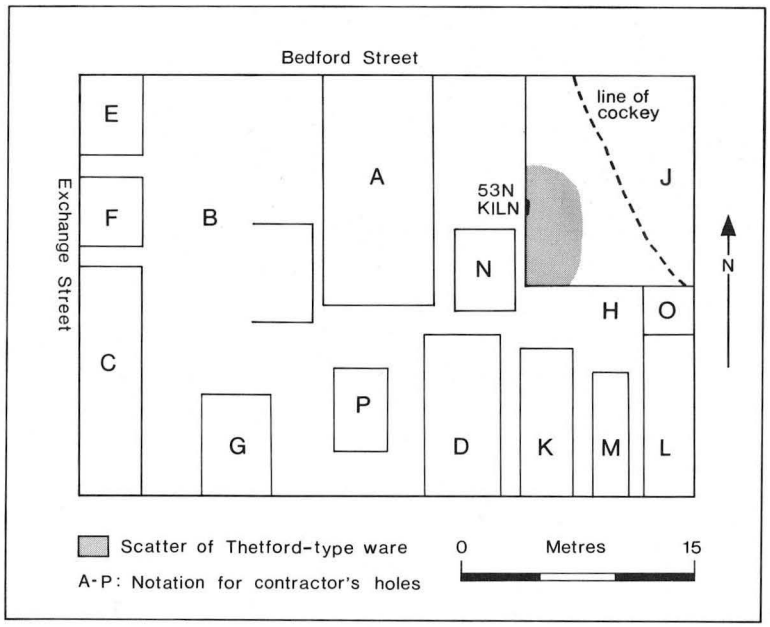


Fig.33. 2-4 Bedford Street (53N). Location plan. Scale 1:500. (after Wade 1973, fig.5).

The Excavation

Enough was recovered of the plan to suggest the junction of the stoke pit and combustion chamber. The portion of the surviving plan suggests that the kiln was of the same basic type as that from the site at 5 Lobster Lane (336N) but was aligned from east to west.

The floor of the combustion chamber had a thin, heavily burnt, clay lining with the natural sand below burnt red to a depth of 1½-3 in (4-8 cm). The kiln structure survived to a maximum height of 9 in (23 cm). This consisted (as far as could be examined) of a simple pit cut into the natural sand and lined with burnt clay. It was impossible to recover any further details as to the layout of the kiln.

A great quantity of wasters was found in the area immediately around the kiln. No further finds were recovered, however, in building work to the south of the kiln, and only a few waster sherds were found to the west. In contrast to the other kilns in this study the chances of these wasters being related to this particular kiln are, therefore, quite good.

5 LOBSTER LANE (336N) TG 22968 080666
(Figs.29, 34 and 40)
by Malcolm Atkin

The Site

During the course of commercial redevelopment in 1977 on the vacant site of 5 Lobster Lane, a number of fragments of fired clay were found, later interpreted as the disturbed lining of a pottery kiln. Permission was obtained to extend the trench in the immediate vicinity of the suspected kiln and excavate this archaeologically. The site lay 9 m back from the modern street frontage. Commercial trenches were cut down through natural sand around the edges of the tenement up to the street. These were carefully watched for any further finds of kiln material but none was located. The

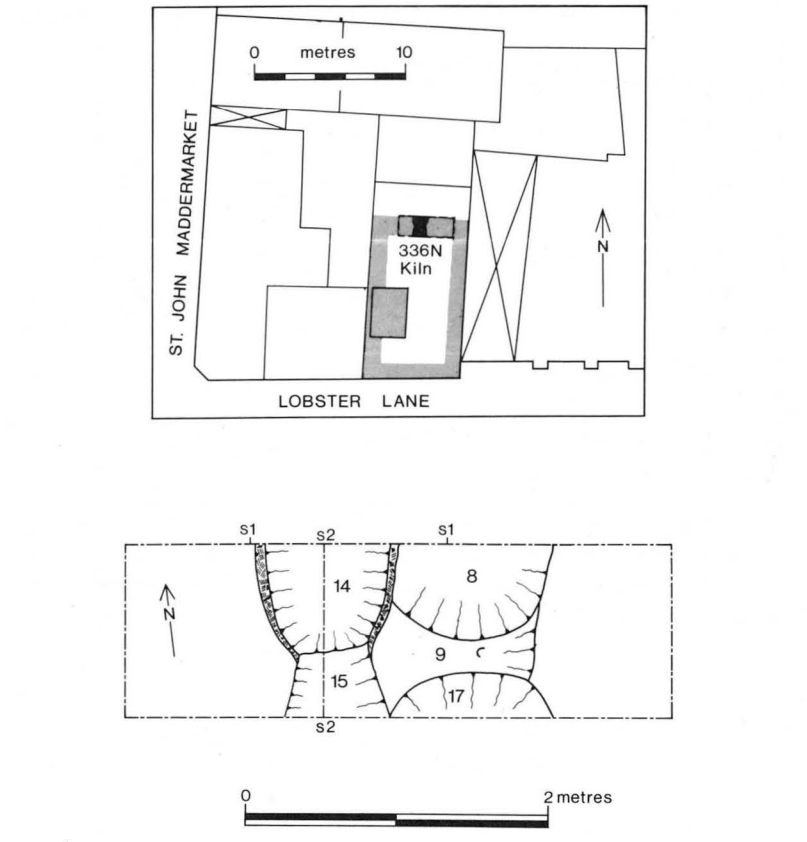


Fig.34. 5 Lobster Lane (336N). Location plan (Scale 1:500), site plan and sections (scale 1:50).

only early feature revealed was an isolated early medieval pit (20) in the south end of the east trench. A trench was also watched within the standing building to the north.

The Excavation

The amount of trench that could be investigated archaeologically was restricted by the presence of adjacent modern drains to a length 3.6 m x 1.20 m. This was enough to reveal the junction of the stoke pit and combustion chamber together with a section establishing the stratigraphic link between the kiln and two earlier features.

Description of the Kiln

Little can be definitely asserted about the actual structure of this kiln. The evidence suggested a feature aligned north to south, with the stoke pit to the south. It was

probably of two phases. The combustion chamber consisted of an oval pit (14) cutting natural sand and lined on the sides and later the bottom with hard-fired clay. This lining was of two phases around the sides, each 3 cm thick, with a subsequent lining 2 cm thick on the floor. The original floor of the kiln was represented only by heavily-burnt natural sand. The walling survived patchily to a maximum height of 50 cm. Despite some undermining of the section, after recording was completed, there was no evidence for any internal structure. The only trace of a flue arch was a squared-off section of the lining at each side of the junction of combustion chamber and stoke pit. The stoke pit (15) consisted of a funnel-shaped scoop through the natural sand, sloping down to the combustion chamber from a slightly higher level. It had a floor of beaten natural sand, heavily stained by burning.

Although it was not possible to recover the complete extent of the feature it appeared that the maximum width (82 cm internal) of the combustion chamber had been reached at the north section line. The stoke pit was 50 cm wide at its junction with the combustion chamber and 70 cm wide at the south edge of the excavation (where it still appeared to be fanning out). From observation of a commercial trench within the standing building to the north it was possible to establish that there was not another flue on the north side of the kiln.

Therefore, the kiln would appear to conform to the single flue updraught type without internal structure, that is Musty Type 1a (Musty 1974, 44). Not enough of the kiln lining was found in situ for archaeo-magnetic dating. A date of 1180 ± 80 was obtained from a sample of ash from layer 16 (lowest fill of kiln) by radiocarbon analysis (p.92).

Stratification

The combustion chamber had been backfilled with yellow-brown silty loam containing large amounts of charcoal flecking (11) and with large pieces of disturbed kiln lining (22, 23, 24). This sealed a 4 cm thick layer of ash (16). The fill contained large quantities of pottery and some waster sherds but it could not be established whether these came from a waster dump associated with this particular kiln or from some other in the vicinity.

The kiln sealed two stratified pits (8 and 9). Both of these were filled with loam containing considerable quantities of ash and charcoal, as well as wasters from an earlier kiln, for which no other evidence was recovered. Both the kiln and the earlier pits were cut by later pit 17 and then sealed by a series of late medieval building levels.

TABLE 18. 5 LOBSTER LANE (336N) PHASE SUMMARY CHART

Phase	Layer No.	Nature
III	25	Soil make up
II	11	Fill
(Kiln)	12, 22, 23, 24	Redeposited lining
	13	Ash
	16	Ash
	14	Floor
	10	Wall
	15	Firing chamber fill
I	8	Pit
	9	Pit
	NATURAL SAND	

CONCLUSIONS ON KILN STRUCTURE
by Malcolm Atkin and Brian Ayers

Few firm conclusions can be drawn from such a small sample of kilns. Only two, those from 5 Lobster Lane (336N) and 27 Bedford Street (424N), can be discussed in any detail and the evidence even here is incomplete. Nevertheless, there are pointers at least to methods and trends in building technique.

The basic method of construction appears to have varied little for each kiln. A simple pit was dug into the subsoil for the kiln oven which was then lined with clay. Achieving a regular shape was a relatively easy matter when digging through the natural sand, as on the Bedford Street sites (53 and 163N) or on the Lobster Lane site (336N). More care had to be taken on 27 Bedford Street (424N) where the kiln was cut through chalk and a pocket of sand. Here the floor had to be levelled and the sand pockets filled with rammed chalk. All the kilns then had their side walls lined with clay. The kiln at 2-4 Bedford Street (53N) also had a clay lining to the floor; this was a secondary addition to that at 5 Lobster Lane (336N). Examination of the fragments of possible kiln lining from 'watching brief' sites 11, 59 and 98N (see Gazetteer p.91) showed them to be consistent with the type of lining from the known kiln sites (grey-brown hard-fired sandy clay with some chalk and occasional flint inclusions). While not conclusive proof, this does support the contention that the latter were also the sites of kilns.

The stoke pits from the two best surviving examples, 5 Lobster Lane (336N) and 27 Bedford Street (434N), were constructed somewhat differently. The Lobster Lane kiln had an ill-defined hollow for this chamber, reflecting the difficulty of maintaining a regular shape through a subsoil of sand. On Bedford Street, however, due to a stable subsoil of chalk, the stoke pit could be designed as an integral part of the finished structure and was consequently constructed as such. In common with the combustion chamber it was cut deeply into the chalk and lined with clay. Its distinctive shape was that of a funnel, narrowing as it met the oven in order to maximise the blast of heat whilst, as far as could be determined, allowing ample room for stoking at the other end.

The 27 Bedford Street kiln also provided the best evidence for internal structures within the oven. Two chalk pedestals ran parallel to the stoke pit, the kiln thereby most closely resembling that from Wharf Road, Stamford (Musty 1974, 44). No evidence was found to suggest a floor and it is perhaps likely that the pots were merely stacked one above the other between and above the pedestals. The kiln was clearly abandoned after the last kiln load had been removed and the resulting pit backfilled with a waster heap.

The kilns from both 5 Lobster Lane (336N) and 27 Bedford Street (424N) showed evidence of secondary repair or alteration. One of the pedestals from the Bedford Street kiln had been repaired by the addition of a capping of clay and the ends of the pedestals were protected by large waster sherds, as on the clay sides at Wharf Road, Stamford (Wilson and Hurst 1969, 234). The side wall lining from Lobster Lane (336N) was quite clearly of two phases rather than repair or pre-firing (that is, firing prior to initial use of the kiln). Here there appeared to have been a relining of the complete structure. This opens up the question of the life of the kilns, and how the finds from them are to be interpreted. Estimates for the life of a pottery kiln of this type vary widely from five to ten years to 'permanent' (Musty 1974, 53). It is a point to remember, however, that the fill of the kilns as excavated represents the period of final disuse and not necessarily the date of original construction and subsequent use. This point becomes very relevant in the general conclusions as to the movement of the pottery industry along Pottergate (p.95-6).

The superstructure of the kilns was completely lacking in all cases except on the stoke pit at 27 Bedford Street where the base of a clay arch was located and some burnt

wattle and daub located. It is likely that the oven roof of all the kilns was provided by a reinforced clay canopy. This may have been left with an open top to be covered by turves at each firing to avoid the need for repeated rebuilding of the whole structure (Bryant 1977, 108).

Two types of kiln have been recognised. These are Musty types I (a) at 5 Lobster Lane (336N) and I (b) at 27 Bedford Street (424N), differentiated by the presence of internal kiln structure (pedestals) at the latter. Again, with the caveat that this is a tiny sample, it is interesting that the small and technically cruder type of kiln on Lobster Lane is also the latest from the pottery evidence in the chronological sequence (p.84). The difference may be based on nothing more than the individual taste and capability of the different potters, or the easier availability, at 27 Bedford Street, of chalk to build the pedestals. There may have been a chronological shift in type, but only the investigation of further examples will determine this matter.

V. THE POTTERY
by Sarah Jennings

INTRODUCTION

The Thetford-type ware tradition is one which extends over the whole of East Anglia in the Late Saxon and EarlyMedieval periods; Norwich is just one of five sites (Bircham, Grimston, Langhale, Norwich and Thetford), both rural and urban, known to have been making this distinctive pottery in Norfolk as well as Ipswich in Suffolk. The exact chronology of production vis-à-vis the various centres and the original source has not yet been established, but it is thought that Ipswich may have been the first production centre (Wade 1973, 51; Hurst 1976, 318). The maximum known period covered by the Norwich kilns spans some 150 years from the late tenth to the early or mid twelfth century. During the latter part, however, the distinctive shapes of the Thetford-type ware tradition give way to the Early Medieval wares and for a time the two industries were running concurrently (Hurst 1976, 342). The main features of Thetford-type wares are well-made pots thrown on fast wheels and fired under controlled, reduced kiln conditions; a large range of forms was made and these were marketed over a wide area of East Anglia and examples have also been found as far afield as Scandinavia (A.E.Herteig pers.comm.). A wide range of forms is known, but the number of different shapes made by each production centre remains in doubt; to date the only wasters found in Norwich, from either the kiln sites or possible waster heaps, are those of cooking-pots and possibly some lamps. Whether or not this means that individual production sites specialised in a particular form to the exclusion of all others is difficult to say. Probably the few scattered kilns found in Norwich are too small a sample to give any definite evidence. They may only represent part of a larger industry and can only be used to raise questions which would require the availability of a large kiln complex to provide an answer. The material from the 27 Bedford Street kiln (424N) illustrates this problem well, as, despite the relatively large amounts of pottery found in a small area together with evidence for two closely associated kilns (p.66), there are very few vessels other than cooking-pots represented in the assemblage and those that are present are not wasters. They consist of either large storage jars or bowls and both are types one would expect to find in a working pottery: the storage jars to contain a supply of water and the bowls as a source of water needed by potters while throwing. Inevitably these would occasionally be broken and were probably discarded along with wasters from the kiln.

