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THE BROUGHTON TO TIMSBURY PIPELINE, PART 1: A LATE SAXON POTTERY KILN AND THE PRODUCTION CENTRE AT MICHELMERSH, HAMPSHIRE

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and illustrations by S E JAMES

ABSTRACT

During excavations in the village of Michelmersh, a late Saxon clamp kiln was discovered, with a number of jars in situ *from its final firing. Archaeomagnetic dating shows that this took place in the late 10th or early 11th century. A small number of contemporary features indicate relatively non-intensive activity. The kiln products, after new chemical analysis and a review of the previously excavated 'Four Seasons' kiln material, suggest that 'Michelmersh ware' should be reconsidered as a 'ceramic tradition' with a lifespan of two or even three hundred years. Village based production is indicated with a distribution area centred around Winchester and extending at least into Wiltshire. Reasons behind the development of high quality wheelthrown wares in standardised forms and sizes are briefly considered.*

INTRODUCTION

This paper forms the first part of a report on excavations in 2001 by Wessex Archaeology ahead of a nine kilometre long bulk transfer pipeline (Fig. 1) constructed by Southern Water. The pipeline begins at Broughton Reservoir (NGR 429440 132450, 140 m above Ordnance Datum (aOD)) and runs from west to east into and across the Test Valley, approximately following the route of the Roman road between Winchester and Old Sarum. It then passes roughly north to south along the eastern edge of the Test Valley through the shrunken medieval village of Brook before turning eastwards and terminating in Michelmersh village (NGR 434510 126350, 80 m aOD).

Following the production of archaeological proposals (Wessex Archaeology 2000), a written scheme of investigation agreed with Hampshire County Council (Wessex Archaeology 2001), and targeted geophysical survey (GSB Prospection 2001), detailed investigations were conducted at ten sites (Fig. 1, A-J). No features of archaeological interest were found at sites A, B, D, H or I. Evidence was recorded for Iron Age and Romano-British activity (Site C) related to the known Bossington enclosures (Palmer 1984), a Romano-British cemetery (Site E) and structure (Site F), and a medieval building (Site G). These sites will be discussed in the second part of this report.

At Michelmersh (Site J), excavation revealed a late Saxon clamp kiln and related features. This paper considers the kiln in the light of another previously excavated in the village (Addyman *et al.* 1972, *see* Fig. 1) and offers an assessment of the Michelmersh pottery industry.

Location, geology and topography

Michelmersh, a village with late Saxon origins, occupying a promontory overlooking the floodplain of the river Test and the wetlands at the confluence of the Test and Dun, the 'big marsh' from which its name derives (Coates 1989, 116). Site J (NGR 434480 126440) lay towards the edge of this promontory, in the eastern part of a field within the village (Fig. 2), overlying sandy clays of the Reading Beds, which in turn rest on the Upper Chalk. Surface topography was marked by a pronounced slope down to the north and west across the site, with evidence of considerable erosion in the east and consequent accumulation of a thicker topsoil to the

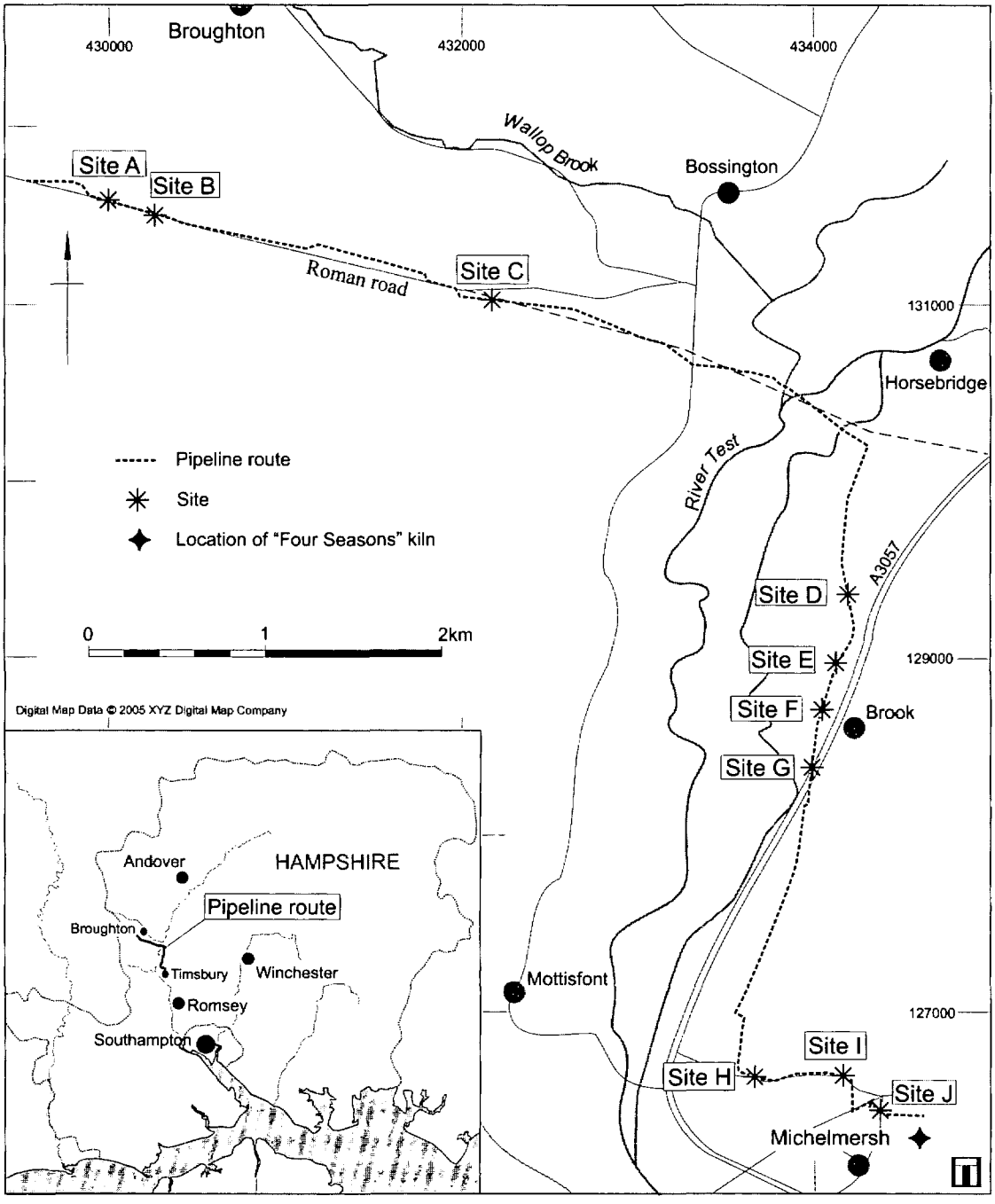

Fig. 1 Location of the Broughton to Timsbury pipeline and sites along its route