Each kiln group has been illustrated separately and the drawings comprise the standard forms from each site with all the major variations. The rim 'types' (Fig.35)

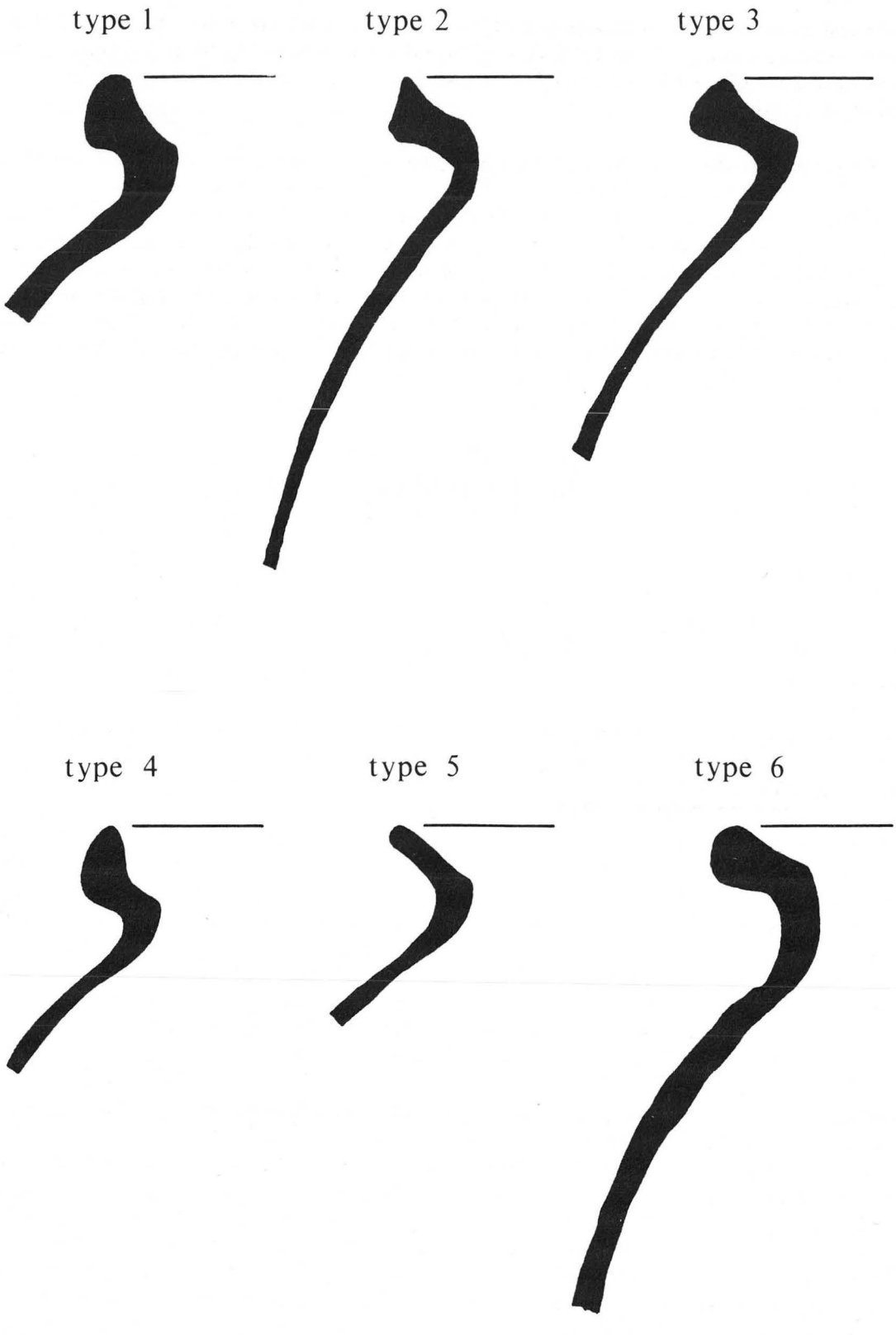


Fig.35. Cooking-pot rim types. Scale 1:1.

represent the most usual forms in each group. Variants and odd vessels from each site, though appearing dominant in the figures were in a minority in the assemblage. Many drawings represent the single example of that shape. Examples of all types of vessels, other than cooking-pots, from each site, have been illustrated. Fig.41 gives examples of the rim forms found on the sites which have produced waster dumps, as well as details of the various roulettes used to decorate the cooking-pots.

The limited areas available for investigation of these sites has meant that probably only a limited percentage of the pottery associated with, or in the locality of, each kiln has been recovered. The minimum vessel estimates given for each site have had to be calculated in two different ways. The bases of the cooking-pots are smaller and much thicker than the rims; many have remained intact or have only broken into a few pieces. These, therefore, have been used for the minimum vessel estimate calculation. All the four kiln site vessel estimates have been calculated in the same way for consistency, but the limited numbers of base sherds from 5 Lobster Lane (336N) makes the minimum vessel estimate smaller than the number of rim sherds would indicate. Other vessels have only been found in very fragmentary pieces, so in this case the minimum vessel estimates have been calculated on the available sherds.

TABLE 19. QUANTITATIVE ANALYSIS OF THE POTTERY FROM THE FOUR KILN SITES

	424N	163N	53N	336N.I	336N.II
Cooking-pots					
Total minimum vessel estimate	230	135	415	12	7
Sagging-base vessel estimate	-	6	-	-	5
Roulette decorated vessel estimate	1	7	42	-	1
Rim sherd count Type 1	38	10	253	-	-
Type 2	768	185	2	-	-
Type 3	-	352	962	5	-
Type 4	-	42	74	1	-
Type 5	-	6	132	104	13
Type 6	-	-	-	27	10
Misc.	12	11	46	3	1
Total weight in kilogrammes	126.740	71.050	168.720	5.850	2.100
Total sherd count	6030	3861	10, 125	731	166
rim sherd count	818	606	1469	140	24
body sherd count	4709	2838	7343	546	123
base sherd count	503	417	1313	45	19
Non-cooking-pots					
Total minimum vessel estimates	6	24	60	2	1
bowls	2	4	7	-	1
storage bowls/jars	-	5	11	-	-
applied band storage jars	4	5	34	2	-
pitchers	-	2	2	-	-
lamps	-	8	6	-	-

THE KILN SITES

27 Bedford Street (424N) (Fig.36)

The pottery from this kiln is probably the earliest of the four groups discussed in this report given the archaeo-magnetic dating of the clay lining of the kiln (p.92). The assemblage is similar to those from the other sites in the proportions of kiln products to other associated vessels, and as with all the sites, this is very small. The minimum number of cooking-pots retrieved from the site was 230 while only six non-cooking-pots were found. The little Thetford-type material that is not of standard cooking-pot or jar form will be dealt with separately below.

As no material was directly associated with the kiln, and the material found within the kiln itself was redeposited (p. 68) and not part of a kiln collapse or its last use, all the material from this site has been dealt with as one group.

The cooking-pots The fabric is mid to dark grey, hard fired with quartz sand, including many small opaque white grains, tempered with some flint and dark grey mineral inclusions; the size of the flint can vary from smaller than 1 mm in length to small stones up to 4-5 mm in length. Individual vessels are uniform in colour throughout, and only occasionally examples have slightly lighter cores in the thicker walls near the base or in the thickness of the rim. The thin, outer surface of the vessel is often very slightly darker. In this group less than one per cent of the sherds are wholly or partly oxidized.

The cooking-pots are remarkably similar in shape: thin walled with a flat base smaller in diameter than the rim (which has two basic forms); the maximum diameter is in the top half of the vessel; girth grooves from throwing are present on most examples. Only one, unstratified, sherd from the top of the site is decorated, and this has a single band of diamond-notched rouletting on the shoulder. The two basic rim forms are similar, both are everted with a hollow on the inner flange. Type 1 has a rounded outer edge (Fig.36, No.4), while Type 2 has a flat outer edge with a pointed top (Fig.36, No.17). These are the two typical shapes of their type groups. Other rims, which are variants of Type 2, such as Fig.36, No.12, are less common. All the vessels have small, flat bases with concentric string marks on the outside, the latter formed when the pot was cut from the wheel head. The bases vary in size from 8 to 9.5 cms. Many are slightly concave with marks around the edge at the junction of the base and side of the vessel. All the cooking-pots are remarkably similar, with little or no variation in rim form or size from the basic shape.

Rim diameters mostly vary from 13 to 16 cms with those in the range of 14-15 cms being the most common. Some vessels have a rim diameter of around 19 cms, though these are few in number.

There does not seem to be any difference between the vessels from the upper levels of the site and the material actually redeposited in the kiln itself; nor are there sufficient differences in any parts of the assemblage to suggest that this group includes material from the nearby kiln and that this kiln was in use at a different period, or made a different product. The sherds from vessels other than cooking-pots are also very limited in variety of form. These apparently comprise fragments of only four or five large storage vessels and two large bowls. Two of the sagging-based storage vessels or possible pitchers have applied strip decoration. Fig.36, No.26 has deeply impressed stamps on the applied strips, and only one other example of this type of decoration has been found in Norwich. The other decorated vessel (not illustrated) has applied strips in a diamond pattern with thumb indentations at the junction of each strip with another; this is very similar to the decoration on Fig.39, No.99. As no handles or spouts were found on the site it is difficult to suggest a specific form for these vessels,

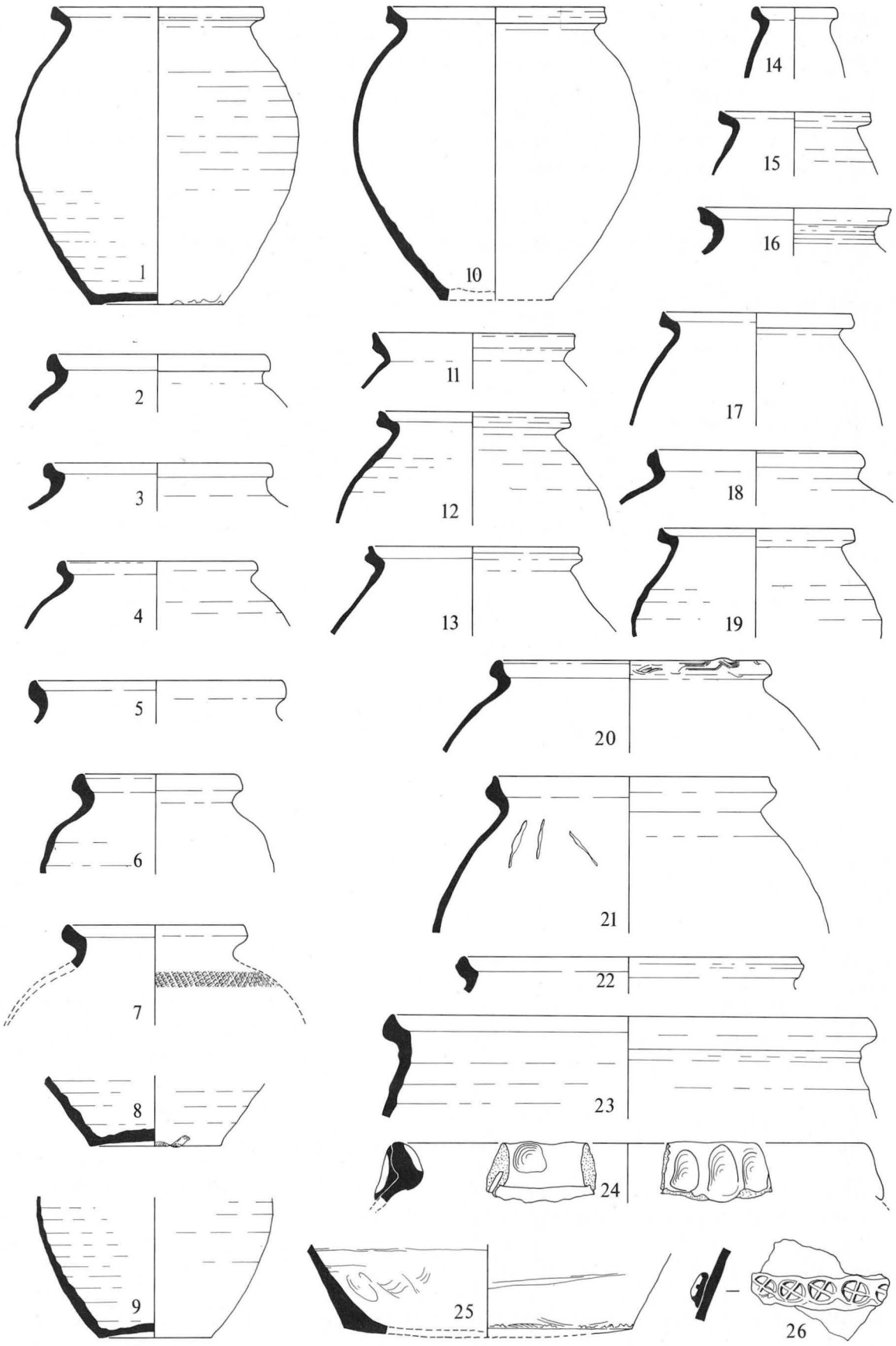


Fig.36. 27 Bedford Street (424N). Kiln group. Scale 1:4.

but the slightly sagging base of Fig.36, No.25 is typical of the large storage pitcher illustrated in Hurst (1976, fig.7.14, no.5). Large bowls, particularly those with reinforced rims (Fig.36, No.24), are fairly common on Norwich sites.

Fig.36, No.1-6, 10-13, 14-19 Cooking-pot rims.
No.7 Extremely distorted rim, shape reconstructed to show rouletting.
No.8-9 Cooking-pot bases.
No.20-4 Storage jars.
No.25 Sagging base from storage jar.
No.26 Sherd from applied band storage jar with stamped motifs.

21 Bedford Street (163N) (Fig.37)

Although this kiln site produced the standard Thetford-type cooking-pot as its main product, it is possible that, like that at 2-4 Bedford Street (53N), it was also making pedestal lamps. The evidence for this, however, is slim and none of the small number of lamp fragments are wasters. The material collected from the site comes from a large area around the kiln and some of the sherds were collected by members of the public. None of the pottery could be directly associated with the use of the kiln.

The fabric is mainly mid-grey in colour; this is consistently lighter than the average colour range of the material from 27 Bedford Street (424N) and the slightly darker surfaces, frequent on that site, are far less common. Small percentages of the sherds are either darker or partly oxidized to a brownish-orange. The vessels are very uniformly fired, and partial lighter cores are rare. One group from layer 41 is highly oxidized with a bright orange exterior surface, though the core is grey. These oxidized vessels also have other distinctive differences which are described below. Although the fabric from this site is sandy, it has fewer quartz inclusions, particularly of the opaque white kind, and the surface is less harsh than the 27 Bedford Street fabric. There are some dark grey mineral inclusions but the flint inclusions are rare. A minimum number of 159 vessels were found on this site, of which 135 were cooking-pots.

The products of this kiln seem to be limited almost exclusively to cooking-pots; these follow the standard Thetford-type form with small flat bases and the point of maximum diameter in the upper half of the vessel. Most vessels have distinctive finger rilling, particularly on the inner surface, as a result of wheel throwing. The cooking-pots from this kiln were produced with greater variety of both size and form than those from 27 Bedford Street. Small, but consistent numbers of larger, heavier vessels are present throughout the assemblage; these usually have well rounded rims and slightly thicker walls (Fig.37, Nos.40-1). The rim diameters of these vessels are not noticeably much larger than the standard cooking-pots. They vary from 16 to 19 cms with 16-17 cms being the usual size, as opposed to the 11-13 cms diameter for the standard cooking-pots. Work done at Ipswich on complete vessels has shown that a small increase in rim diameter of about 4 cms can mean a total volume increase of up to 3 litres (Keith Wade pers.comm.). Many of the rims come from small vessels with diameters of 8-10 cms. The cooking-pots in this 21 Bedford Street group have three main rim types, by far the most common being the Type 1 which is found in limited numbers on the site at 27 Bedford Street (Fig.37, No.48). The outer rim edge can vary from rounded to fairly flat and most vessels have the slight concave hollow on the inner rim edge. Although the variation within Type 1 is quite large, particularly of the outer rim edge, the rims attributed to this group do seem to be related as the action of the potter in forming the rim is the same on all examples (Roger LeDieu pers.comm.).

Type 2, which has a straight, nearly vertical, outer rim edge with a pointed top, is far less common and occurs only in small numbers on this site. Several of these have a slight groove just below the rim top (Fig.37, No.29).

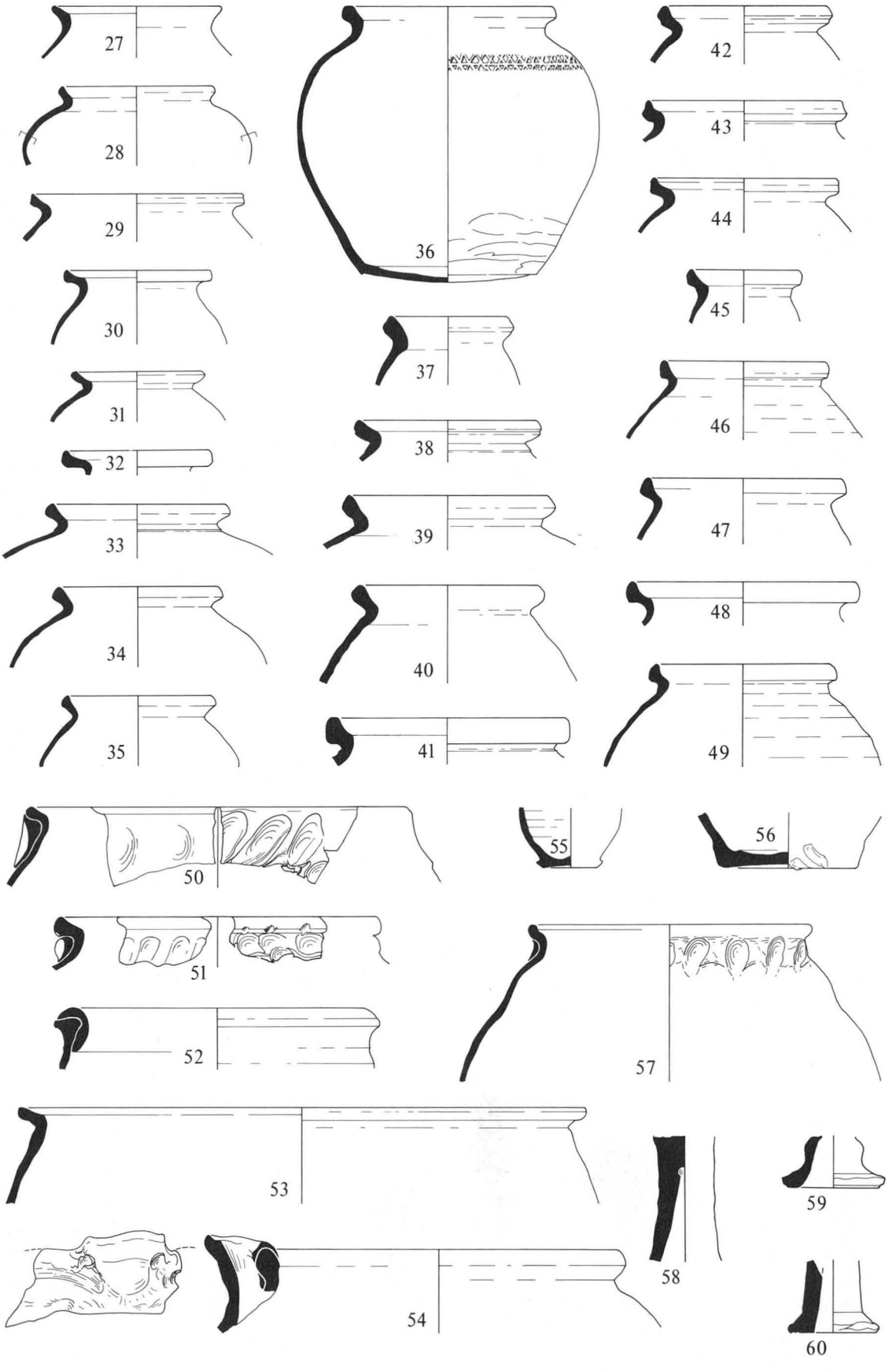


Fig.37. 21 Bedford Street (163N). Kiln group. Scale 1:4.

Type 4 (Fig.37, No.49) has a pronounced lid seating and a vertical outer edge with a rounded top, giving the appearance of a collar. This is also only found in limited numbers, at least 50 per cent of which are partly oxidized. Fig.37, No.27 is an oddity in this assemblage, but is similar to those rim forms found at 5 Lobster Lane. The flat bases all have traces of wire marks on the exterior surface resulting from cutting the vessel off the wheel head with a wire. The few slightly sagging bases (Fig.37, No.36) have no traces of these marks but do show signs of trimming. These bases have a much smoother and far more regular base edge, as well as an even, slightly concave base, both the result of deliberate shaping (van der Leeuw 1979, 79).

The two rims which are definitely from vessels with sagging bases are both roulette-ted, but a different roulette has been used on each vessel. These are the only two vessels which are complete enough to allow the circumference of the roulette wheel to be calculated. The rouletting on Fig.37, No.36, which is also shown at a scale of 1:2 on Fig.41, No.149, was made with a wheel that had a circumference of 5 cms; that used on Fig.41, No.150 had a slightly larger circumference of 5.2 cms.

The limited numbers of non cooking-pot vessels fall into four types: lamps, pitchers, applied-band storage jars and bowls with reinforced rims. The lamps are all of the tall pedestal type with hollow bases (Fig.37, Nos.58-60); parts of eight were found and the stems, distinctive even in a fragmentary state, are unlikely to be confused with other forms. However, if these were made at this production site, larger numbers of fragments might have been expected. The body sherds of the pitchers and bowls can be confused with those from cooking-pots but the few rims are sufficiently different and can be easily identified. None shows any trace of distortion or kiln wasting.

Fig.37, No.27-49 Cooking-pot rims.
No.50-53, 57 Storage jars.
No.54 Spouted-pitcher.
No.55-6 Unusual bases.
No.58-60 Pedestal lamps.

2-4 Bedford Street (53N) (Figs.38 and 39)

The assemblage from this site is by far the largest of the groups under discussion, with a minimum vessel estimate of 415 cooking-pots and sixty other vessels. It is possible that lamps, both of the pedestal and spike types, were being produced, as well as the cooking-pots, though relatively few fragments were found, probably not representing more than six lamps. The percentage of other vessels is the highest for all the sites, and the range of their forms is also larger. (A study of this site formed part of an undergraduate dissertation by Keith Wade for Southampton University in 1973.)

The basic fabric is sandy with a greater than usual range of colours. The quartz-sand inclusions are fine with many minute opaque white grains. Small, dark grey mineral inclusions are visible in most of the sherds with a pale grey fabric. There are two fabrics on this site; one is noticeably finer, with fewer quartz inclusions. This has a much smoother surface, and tends to be a paler grey colour than the more sandy fabric. The finer fabric accounts for only some five per cent of the total sherds, and it does not seem to be confined to any particular rim form or vessel size. The colour range of the main, sandier, fabric is very diverse; it varies from pale to very dark grey to virtually black, with the majority being dark grey. Approximately 20 per cent of sherds have a lighter grey core and only rare sherds have a slightly oxidized core. Fewer than 0.5 per cent of the sherds are wholly or partly oxidized.

All three sizes of cooking-pots are present, but again the medium size is the most common. These have diameters of between 12 to 15 cms, with 13-14 cms diameter

being the most usual size. The smaller size has an average diameter of 9-10 cms, while the larger size of cooking-vessel has an average diameter of 15-17 cms. Many of these larger vessels have thicker, rounder rims and thicker walls, similar to that of Fig.38, No.82, though this is a small example. The range of rim forms from 2-4 Bedford Street (53N) is the largest and most diverse of the four sites. Type 3 (Fig.38, No.73) is the most common and there are limited numbers of Type 4 and also Type 5, which is commonly found on 5 Lobster Lane (336N); Type 2, however, is rare on this site.

The shape of Fig.38, No.70 is typical of the cooking-pots from this site. The point of the maximum diameter of the body is higher than those from 27 Bedford Street (424N) resulting in a more angular vessel. The wheel throwing lines on both the interior and the exterior are distinct. Fig.38, No.85 shows the marks, found on all typical Thetford-type ware bases from Norwich, made on the exterior base of a vessel when it was cut from the wheel head with a length of string or wire.

Several different types of rouletting, as well as incised lines, have been found as decoration on some forty-eight sherds of the cooking-pots. The rouletting is both square (Fig.38, No.88) and diamond-shaped, or a mixture of diamonds and triangles (Fig.38, No.90). There is one small rim sherd with diamond rouletting on the rounded rim edge, and the only other site that has produced these is at 13-25 London Street (215N). The rouletting on Fig.38, No.87 appears similar to the rather smudged fragment from 5 Lobster Lane (336N) (Fig.40, No.133); certainly the rim form is one commonly found at that site.

Six fragments with incised lines have been found. Four of these are from cooking-pots and one small sherd has certainly one, probably two, wavy lines on the rim edge, while three sherds have single wavy lines on the shoulder and one sherd has two incised wavy lines. The other two sherds, both from bowls, have two closely parallel incised lines with an acute angle of decoration (Fig.39, No.112).

None of the fragments of either the spike lamps (Fig.39, No.92) or the pedestal lamps (Fig.39, Nos.93-6) appears to be a true waster. The only example with an intact rim (Fig.39, No.92) shows signs of burning on the top 1 cm of the interior and over the rim edge on to the exterior surface but this is a result of use rather than a firing fault.

Bowls of several different shapes and sizes comprise part of this assemblage. The larger bowls have both thumb indentations on the rim edge (Fig.39, No.104), or thumbed applied reinforcement strips around the rim (Fig.39, No.106), as well as being undecorated. The smaller bowls (Fig.39, Nos.109-10) have only been found on this site. Fragments of several larger storage jars with applied criss-cross strips (Fig.39, No.99) and the spouts of at least two pitchers (Fig.39, No.97) are typical of the other vessels in this group.

The diversity of this assemblage, with the range of forms, fabrics and colours, is far wider than that from the other three sites. The significance of this is difficult to determine because of the limited nature of the site excavation, but it is possible to argue that it represents either a longer period of kiln use, or the dumping of debris from more than one kiln.

Fig.38, No.61-83 Cooking-pot rims.
No.84-5 Cooking-pot bases, 85 shows the typical wire marks on Thetford-type flat bases.
No.86-90 Cooking-pot rim with rouletted decoration.
No.91 Cooking-pot rim with small bosses, pressed out from the interior and pinched on the exterior.

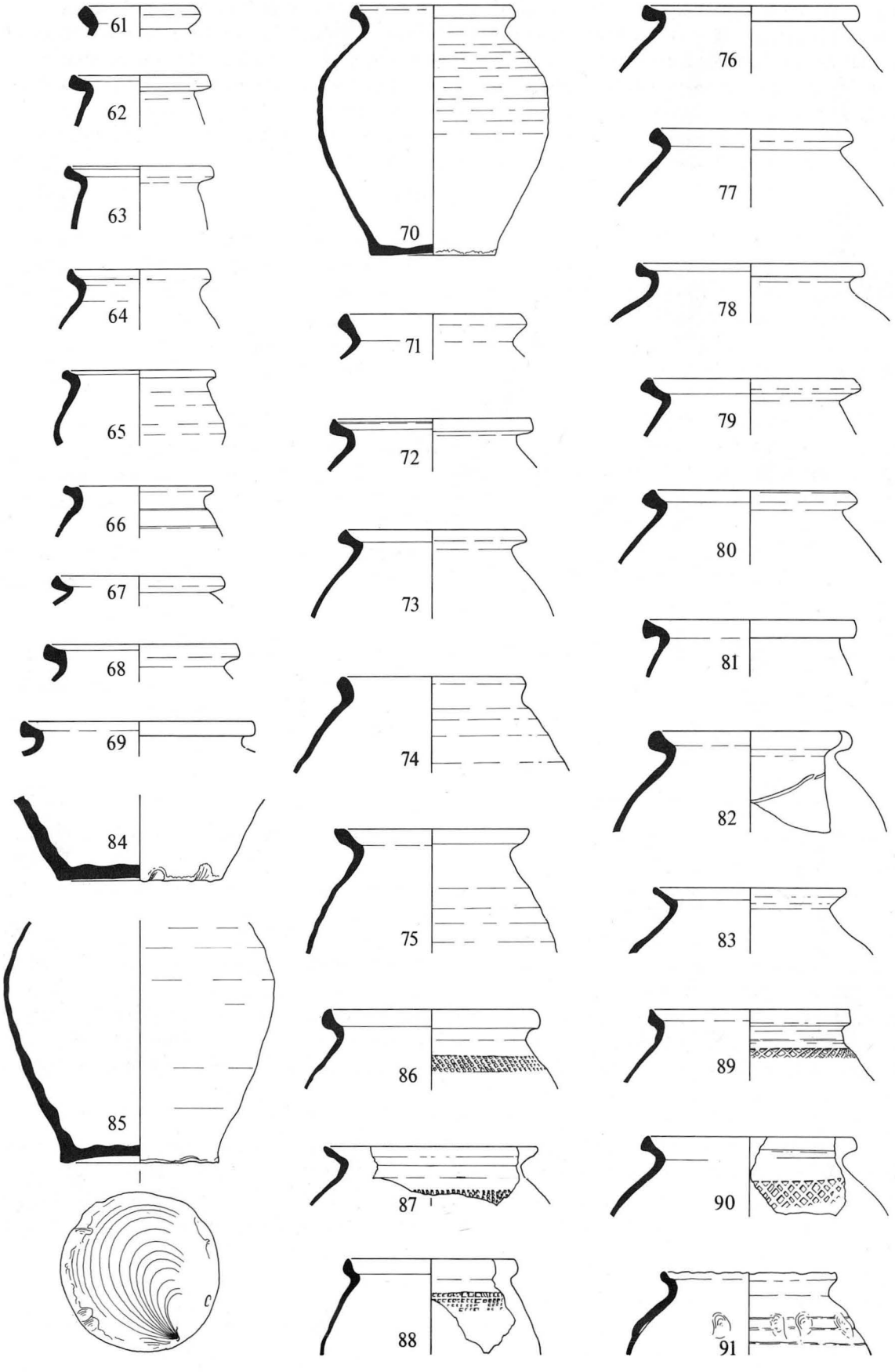


Fig.38. 2-4 Bedford Street (53N). Kiln products. Scale 1:4.

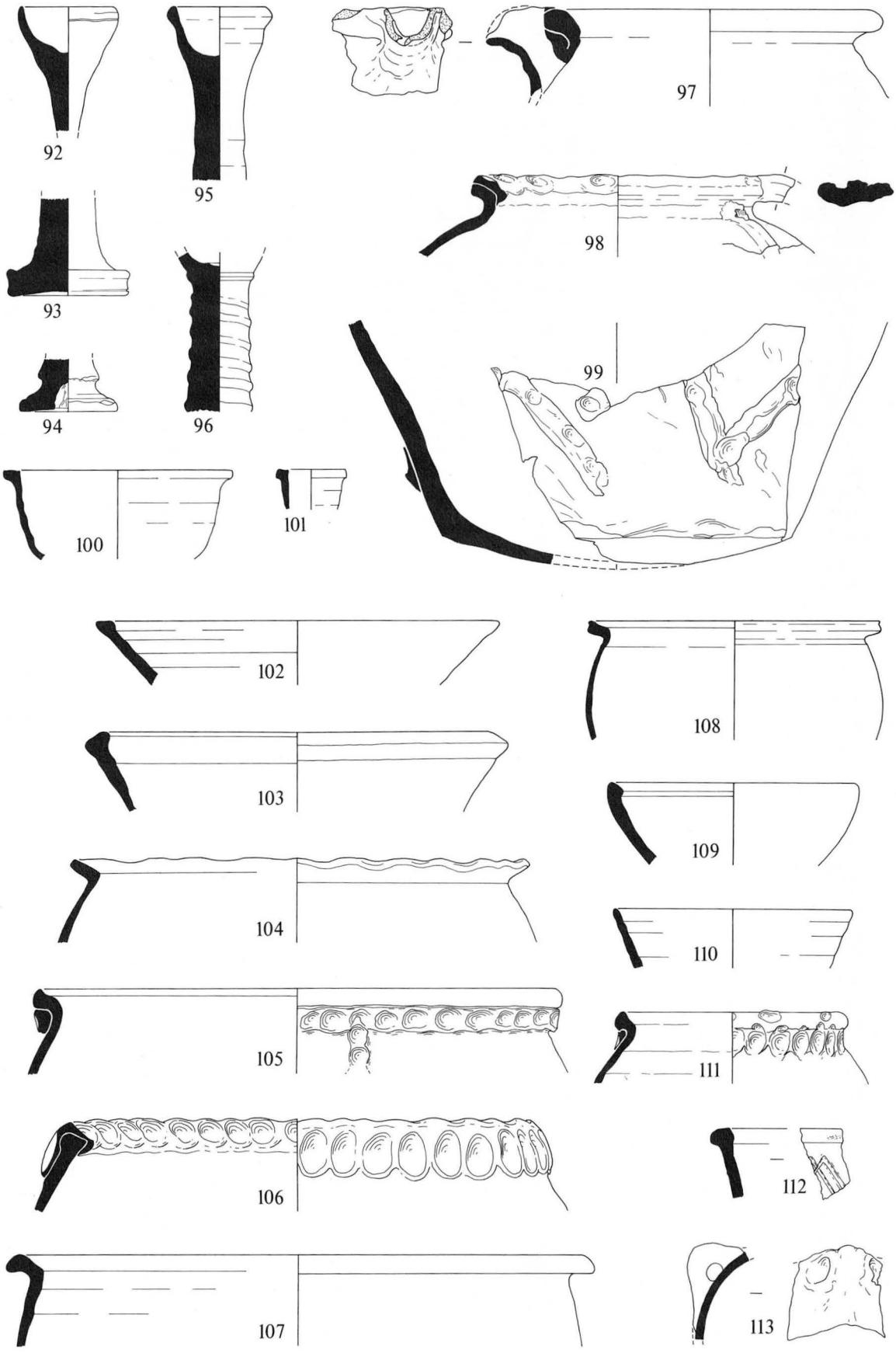


Fig.39. 2-4 Bedford Street (53N). Kiln-associated material. Scale 1:4.

Fig.39, No.92 Spike lamp.
No.93-6 Pedestal lamps.
No.97 Spouted-pitcher.
No.98 Pitcher.
No.99 Base of applied band storage jar.
No.100-3, 108-10 Bowls.
No.104-7 Storage bowls or jars.
No.111 Cooking-pot rim with applied band around the neck.
No.112 Bowl rim with incised decoration.
No.113 Handle.

5 Lobster Lane (336N) (Fig.40)

The pottery assemblage from this site is typologically the latest of the four kiln sites discussed in this report and this is confirmed by the radiocarbon date of 1180 ± 80. It seems probable, on typological grounds, that this assemblage belongs to the first half of the twelfth century (Jennings 1981, 41-45). Unfortunately, it also has by far the smallest number of sherds making definite conclusions difficult. In this relatively small group there is little definitely wasted material.

The pottery from the kiln levels, and the two pits cut by the kiln, differs noticeably from that found on the preceeding three kiln sites; it is beginning to reflect the change from the Saxo-Norman to the medieval tradition. Again the production is confined to cooking-pots, but the rim forms and bases have begun to change.

The fabric is mainly mid to dark grey in colour with some 25 per cent of the sherds a brownish-grey. The basic sandy fabric is similar to that of the other groups and has few added inclusions. In contrast to 27 Bedford Street, the occasional flint inclusions are only found on a few vessels. The vessels are uniformly fired; slightly lighter cores are rare, but the outer surface is often slightly darker than the inner surface. Only one sherd is totally oxidized and less than ten are partly oxidized.

This pottery has been divided into two groups, the material from Pits 8 and 9 below the kiln, Phase I, and the material associated with the kiln structure, Phase II. The possibility that material from the two pits may have been redeposited in Phase II is discussed above (p.72).

Phase I (Fig.40,Nos.128-47) The sherds from the two pits beneath the kiln are all consistently small and abraded. There is little doubt, though, that these also come from an earlier kiln due to the small, but consistent, numbers of wasted and distorted sherds. Most of the rim sherds are Type 5, the distinctive feature of this type being its narrow, almost pointed, end. Although everted and roughly similar to the basic Thetford-types, the concave hollow on the inside edge is either extremely shallow or, more usually, non existent. Only six rim sherds have the thicker, more sharply angled profile of Types 1-4. Two rims have regularly spaced small thumb indentations on the edge (cf. Fig.40, Nos.124-5). All the bases in this group are the standard flat Thetford-type with concentric wire marks, and they vary in size from 8 to 12 cms in diameter.

While the rim forms are similar to many of those from Phase II, there are no sagging bases in this group; the sherds are too small to reconstruct profiles, though the few that can be compared with forms from Phase II do seem to be similar.

The exception to this seems to be the vessels with sagging bases (Fig.40, No.114) with round-edge rims which do not seem to be present in this phase. The cooking-pots are remarkably consistent in size: the total diameter range is from 10 to 19 cms but very few come outside the 11-13 cms range, with the majority being around 13 cms.

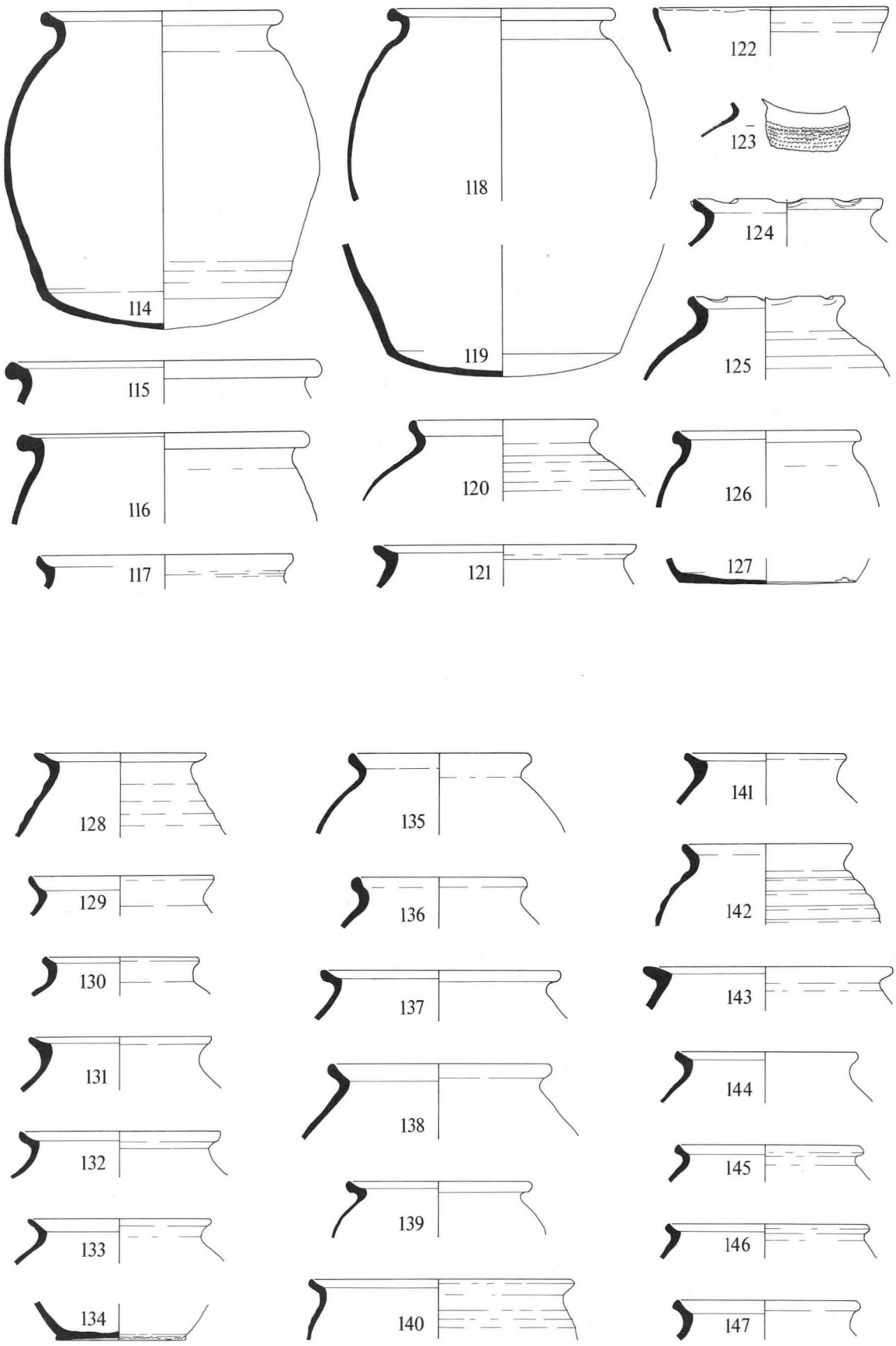


Fig.40. 5 Lobster Lane (336N). Kiln group. Scale 1:4.

The only rouletted sherd from the site is from Pit 8, and the small, faint, square-notched rouletting is completely different from the diamond-shaped rouletting found on the other sites. It does, however, appear to be a rather smudged version of a similar example from 2-4 Bedford Street (53N) (Fig.38, No.87).

Phase II (Fig.40, Nos.114-27) Approximately half of the vessels have larger, slightly sagging, bases and squatter, more globular, bodies (Fig.40, No.114). The rims associated with these differently shaped vessels are everted with thickened, plain round edges, Type 6. The point of maximum diameter of the globular cooking-pots is lower than on the standard Thetford-type ware cooking-pots and comes in the centre of the vessel. The wider bases are larger and slightly sagging, they vary in diameter from 13 to 19 cms, and have been hand-trimmed in a leather-hard state, leaving a sharp and well-defined base edge. The rim diameters of these globular cooking-pots are also larger, the range being 14 to 17 cms. The remaining rim forms are those of Type 5 found in the previous phase. These also include two with thumb indentations regularly spaced around the rim edge (Fig.40, Nos.124-5). The other bases are small and flat with wire marks of the standard Thetford-type, which are probably associated with the Type 5 rims from this phase. Unfortunately, the sample is too limited to indicate whether or not these are intrusive or contemporary with the use of the kiln. The single non cooking-pot sherd is a thin, slightly everted, straight rim, possibly from a small bowl (Fig.40, No.122).

The pottery from both Phases I and II reflects the later date of this kiln, indicated by the radiocarbon date of 1180 $\pm$ 80. Here the basic shape of the cooking-pot has begun to change from the taller, narrow based, Late Saxon shape to the squatter, more globular and wider medieval shape. Excavations by E.M.Jope (Jope 1952, 287-323) and J.G.Hurst (1963, 131-79) and preliminary studies of the material from the Norwich Survey excavations show that the Early Medieval wares (EMW) were in production at the same time as the Thetford-type wares for a period of some 150 years from c.1000 to c.1150. The Early Medieval wares, as defined by Hurst (1963, 155; 1976, 342), are partly hand-made with distinctive hand-finishing around the neck, at the junction of the rim with the body (Jennings 1981, fig.14, nos.285-9). The hand-finishing and smearing of the neck is a feature which carries on into the full medieval period, and is still common on cooking-pots of that date. It is, however, something that is conspicuously absent from all the vessels from this kiln site. Unlike the EMW, the walls of these cooking-pots were totally wheel thrown. It is possible that this kiln reflects the development of an already changing market.

Fig.40, No.114-21 Cooking-pot rims. Phase II.
No.122 Bowl rim. Phase II.
No.123 Sherd, plan view angled to show detail of rouletting. Phase II.
No.124-6 Cooking-pot rims. Phase II.
No.127 Small sagging base. Phase II.
No.128-33, 135-47 Cooking-pot rims. Phase I.
No.134 Base. Phase I.

THE WASTER GROUPS

Apart from the four sites that constitute the main body of this report, there are other groups of Thetford-type ware sherds that appear to be the debris from kilns. These have been found on sites in the Pottergate/Bedford Street area and are listed in the Gazetteer (p.91), together with such details as are known about them.

The criteria used for defining these groups as probable kiln working debris are as follows: that they come from deposits containing nearly, if not all, sherds of a similar form, shape and size; at least some of the sherds show definite signs of distortion or

splitting during firing; that the degree of distortion is probably sufficient to preclude the vessels being sold as seconds; that they are present in sufficient quantities to be more than accidental or random finds. In addition, three sites produced evidence of possible kiln lining (consistent with the lining from the known kiln sites, see below).

All five of the main groups plus one solitary vessel have been dealt with below, giving details of the fabric and any distinctive features that exist. No quantative analysis has been attempted as they are all fragmentary groups, and not all the material from each one was retained. These groups, however, do have distinctive similarities with those from known kiln sites. None of them produced any evidence for the manufacture of vessels other than cooking-pots. They all have several rim forms, although one form is usually dominant. A sample selection from each group, with the exception of 8-10 Exchange Street (59N), which is very similar to 2-4 Bedford Street (53N), showing as wide a range as possible, has been illustrated in Fig.41. A brief comment is given below on each individual group together with an indication of which forms are common and which are rare. The one exception to this is the solitary vessel from the Shirehall Chambers site (135N).

Waster groups in association with possible kiln lining

20 Bedford Street (11N) (Fig.41, Nos.154-9) A collection of vessels, all cooking-pots, most of which are similar both in fabric and shape to those from 27 Bedford Street (424N). The vast majority have the flattened outer rim edge typical of Type 2. There does, however, appear to be a distinctive sub-group, which comprises larger rims with diameters of 15 to 16 cms. These also have a vertical flattened rim edge which is usually slightly hooked underneath (Fig.41, No.158). All the fragments that are apparently from these vessels have a smoother, finer fabric, which is different from the rest of the group. This is the result of smaller and fewer quartz-sand inclusions and the two fabrics are quite distinctive under a x20 microscope.

8-10 Exchange Street (59N) (Not illustrated) This is a small group with a limited range of forms and sizes. Most of the small sherds are from the standard, medium size of cooking-pot and the assemblage is very similar in rim types to that from 2-4 Bedford Street (53N). Rim Type 3 is the most numerous, with small numbers of Type 5. The fabric is mostly mid-grey in colour with little difference in the surface colour, or in the core, and only a very few sherds have a slightly darker surface. None of the sherds is decorated.

12-16 Pottergate (98N) (Fig.41, Nos.160-7) A large group of mainly medium sized vessels, mostly with rim diameters of 13-14 cms. The fabric is a standard one, similar to that found at 2-4 Bedford Street (53N), though a few vessels do have minute white inclusions. The majority of sherds have a light to mid-grey core with slightly darker margins and surfaces. There are three main rim types; nearly half the vessels have the 'S'-shaped rim, Type 4 (Fig.41, No.167) while the other two most common shapes are Fig.41, Nos.160 and 163. This group includes the only sherds in the whole collection which have visibly failed to reach the correct firing temperature.

Waster groups only

2-4 Pottergate/Dove Street/5 Guildhall Hill (101N) (Fig.41, Nos.168-71) This is one of the smallest groups and has a standard Thetford-type sandy fabric. There is little variety in the rim shapes with most of the vessels having the 'S'-shaped rim Type 4. The distinctive feature of this group is that the rims are nearly all from larger, heavier vessels with proportionally larger bases. The rims vary in size from 16 to 18 cms in diameter. This is noticeably larger than those from 12-16 Pottergate (98N).

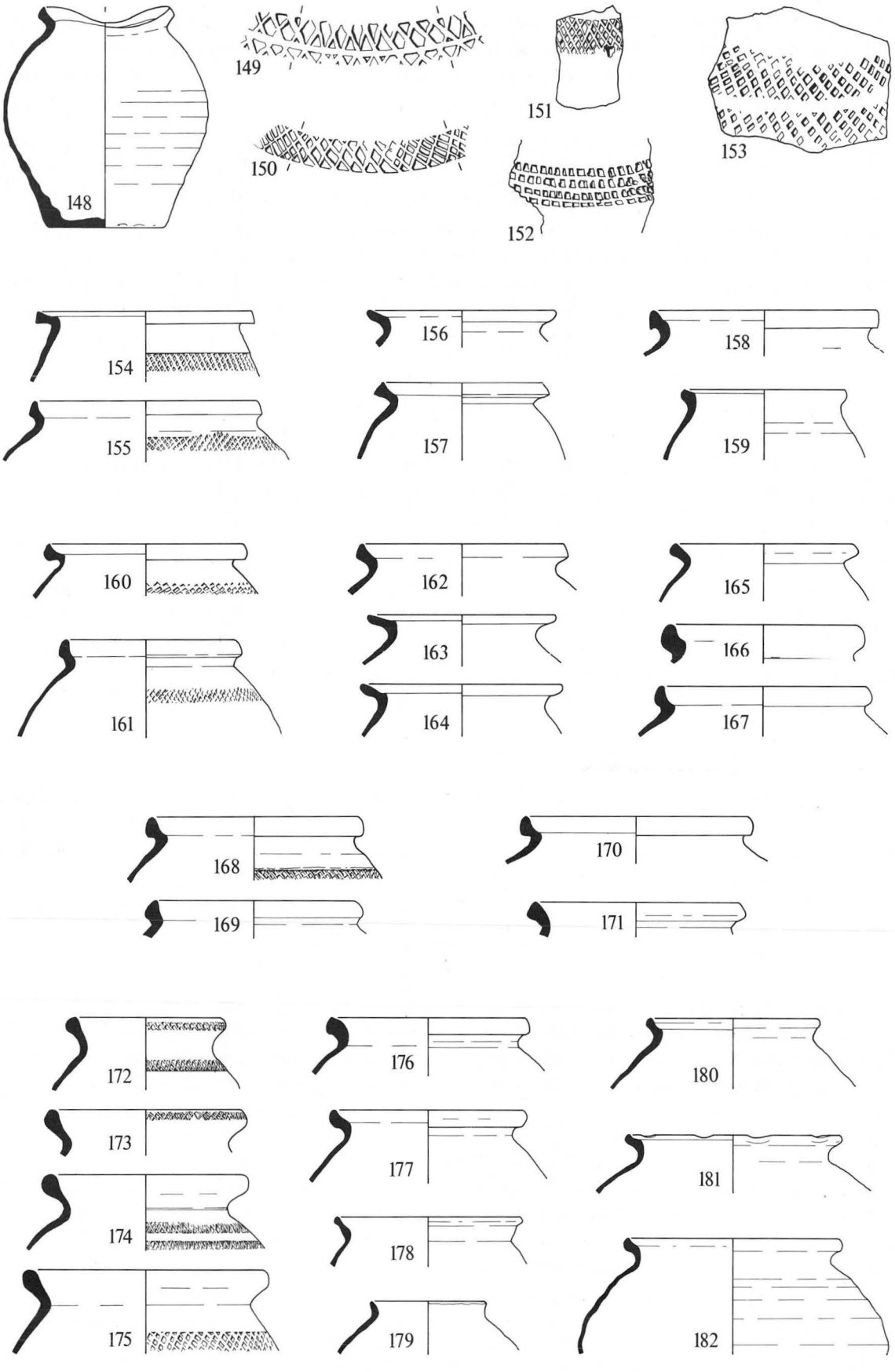


Fig.41. Details of rouletting and waster groups. Scale 1:4 except 149-53 (1:2).

Shirehall Chambers, Market Avenue (135N) (Fig.41, No.148) The single vessel from this site is sufficiently distorted and split to preclude its ever having been used. It is a typical Thetford-type cooking-pot of a standard size. The fabric is a dense darkish-grey with many small quartz-sand inclusions.

13-25 London Street (215N) (Fig.41, Nos.172-82) The fabric of this group is of the standard sandy type, though occasional vessels have a few small white flecks similar to those found in some of the vessels from 5 Lobster Lane (336N). This group has the highest percentage of roulette decorated vessels of all the groups dealt with in this report. It also has several vessels which are rouletted on the rim edge, as well as on the shoulder (Fig.41, Nos.172-3). All the available rouletted sherds are of a similar rim shape, Type 1, with a rounded outer edge. This seems to be consistent, whether they are rouletted on the rim and shoulder, or on the shoulder only. From the fragments surviving, it seems unlikely that any of the vessels were rouletted on the rim only. Fig.41, No.173 appears to have broken on the line of the shoulder rouletting.

A small hoard of William I Type 1 pennies (dated 1066-8) was recovered from this site. This find probably represents an accidental loss and was thought by the finder to be associated with a layer of ash and Thetford-type waster material (Mck.Clough 1973, 142). The circumstances of the discovery, however, make certainty impossible.

All the bases from these six sites are of the standard flat Thetford-type with string marks on the bottom. There are no examples of the small sagging bases found at 21 Bedford Street (163N), or the larger sagging bases found at 5 Lobster Lane (336N).

Fig.41, No.148 Cooking-pot. 135N.
No.149-50 Detail of rouletting to show length of roulette wheel. 163N. Scale 1:2.
No.151 Detail of rouletting. 163N. Scale 1:2.
No.152 Detail of rouletting. 53N. Scale 1:2.
No.153 Detail of rouletting. 163N. Scale 1:2.
No.154-9 Cooking-pot rims. 11N.
No.160-7 Cooking-pot rims. 98N.
No.168-71 Cooking-pot rims. 101N.
No.172-82 Cooking-pot rims. 215N.

CONCLUSIONS

Detailed examination of the fairly large numbers of sherds from the four kiln sites and the six waster heaps found in Norwich has only produced evidence for the manufacture of cooking-pots, and dubious evidence for the production of lamps. None of the other forms found on these sites showed any signs of being wasters or reject kiln material. Even if bowls were being made in far smaller numbers than the cooking-pots, one would expect rather more than the few fragments found on most of the sites. It therefore seems likely that the kilns so far located were limited to producing one form only, that of the cooking-pot. All four kiln assemblages show evidence of production throwing, with extremely limited variations in both size and shape of a utilitarian vessel that was rarely decorated. There is no doubt that it was a mass production industry and it is probable that on some sites more than one potter was throwing. The differences between some of the rim types are a result of different actions and techniques of an individual potter, and it would be extremely unusual for one person to do both shapes (Roger LeDieu pers.comm.).

One key point of interest has always been the extent to which the products of the kilns at Thetford (Rogerson and Dallas forthcoming) were imported into Norwich, a town with its own industry. There are various distinctive forms, bowls with spouts and cos-

trels for example, that are extremely rare in Norwich, even on excavated sites, but are known to have been made in Thetford. Only slightly more common are the large, applied band, storage jars, and it might be suggested, based on the limited available evidence, that these unusual forms were not made in Norwich. However, the range of forms found in Norwich is much larger than that from the known kiln sites (Jennings 1981, 14-22). The Thetford-type industry at Norwich does, perhaps, have stronger similarities to that found at Ipswich, Suffolk, where the range of forms is also limited. Ipswich, like Norwich but unlike Thetford, also mainly produced vessels with flat bases. It is possible that the larger, well established, perhaps parent industry to Norwich which originated the production of the more elaborate and complicated forms, continued to produce the very limited numbers required even for a large area and exported them to subsequent areas of manufacture. These industries may have been established solely to provide the mass production wares, those required in large numbers by all households for everyday use. Norwich was certainly a town of sufficient size to support an industry of this type. The problem of locating the centre at which individual pots were made is further compounded by the fact that visually the products of Thetford and Norwich are macroscopically indistinguishable, although some differences have been established by scientific analysis (Hawkins 1977). The products of the rural kilns are often easier to distinguish visibly and it is also unlikely that they would be traded in towns which already had their own sources of supply. Until more information is available the attribution of forms to specific urban production centres should be confined to those for which definite wasters have been found, or where evidence exists for large numbers of discarded fragments.

The time span covered by these four kilns and waster groups has still not been entirely settled. The two available absolute dates are, on stylistic grounds, probably for the earliest and the latest kilns. However, given the 68 per cent confidence level for both radiocarbon and archaeo-magnetic dating, this gives a maximum possible date range of AD 960-1260, while the minimum range is only twenty years, AD 1060-80. The most likely date range would be late tenth century to the early twelfth century, but this needs to be substantiated by work on the material from excavated sites.

VI. GAZETTEER OF SITES

The gazetteer includes brief details of all sites in Norwich that are known to have produced Thetford-type wasters, kiln debris or actual kiln structure up to 1982. They are set out in numerical order according to the county sites and monuments index. Museum accession numbers are given only for the Late Saxon material found on the site (although a number of the sites produced significant material of other periods). To set these ten sites producing evidence of Saxo-Norman pottery production in context, it should be noted that up to 1976 133 sites in the city had produced Thetford-type wares (out of over 280 producing pottery of all periods).

11N 20 Bedford Street
TG 2311 0864
1961: Building site.
Fragments of possible kiln found.
NCM 38-976

53N 2-4 Bedford Street/Exchange Street/Little London Street
TG 2301 0863 (approx.)
1964: Building site.
Fragmentary remains of kiln found.
NCM 84.965
Wilson and Hurst 1965, 173;
Webster and Cherry 1974, 181.

59N 8-10 Exchange Street
TG 2296 0861 (approx.)
1970: Internal building alterations.
Possible kiln lining and wasters found.
NCM 43.971
Wilson and Moorhouse 1971, 129.

98N 12-16 Pottergate
TG 2288 0865 (centred)
1963: Building site. Possible kiln lining and wasters found.
NCM 378.963
Wilson and Hurst 1964, 296.

101N 2-4 Pottergate/Dove Street/
5 Guildhall Hill
TG 2293 0862 (centred)
1852, 1898, 1966: Building sites.
Possible wasters found.
NCM 228.966
Jope 1952, 304, 318 and fig.9. 1-3.

135N Shirehall Chambers, Market Avenue
TG 2326 0850 (approx.)
1905: Building site. Within Castle precinct (429N).
A waster pot found.
NCM 57.05
Jope 1952, 318 with ref.

163N 21 Bedford Street
TG 23075 08664
1973: Building site/Excavation by Norwich Survey. Fragmentary remains of a kiln found.
NCM 595.973
Carter et al. 1974, 66;
Webster and Cherry 1974, 181.

215N 13-25 London Street
TG 2305 0861 (centred)
1862, 1971, 1972: Building sites.
Large quantities of wasters - probable site of waste heap from a nearby kiln.
NCM 606.972
Mck.Clough 1973, 142-3;
Webster and Cherry 1973, 170.

336N 5 Lobster Lane
TG 22968 08666
1977: Building site/Excavation by Norwich Survey. Fragmentary remains of kiln found.
NCM 90.982
Atkin and Sutermeister 1978, 20.

424N 27 Bedford Street
TG 23115 48668
1979/80: Building site/Excavation by Norfolk Archaeological Unit.
Kiln found.
NCM 376.982.

VII. SCIENTIFIC DATING EVIDENCE

ARCHAEO-MAGNETIC DATING OF SAXON POTTERY KILN (SITE 424N), BEDFORD STREET, NORWICH

by A J Clark

Fifteen small samples were taken for thermoremanent directional dating by the disc method from the thin, hard-baked clay lining on either side of the flue, and measured in the Digico spinner magnetometer. Conditions were such that magnetic orientation had to be used although there was steel shuttering only about 1.5 m to the north of the sampling area. In spite of this, the results were well clustered and close to the magnetic curve, the mean direction being Dec. 29.4°E, Inc. 70.1°, with a circular standard error at 95 per cent confidence level of 2.3°. Normalising to Meriden, and making a small reduction in inclination to correct for the magnetic distortion of wall samples, gave final values of Dec. 29.0°, Inc. 68.2°, representing a date of AD 1000 + 60/-40 at the 68 per cent confidence level on the Ancient Monuments Laboratory archaeomagnetic curve as revised to March 1981.

RADIOCARBON DATING

A sample (HAR 2560) of charcoal from the fill (layer 16) of the kiln from site 336N (Lobster Lane) was submitted to the Ancient Monuments Laboratory and was analysed at the Carbon-14/Tritium Measurements Laboratory, Harwell. The charcoal derived from a mixture of oak (twig and large timbers), hazel/alder ? and willow/poplar (identified by C.Keepax, Ancient Monuments Laboratory). The result was Age b.p. (years) 770±80: a.d. 1180.

VIII. GENERAL CONCLUSIONS
by Malcolm Atkin, Brian Ayers and Sarah Jennings

The kilns were all discovered by accident during the course of commercial redevelopment. They stand, therefore, as more or less isolated examples. In particular it has been impossible to relate any of the kilns to their surroundings. Furthermore, no evidence of associated working areas and little for the grouping of kilns has been recovered. It is known that there were two kilns in close proximity at 27 Bedford Street (424N). On the other hand the kiln at 2-4 Bedford Street (53N) would seem to have been quite isolated.

No waster material has been found on building sites or from excavations west of 12-16 Pottergate (98N), nor on streets to the north or south. Evidence for the pottery-making industry is thus confined to a restricted band along Pottergate east of St Gregory's church, on Lobster Lane and on Bedford Street (Fig.42). A find from Shirehall Chambers, Market Avenue (135N), also suggests that the industry may originally have spread under the area later covered by the Castle Mound. The industry therefore occupied a linear area which, whilst being close to the centre of the Late Saxon conglomerate, was still a fringe development around the original nucleii, as noticed in other towns such as Lincoln, Stamford, Nottingham and Thetford (Musty 1974, 58). This point is of considerable interest in our understanding of the development of Norwich as a whole.

The town is believed to have grown out of the fusion of a series of Middle Saxon settlements: those of Needham, Coslany, Conesford and Westwick (p.64). These were gradually linked by a process of osmotic ribbon development to create, by the mid-eleventh century, the unified settlement of Norwich (Carter 1978, fig.80). Actual settlement within the bounds of the Saxon town was, however, likely to vary considerably in density. Large parts of the town remained open space throughout the medieval period. These unexploited areas were most valuable at the junctions of the original nucleii and, at the most strategic of these, the pottery industry was able to establish itself. Such a location would have the advantage of being able to serve the different nucleii from a central base.

The Pottergate/Bedford Street area was particularly well-suited being within easy reach of the local market (Tombland), the main east-to-west thoroughfare through the town ('Holmestrete/Westwick Way') and the River Wensum. The industry primarily produced material for local consumption. Pottery forms not made in the town could have been imported by packhorse or boat from other production centres; the situation of the wharf between Fye Bridge and the east end of Palace Plain, the latter notable for the discovery of quantities of imported pottery (cf. Ayers and Ayers this volume), may have served as an outlet for markets further afield to the east).

The source of supply of the bulky raw materials - wood for fuel and clay - cannot now be securely established although timber and gorse could have been gathered in Thorpe or on Mousehold Heath. The source of the clay is problematical. Local supplies could have been met from the surrounding drifts but may have been carted a considerable distance. It is known, for instance, that clay from a source now completely worked out, was being exported to the Netherlands from Cringleford in c. 1600 (Blomefield 1806, 39).

The location of the Pottergate/Bedford Street area was thus well-suited for a fledgling ceramics industry. It grew to satisfy the demands of an enlarging town which was rapidly establishing itself as the foremost borough in East Anglia, augmenting its entrepôt status with a manufacturing base, of which the potters on Pottergate formed an important part. The available evidence suggests that the earliest kilns were located at the eastern end of the street, the 27 Bedford Street kiln having a terminal date established by archaeo-magnetic dating of AD 1000 + 60/-40. The vessels produced by this kiln

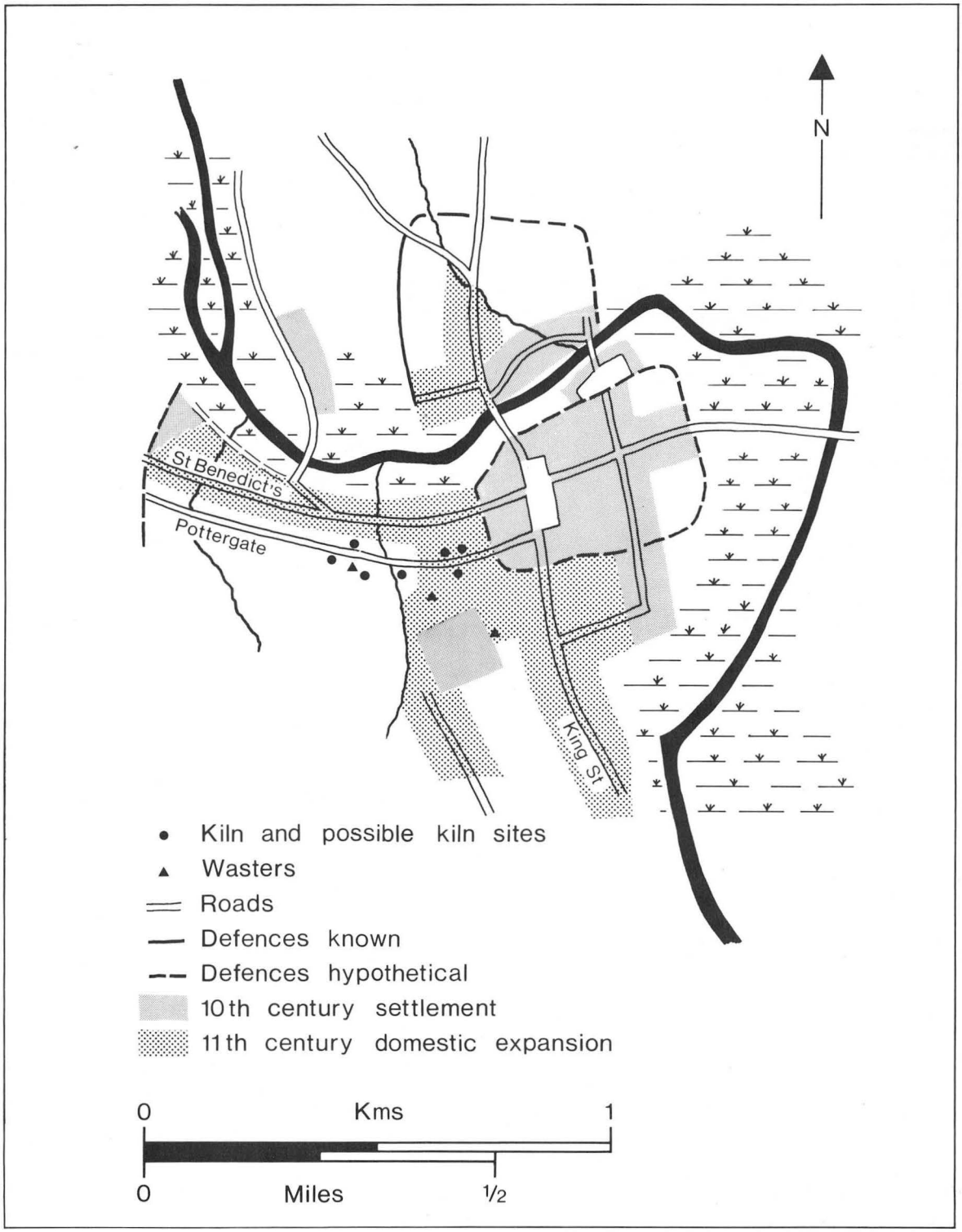


Fig.42. Thetford-type ware production in Norwich - interpretation plan showing kiln sites and waster finds against the background of the largely hypothetical plan of the defences and areas of settlement.

Fig.43. Suggested reconstruction of kiln from 27 Bedford Street (424N) showing the early stage of firing to heat the oven.

seem, within the notoriously homogeneous Thetford tradition, to be generally of an earlier type. The possibility that kilns extended below the area of the Castle Mound (p.65), necessarily placing them in the mid-eleventh century at the latest, would tend to confirm the eastern end of the area as essentially Late Saxon in character.

Within this general scenario there would appear to have been a westward shift of the industry between the later tenth century and the twelfth century (the Lobster Lane kiln was radiocarbon-dated to 1180 $\pm$ 80 AD). This may, in part, be due to the construction of the Norman Castle which could have displaced several potters, but it seems also to have been the result of increasing domestic occupation in the Bedford Street area which ousted the pottery kilns in favour of houses. The westward movement to east Pottergate was probably facilitated by the industrial tradition prevailing in this locality. Chalk and flint mines are known to have been operated off Pottergate and their presence probably inhibited early urbanisation (Atkin forthcoming (b)). Their exact date is unknown but they were probably obliquely referred to in a later document of 1267 mentioning 'Stonegate' (now Upper Goat Lane), (Hudson 1889, 49). Chalk mining, supplemented by a displaced pottery industry, would provide sufficient reason for the known lack of large scale urban development in Pottergate before the twelfth century (Carter et al. 1974, 43).

The perceived westward shift of the pottery industry may, however, be an illusion with the industry merely surviving longer at its western extremity. Whilst it must remain likely that the initial centre was based on Bedford Street, the late kiln at Lobster Lane (336N) did cut earlier pits (p.72). These pits contained waster sherds from an earlier kiln or kilns which may be of a similar date to vessels located further to the east. Without more fieldwork, therefore, the development of the industry, both spatially and technologically, cannot be adequately understood.

This study has necessarily been limited in its objectives. The dearth of material, archaeological and historical, renders wide-ranging discussion impossible. Nevertheless, it can be shown that a major manufacturing industry existed in the Pottergate/ Bedford Street area from the Late Saxon to the Saxo-Norman period. This industry seems to have confined itself to a very limited range of products (producing, almost exclusively, cooking pots) but was not a static and economically moribund undertaking. Whilst undoubtedly the industry was a loose amalgam of individual potters it nevertheless possessed sufficient impetus to survive even the most devastating economic misfortune, such as the Norman Conquest, and continued to produce ceramics into the twelfth century. It might be suggested that the reason for the exodus of the pottery industry was due to the continued expansion of the domestic settlement within the town boundary. Such settlement would be incompatible with an extensive and noxious industry which thus suffered a similar decline to that observed in the iron smelting industry at Alms Lane (Atkin forthcoming). Thereafter pottery was supplied from outside Norwich, although the exact source cannot yet be defined.

A study of this kind can only be a superficial summation of the available evidence as more detailed and exhaustive analysis is impossible without more fieldwork. Close examination of the known material, however, provides a general framework within which further research is clearly necessary. The development of a kiln typology is, at present, not practicable as so few examples of kilns have been located, but small scale excavation could yield many results. The total range of products remains unknown; Norwich excavation sites produce most known forms of Thetford-type ware, yet few of these are reflected in the waster sherds from the Pottergate area. Continued observation of building sites and the collection of waster material is thus clearly necessary. On a wider level it is important to establish the true scale and nature of the industry, the reasons for its location and changes of its siting. Increased knowledge of the pottery industry can then be expected to add to the current knowledge of the development of Nor-

wich as a whole. At the time of writing the relative importance of this industry as an economic unit within the Late Saxon and Early Norman town can only, at best, be assumed, but further research opportunities may help to assess its significance.

IX. ACKNOWLEDGEMENTS

The material described here has been collected over several decades. The authors have pleasure in acknowledging the great help received from the people who have been concerned with this work. The chief thanks go to the owners of the properties who allowed the work to be carried out - J Jarrold & Sons Limited, Hovells Limited and Calabrian Investments Limited. Special acknowledgement must be made to the work of W F Milligan of the Castle Museum who has been largely responsible for building up the collection of finds from building sites in the city; without his efforts this report would not have been possible.

The excavation of the kiln at 27 Bedford Street was carried out with the assistance of Lynn Ayers, William Burroughs, Andrew Harris and Tom Thompson.

Thanks are also due to Jan Roberts for consultations with the authors concerning his work at 21 Bedford Street which he carried out as a member of the Norwich Survey staff. Matthew Johnson kindly helped with the quantitative analysis of the pottery from the four kiln sites.

June 1982

ADDENDUM

Since the above report went to press, recalibration of the radiocarbon sample from Lobster Lane (336N), Layer 16, in January 1983, using the high precision calibration curve of Stuiver (1982), suggests a date range of AD 1210-1280. Although this may indicate a later date for the final demise of the Thetford-type pottery industry in Norwich than first suggested on the basis of the original radiocarbon date, it should be noted that the sample was from a context subsequent to the actual operation of the kiln. Most of the pottery described in the report came from the earlier of the sequences on this site and the above date is considerably later than the traditional date for the termination of the industry. This highlights the need for further work on this subject.

Stuiver, M., 1982 'A High Precision Calibration of the AD Radiocarbon Timescale', Radiocarbon 24, No.1, 1-26

BIBLIOGRAPHY

Addyman, P.V. and Hill, D.V., 1969 — 'Saxon Southampton: A Review of the Evidence, Part II', Proc.Hampshire Field Club Archaeol. Soc.XXVI, 61-96

Atkin, M.W., 1982 — 'St James Church', E.Anglian Archaeol. 15, 31-7

Atkin, M.W., forthcoming (a) — 'Excavations on Alms Lane (Site 302N)', E. Anglian Archaeol.

Atkin, M.W., forthcoming (b) — 'The Chalk Tunnels of Norwich', Norfolk Archaeol.

Atkin, M.W., and Sutemeister, H., 1978 — 'Excavations in Norwich - 1977/8. The Norwich Survey - 7th interim report', Norfolk Archaeol. XXXVII, 19-55

Ayers, B.S., 1979 — 'Excavations at Chapel Lane Staith, 1978', E.Riding Archaeol.5 (Hull Old Town Reports Series 3)

Ayers, B.S., forthcoming — 'Excavations at St Martin-at-Palace Plain, 1981', E.Anglian Archaeol.

Baker, E. and Hassall, J., 1979 — 'The Finds' in Baker, D. et al., 'Excavations in Bedford, 1967-1977', Bedfordshire Archaeol.J. 13, 147-293

Beijerinck, W., 1947 — Zadenatlas der Niederlandsche Flora (Wafeningen)

Bertsche, K., 1941 — Früchte und Samen (Stuttgart)

Blomefield, F., 1806 — An Essay towards a Topographical History of the County of Norfolk, continued by Parkin, III and IV (Norwich)

Blomquist, R., 1938 — 'Medeltidan skor i Lund', Kulturen, 189-219

Bryant, G.F., 1977 — 'Experimental kiln firings at Barton-on-Humber, S.Humberside 1971', Medieval Archaeol.XXI, 106-123

Campbell, J., 1975 — 'Norwich' in Lobel, M.D. (ed.), Historic Towns 2 (London)

Carter, A., 1978 — 'The Anglo-Saxon Origins of Norwich: the problems and approaches', Anglo-Saxon England 7, 175-204

Carter, A., 1981 — 'Norwich' in Milne, G. and Hobley, B. (ed.), Waterfront Archaeology in Britain and Northern Europe, Council for British Archaeology Res. Rep.41, 139-141

Carter, A. and Roberts, J.P., 1973 — 'Excavations in Norwich, 1972. The Norwich Survey - 2nd interim report', Norfolk Archaeol. XXXV, 443-468

Carter, A., et al., 1974 — 'Excavations in Norwich - 1973. The Norwich Survey - 3rd interim report', Norfolk Archaeol. XXXVI, 39-71

Carver, M.O.H., 1979 — 'Three Saxo-Norman Tenements in Durham City', Medieval Archaeol.XXIII, 1-80

Clapham, A.R., Tutin, T.G., and Warburg, E.F., 1968 — Excursion Flora of the British Isles (Cambridge)

Coles, B.P.L., 1977 — The Holocene Foraminifera and Palaeogeography of Central Broadland 2, unpublished Ph.D. thesis, Univ.of East Anglia

Cunliffe, B., 1976 — Excavations at Portchester Castle Vol.II: Saxon, Rep.Res.Com.Soc.Antiq.London XXXIII, (London)

Ekwall, E., 1960 — Concise Dictionary of English Place Names (Oxford)

Evans, J.G., 1975 — The Environment of Early Man in the British Isles (London)

Funnell, B.M., Norton, P.E.P., and West, R.G., 1979 — 'The Crag at Bramerton, near Norwich, Norfolk', Phil.Trans.Roy.Soc.A.B. 287, 489-533

Galloway, P., 1976 — 'Note on Descriptions of Bone and Antler Combs', Medieval Archaeol.XX, 154-156

Gebbels, A., 1976 — 'The animal bones', in Rogerson, A., 'Excavations on Fuller's Hill, Great Yarmouth', E. Anglian Archaeol.2, 198-207

Godwin, H., 1968 — 'Studies of the postglacial history of British vegetation XV. Organic deposits of Old Buckenham Mere, Norfolk', New Phytologist 67, 95

Godwin, H., 1975 — The History of the British Flora (Cambridge)

Godwin, H., 1978 — Fenland: Its Ancient Past and Uncertain Future (Cambridge)

Green, C., 1961 — 'East Anglian Coastline Levels since Roman Times', Antiquity XXXV, 21-28

Greig, J.R.A., 1978 — 'Worcester Barrel. Interim report on the remains found in layer I and the cloth', Ancient Monuments Laboratory Report No.2439

Hawkin, F.A., 1977 — Neutron activation analysis of Thetford-type wares, unpubl. M.A. dissertation, Univ.of Bradford

Hjelmqvist, H., 1950 — 'The flax weeds and the origin of cultivated flax', Botaniska Notiser 103, 257-298

Hudson, W., (ed.), 1889 — The Streets and Lanes of the City of Norwich: a memoir by J.Kirkpatrick (Norwich)

Hudson, W., 1896 — 'On an Ancient Timber Roadway across the River Wensum at Fye Bridge, Norwich', Norfolk Archaeol. XIII, 217-232

Hudson, W., and Tingley, J.C., (eds.), 1910 — The Records of the City of Norwich II (Norwich)

Hurst, J.G., 1963 — 'Excavations at Barn Road, Norwich, 1954-55', Norfolk Archaeol. XXXIII, 131-79

Hurst, J.G., (ed.), 1969 — 'Red-painted and glazed pottery in Western Europe from the eighth to the twelfth century', Medieval Archaeol. XIII, 93-147

Hurst, J.G., 1976 — 'The pottery', in Wilson D.M. (ed.), The Archaeology of Anglo-Saxon England, 283-348 (Cambridge)

Hustedt, F., 1930 — Die Susswasserflora mitteleuropas Heft 10 Bacillasiophyta (Diatomeae) (Jena)

Jennings, S., 1981 — 'Eighteen centuries of pottery from Norwich', E.Anglian Archaeol. 13

Johnson, C., and Cronne, H.A., (eds.), 1956 — Regesta Regum Anglo-Normannorum 1100-1135 (London)

Jones, A., 1976 — 'The Plant Remains', in Rogerson, A., 'Excavations on Fuller's Hill, Great Yarmouth', E. Anglian Archaeol. 2, 227-233

Jones, A., 1976 — 'The Molluscan Remains', in Rogerson, A., 'Excavations on Fuller's Hill, Great Yarmouth', E.Anglian Archaeol. 2, 225-6

Jones, A., forthcoming — 'Ipswich Molluscan Report', E.Anglian Archaeol.

Jones, F.R. Harden, 1976 — 'The marine environment and the commercial fisheries', in Washbourne R. et al. (eds.), Nature in Norfolk: A Heritage in Trust, 139-146 (Norwich)

Jope, E.M., 1952 — 'Excavations in the City of Norwich, 1948', Norfolk Archaeol. XXX, 287-323

Katz, N.Ja., Katz, S.V. and Kipicini, M.G., 1965 — The Detrivution of Fruits and Seeds (Moscow)

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 Archaeol. 22, 3-15

Kilmurry, K., 1980 — The Pottery Industry of Stamford, Lincs. circa A.D. 850-1250 (Brit.Archaeol.Rep.84)

MacGregor, A., 1975 — 'The Old Warehouse Site, Skeldergate', in Addyman, P.V. et al. 'Excavations in York: 1st Interim Report', Antiq.J. 54, 225-27

MacGregor, A., 1978 — 'Industry and Commerce in Anglo-Scandinavian York', in Hall, R.A. (ed.), Viking Age York and the North, (Council for British Archaeology Res. Rep.27) 37-57

Macon, T.T., 1969 — 'Key to the British fresh and brackish water gastropods', Freshwater Biological Association Scientific Publication 13

MacPhail, R.I., forthcoming — 'Soil and botanical studies in the "Dark Earth" ', in The Environment of Man: Iron Age to Saxon, (Brit.Archaeol.Rep. Oxford)

Maltby, M., 1979 — 'Faunal Studies on Urban Sites. The Animal Bones from Exeter 1971-1975', Exeter Archaeol.Rep.2, University of Sheffield publications

Mck.Clough, T.H., 1973 — 'A small hoard of William I Type 1 pennies from Norwich', Brit.Numis.J. XLIII, 142-3

Miller, L., 1977 — 'New Fresh Wharf - 2, The Saxon and Early Medieval Waterfronts', London Archaeol. 47-53

Milne, G., 1979 — 'Medieval Riverfront Construction in London', in McGrail, S. (ed.), Medieval Ships and Harbours in Northern Europe (Brit.Archaeol.Rep. 566, Oxford)

Milne, G. and Milne, C., 1978 — 'Excavations on the Thames Waterfront at Trig Lane, London, 1974-76', Medieval Archaeol. XXII, 84-104

Moore, P.D. and Webb, J.A., 1978 — An Illustrated Guide to Pollen Analysis, (London)

Moss, B., 1980 — Ecology of Fresh Waters, (London)

Musty, J., 1974 — 'Medieval pottery kilns' in Evison, V.I. et al. (eds.), Medieval pottery from Excavations, 41-65

Noddle, B., 1977 — 'Mammal Bone' in Clarke, H. and Carter, A. Excavations in King's Lynn 1963-1970, 378-399. (Soc. Medieval Archaeol. Mono. Ser. No. 7, London)

Organisation for Economic Co-operation and Development 1965 — Catalogue of main marine fouling organisms Polyzoa 2

Parker, H., 1965 — 'A Medieval Wharf at Thoresby College Courtyard, King's Lynn', Medieval Archaeol. IX, 94-104

Payne, S., 1973 — 'Kill-off patterns in sheep and goats: the Mandibles from Asvan Kale', Anatolian Stud. 23, 281-301

Percival, J., 1918 — Agricultural Botany (London)

Petch, C.P. and Swann, E.L., 1968 — Flora of Norfolk (Norwich)

Pound, J.F., 1976 — 'The Social and Trade Structure of Norwich 1525-1575' in Clarke, P. (ed.) The Early Modern Town, 129-147 (London)

Rackham, O., 1976 — Trees and Woodland in the British Landscape (London)

Radley, J., 1971 — 'Economic Aspects of Anglo-Danish York', Medieval Archaeol. XV, 37-57

Renhew, J.M., 1973 — Palaeoethnobotany (London)

Richardson, K.M., 1959 — 'Excavations in Hungate, York', Archaeol.J. CXVI, 51-114

Roberts, J., et al., 1975 — 'Excavations in Norwich 1974. The Norwich Survey 4th interim report', Norfolk Archaeol. XXXVI, 99-110

Robinson, M. and Hubbard, R.N.L.B., 1977 — 'The transport of pollen in the bracts of hulled cereals', Arch Science 4, 197-199

Rogerson, A., 1976 — 'Excavations on Fuller's Hill, Great Yarmouth', E.Anglian Archaeol. 2, 131-245

Rogerson, A. and Dallas, C., forthcoming — 'Excavations in Thetford, 1948-59, 1973 and 1977', E.Anglian Archaeol.

Scaife, R.G., 1980a — 'Pollen analytical investigation of Broad Sanctuary, Westminster, London', Ancient Monuments Laboratory Report No.3070

Scaife, R.G., 1980b — 'Medieval pollen and macroscopic plant remains from Newport, Isle of Wight', Ancient Monuments Laboratory Report No.3102

Scaife, R.G., 1981 — In Macphail, R.I. 'Soil and botanical studies of the "Dark Earth" ', in Jones, M. and Dimbleby, E.W. (eds.), The Environment of Man: the Iron Age to the Anglo-Saxon Period, 309-331 (Brit. Archaeol.Rep. Brit.Series)

Silver, I.A., 1969 — 'The ageing of domestic animals', in Brothwell, D.R. and Higgs, E.S. (eds.), Science in Archaeology, 283-302 (London)

Smith, A.J.E., 1978 — The Moss Flora of Britain and Ireland (Cambridge)

Sparks, B.W., 1961 — 'The Ecological Interpretation of Quaternary non-marine Mollusca', Proc.Linnaean Soc. London 172, 71-80

Swann, J.M., 1973 — 'Shoe Fashions to 1600', Trans.Mus.Asst.Group 12, 14-24

Tansley, A.G., 1953 — The British Isles and their Vegetation (Cambridge)

Tebble, N., 1976 — British Bivalve Seashells (Edinburgh)

Thornton, J.H., 1973 — 'The Examination of Early Shoes to 1600', Trans. Mus.Asst.Group 12, 2-13

Thornton, J.H. and Goodfellow, A.V., 1956-8 — 'Leather Shoes from Excavations at S.Corner Tower, Roman Fortress, York', Yorkshire Archaeol.J. 39, 525-530

Uerpmann, H.P., 1973 — 'Animal bone finds and economic archaeology: A critical study of 'osteo-archaeological method', World Archaeol. 4, 307-322

van der Leeuw, S.E., 1979 — 'De technologische aspecten van het aardewerk uit de Haarlemse oven', Haarlems Bodemonderzoek 10, 55-126

Wade, K., 1973 — The Thetford ware tradition with special reference to Norfolk. Unpubl. B.A. dissertation, Univ.of Southampton

Wade-Martins, P., 1980 — 'Excavations at North Elmham', E.Anglian Archaeol. 9

Waterman, D.M., 1959 — 'Late Saxon, Viking and Early Medieval Finds from York', Archaeologia 97, 59-105

Webster, L.E., and Cherry, J., 1973 — 'Medieval Britain in 1972', Medieval Archaeol. XVII, 138-88

Webster, L.E., and Cherry, J., 1974 — 'Medieval Britain in 1973', Medieval Archaeol. XVIII, 174-223

West, S.E., 1963 — Excavations at Cox Lane (1958) and at the Town Defences, Shire Hall Yard, Ipswich (1959)', Proc.Suffolk Inst.Archaeol.XXIX, 238-303

Wheeler, A.C., 1969 — The Fishes of the British Isles and North West Europe (London)

Wheeler, A.C. and Jones, A.K.G., 1976 — 'Fish remains', in Rogerson, A., 'Excavations on Fuller's Hill, Great Yarmouth', E.Anglian Archaeol. 2, 208-224

Williams, D., 1973 — 'Flotation at Siraf', Antiquity 47, 198-202

Williams, D., 1977 — 'The Plant Macrofossils', in Armstrong, P., 'Excavations in Sewer Lane, Hull', E.Riding Archaeol. 3, 18

Wilson, D.G., 1975 — 'Plant remains from the Graveney boat and the early history of Humulus in Western Europe', New Phytologist LXXV, 727-43

Wilson, D.M., and Hurst, D.G., 1964 — 'Medieval Britain in 1962 and 1963', Medieval Archaeol. VIII, 231-99

Wilson, D.M., and Hurst, D.G., 1965 — 'Medieval Britain in 1964', Medieval Archaeol. IX, 170-220

Wilson, D.M., and Hurst, D.G., 1969 — 'Medieval Britain in 1968', Medieval Archaeol. XIII, 230-87

Wilson, D.M., and Moorhouse, S., 1971 — 'Medieval Britain in 1970', Medieval Archaeol. XV, 124-79

Winder, J., 1980 — 'The marine mollusca', in Holdsworth, P., 'Excavations at Melbourne Street, Southampton, 1971-6', 121-7 (Council of British Archaeology Res.Rep.33, London)

Wortley, J.S., 1976 — 'The River Systems of Norfolk', in Washbourne, R. et al. (eds.), Nature in Norfolk: A Heritage in Trust (Norwich)

Young, C.M., 1949 — The Sea-Shore (London)

INDEX

Antler points, 20.
Archaeo-magnetic dating, 68, 77, 91, 92, 93.
Attechirchyerd, William, 53.
Awls, Medieval, 12, 13 (Fig.15).

Barrels, 11.
Bircham (N), 74.
Bishop, Custance (nee De Martham), 53.
Bishop, John, 53.
Bone objects, 1, 9, 20-2 (Figs.19-20), 59.
Bones, animal: 4, 30-2, 47; caprovine, 30, 31, 32, 47, 48; cat, 30, 31; cattle, 20, 30, 31, 32, 47; deer, 20, 30, 31, 51; dog, 30, 31; hare, 30, 31, 51; horse, 20, 30, 31, 47; pig, 20, 30, 31, 32, 47.
bird: 47.
fish: 32-4, 46, 48, 49, 59.
Bowls, 23, 59. See also Pottery.
Box, 23.
Brandon (S), 42.
Breckland, 42.
Breydon Water, 34, 36, 48.
Brick, 20.
Brushwood matting, 1, 4-5, 9, 11, 45, 55-6, 57, 58, 59.
Buckenham, Old (N), 40.
Buildings, Medieval, 52-5, 57, 58. See also Fish-houses.
Burnt clay objects, 20.

Cereals, 39, 40, 44, 46, 47, 50.
Chalk mines, 96.
Chisels, Medieval, 12, 13 (Fig.15).
Climate, 40, 55.
Comb, 1, 9, 20, 59.
Coins, Medieval, 89.
Cringleford (N), 93.

Darby, H.C., 43.
De Attilbrigge, Peter, 53.
De Attilbrigge, Roger, 54.
De Birlingham, Alexander, 53.
De Blofeld, Margery, 53.
De Blofeld, Nicholas, 53.
De Bokynham, Emma, 53.
De Bokynham, Roger, 53.
De Burg, Roger, 52, 57.
De Catton, Matilda (Maud), 52, 53, 54, 57, 58.
De Couteshalle, Alice, 53.
De Couteshalle, John, 53.
De Drayton, Robert, 53.
De Greymeston, Matilda, 53.
De Greymeston, Thomas, 53.
De Irstead, Adam, 52, 54.
De Martham, Robert, 53, 54.
Dendrochronology, 1, 4, 12, 44-5, 50, 51, 55, 72, 84, 86, 91, 92.
De Rudham, John, 53, 54.
De Rudham, Margaret, 53.
De Therston, Beatrice, 53.
De Therston (Thirston), Henry, 53.
De Therston, John (sen.), 53.
De Therston (Thirston), John (jun.), 53.
De Verly, Cristiana, 53.
De Verly, Rado, 53.
De Welleford, Walter, 54.
De Yelverston, George, 54.
Diatoms, 37-8, 49.
Diet, 31, 33-4, 36, 39, 40, 42, 43, 47, 48, 49, 51.
Domesday Book, 3, 33, 43, 48.

Eaton (N), 65.
Elmham, North (N), 20.

Fakenham (N), 43.
Fenland, 42.
Fisheries, 33, 36, 59.
Fish hooks, 12.
Fish-houses, 43, 57, 59.
Flax, 40, 42, 43, 44, 47, 55.
Flint mines, 96.
Flint tools, 46.
Flooding, 9, 38, 44, 49-50, 57-8.
Flora, 40-4 (Fig.27), 46, 47, 48, 49, 50. See also Cereals, Diatoms, Fruit and nuts, Mosses, Pollen.
Fruit and nuts, 5, 40, 41 (Fig.27), 43, 47, 51.

Godinge, Adam, 54.
Godinge, Isobel, 54.
Graveney (E), 42.
Grimston (N), 74.

Heckles, 12, 13 (Fig.15).
Hemp, 40, 42, 47, 55.
Hops, 42.
Hurst, J.G., 86.

Ipswich (S), 34, 35 (Fig.26), 36, 42, 45, 74, 78, 91.
Iron-working, 96.

Jope, E.M., 86.

Kilns, 14, 59, 61, 65, 66-74 (Figs.31-4), 76, 77-8, 80, 82, 84, 86, 88, 89, 91, 92, 93-7 (Figs.42-3).
King's Lynn (N), 30, 32, 57.
Kirkpatrick, J., 52, 54, 55-6, 57, 64.
Knives, Medieval, 12, 13 (Fig.15), 20, 59.

Lamps, 74, 78, 80, 82, 84, 89.
Langhale (N), 74.
Lava, 12.

Leather, 1, 5, 23-8 (Figs.21-4), 59.
Le Blexester, John, 54.
Le Blexester, Marion, 54.
Le Blexester, Michael, 54.
Le Cunte, Agnes, 54.
Le Cunte, Simon, 52, 54.
Leech Books, 42.
Le Moneye, Richard, 52, 54.
Le Moyne, William, 52, 54.
Le Verrer, Jordan, 53.

Maps, Norwich, 57, 58, 65.
Mersea Strood (E), 45.
Metalwork, Medieval: iron, 12, 13 (Fig.15), 20, 59.
Milligan, W.F., 66.
Mints, Medieval, 65.
Mosses, 38, 50.
Mousehold Heath, 50.

Nails, Medieval, 12, 13 (Fig.15).
Norwich, Alms Lane, 96: Anglia TV extension, 42: Bedding Lane, 57; Bedford Street, 14, 59, 61, 64, 65, 66-70 (Figs.31-3), 73-4, 76, 77-84 (Figs.36-8), 85 (Fig. 39), 86, 88, 89, 90 (Fig.41), 91, 92, 93, 96; Bishopbridge, 58; Castle Mound, 64, 65, 93, 96; Cathedral Close, 1, 56, 57; City walls, 64, 65; Colegate, 40, 55-6; Conesford, 64, 65, 93; Coslany, 64, 93; Cowgate, 2, 56; Dove Street, 88, 90 (Fig.41), 92; Exchange Street, 88, 91; Fishergate, 59; Fye Bridge, 2, 4, 48-9, 51, 52, 56, 57, 93; Grapes Hill, 64; Guildhall Hill, 88, 90 (Fig.41), 92; Holme Street, 2, 56, 93; King Street, 2, 56, 64; Lobster Lane, 61, 64, 65, 70-4 (Fig.34), 76, 80, 82, 84, 86, 87 (Fig.40), 89, 92, 93, 96; London Street, 89, 90 (Fig.41), 92; Magistrates Court, 28, 44, 51, 56; Market Avenue, 64, 65, 89, 90 (Fig.41), 92, 93; Markets, 56, 65, 93; Needham, 64, 93; Palace Plain, 2, 3, 4, 11, 55, 57, 58, 59, 93; Pottergate, 14, 59, 61, 64-5, 86, 88, 90 (Fig.41), 91, 92, 93, 96, see also Lobster Lane; St.Andrew's Street, 65; St.Benedict's Street, 64; St. Faith's Lane, 2, 56; St.Gregory's, 64, 65, 93; St.John Maddermarket, 64, 65; St.Lawrence, 64-5; St.Margaret, 64; St.Martin-at-Palace, 2-3, 51, 56; St. Michael Coslany, 56; St.Swithins, 64; Shirehall Chambers, 65, 88, 89, 90 (Fig. 41), 92, 93; Tombland, 2, 47, 65, 93; Upper Goat Lane, 96; Wensum Street, 42, 43, 50, 57; Westwick, 64, 65, 93; Westwick Way, 93; Whitefriars Bridge, 1, 3, 48-9, 51, 52, 55, 56, 57; Wymer Ward, 64.

Percival, J., 42.
Pie, Edmund, 53.
Pins, 20, 59.
Pollen, 38-9, 46, 50.
Pottery, Anglo-Saxon and Saxo-Norman: 1, 12-9 (Figs.15-8), 58; Badorf Ware, 14, 19; Ipswich Ware, 1, 13, 14, 15, 19; Stamford Ware, 14, 15, 19; Thetford-type Ware, 1, 5, 13-4, 15, 18, 19, 59, 61, 65, 66, 72, 74-91 (Figs.35-41), 94 (Fig.42), 96-7. Medieval: 12-9 (Figs.15-8); Andenne Ware, 14, 18, 19; Early Medieval Ware, 1, 14, 15, 18, 19, 74, 86; Early Medieval Sandwich Ware, 14, 19; Early Medieval Sparse Shelly Ware, 14, 15, 19; Limburg Ware, 14, 18, 19; Normandy Ware, 15, 19; Paffrath Ware, 14, 19; Pingsdorf-type Ware, 1, 14, 15, 19; Rhenish Ware, 14, 15, 19; Rouen Ware, 19. See also Kilns.

Quays, 1, 51, 52, 53, 54, 57, 58.
Querns, 12, 13 (Fig.15).

Richard, Joan, 53.
Richard, Thomas, 53.
Richard, William, 53.
Rivets, 20.
Roberts, J.P., 68.

Samoun, Thomas, 54.
Shells, 34-7 (Fig.26), 46, 48, 56.
Shoes, 5, 23-4, 25-8 (Figs.22-4), 29 (Fig.25), 58.
Silverton, John, 54.
Slag, 46.
Soils, 46-7, 49, 50.
Soneman, William, 53.
Stone objects, 12, 13 (Fig.15).
Strips, 20.
Strumpshaw Broad (N), 48.

Thetford (N), 12, 15, 20, 40, 74, 89, 91, 93.
Tile, 20.
Timbers, ash, 23, 45, 50; hazel, 45, 50, 92; holly, 45, 50; oak, 4, 9, 23, 45, 50, 51, 55, 92; prunus, 45, 50; willow/poplar, 45, 50, 92. See also Flora, Pollen.

Wattle and daub, 20, 66, 74.
Wells, 40, 55.
Wensum, River, 1, 2, 3, 4, 9, 11, 43, 48-9, 51, 52, 55, 56, 57-8, 59, 93; tributaries, 69; valley, 28, 55.
Woodland management, 45, 50.
Woodwork, Late Saxon, 1, 4, 9, 11, 22 (Fig. 20), 23, 44-5, 59.
Wool, 47-8.

Yare, River, 48; valley, 43, 48, 55.
Yarmouth, Great (N), 12, 30, 32, 33, 34, 35 (Fig.26), 36, 42, 55.

EAST ANGLIAN ARCHAEOLOGY

is a serial publication sponsored by The Scole Archaeological Committee Ltd. The Norfolk, Suffolk and Essex Units and the Norwich Survey will all be contributing volumes to the series. It will be the main vehicle for publishing final reports on archaeological excavations and surveys in the region.

Copies and information about the contents of all volumes can be obtained from:

Centre of East Anglian Studies,
University of East Anglia,
Earlham Hall,
Norwich, NR4 7TJ

or directly from the Archaeological Unit publishing a particular volume.

Reports available so far

Report No.1, 1975 Suffolk: various papers

Report No.2, 1976 Norfolk: various papers

Report No.3, 1977 Suffolk: various papers

Report No.4, 1976 Norfolk: Late Saxon town of Thetford

Report No.5, 1977 Norfolk: various papers on Roman sites

Report No.6, 1977 Norfolk: Spong Hill Anglo-Saxon cemetery

Report No.7, 1978 Norfolk: Bergh Apton Anglo-Saxon cemetery

Report No.8, 1978 Norfolk: various papers

Report No.9, 1980 Norfolk: North Elmham Park

Report No.10, 1980 Norfolk: Villages in Launditch Hundred

Report No.11, 1981 Norfolk: Spong Hill Anglo-Saxon cemetery: Part II

Report No.12, 1981 The Barrows of East Anglia

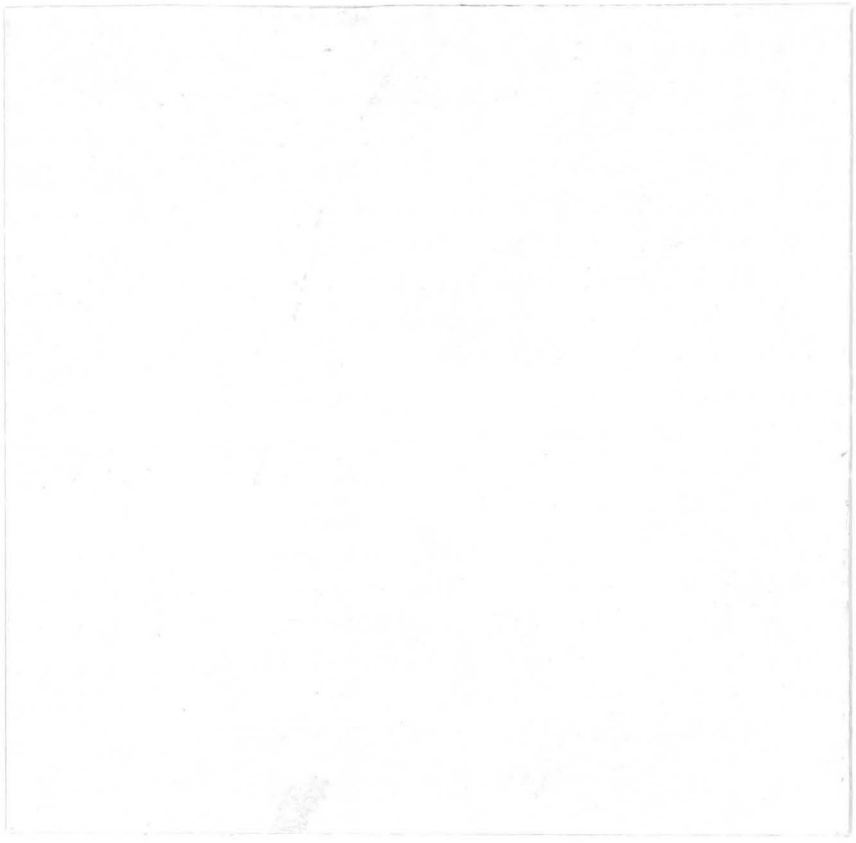
Report No.13, 1981 Norwich: Eighteen centuries of pottery from Norwich

Report No.14, 1982 Norfolk: various papers

Report No.15, 1982 Norwich: Excavations in Norwich 1971-8, Part I

Report No.16, 1982 Norfolk: Beaker Domestic Sites

Report No.17, 1982 Norfolk: Waterfront excavation and Thetford-type ware production, Norwich



CONTENTS

A Waterfront Excavation at Whitefriars Street Car Park, Norwich, 1979 1

Thetford-type Ware Production in Norwich 61

Printed by F. Crowe & Sons Ltd., 11 Concorde Road, Norwich NR6 6BJ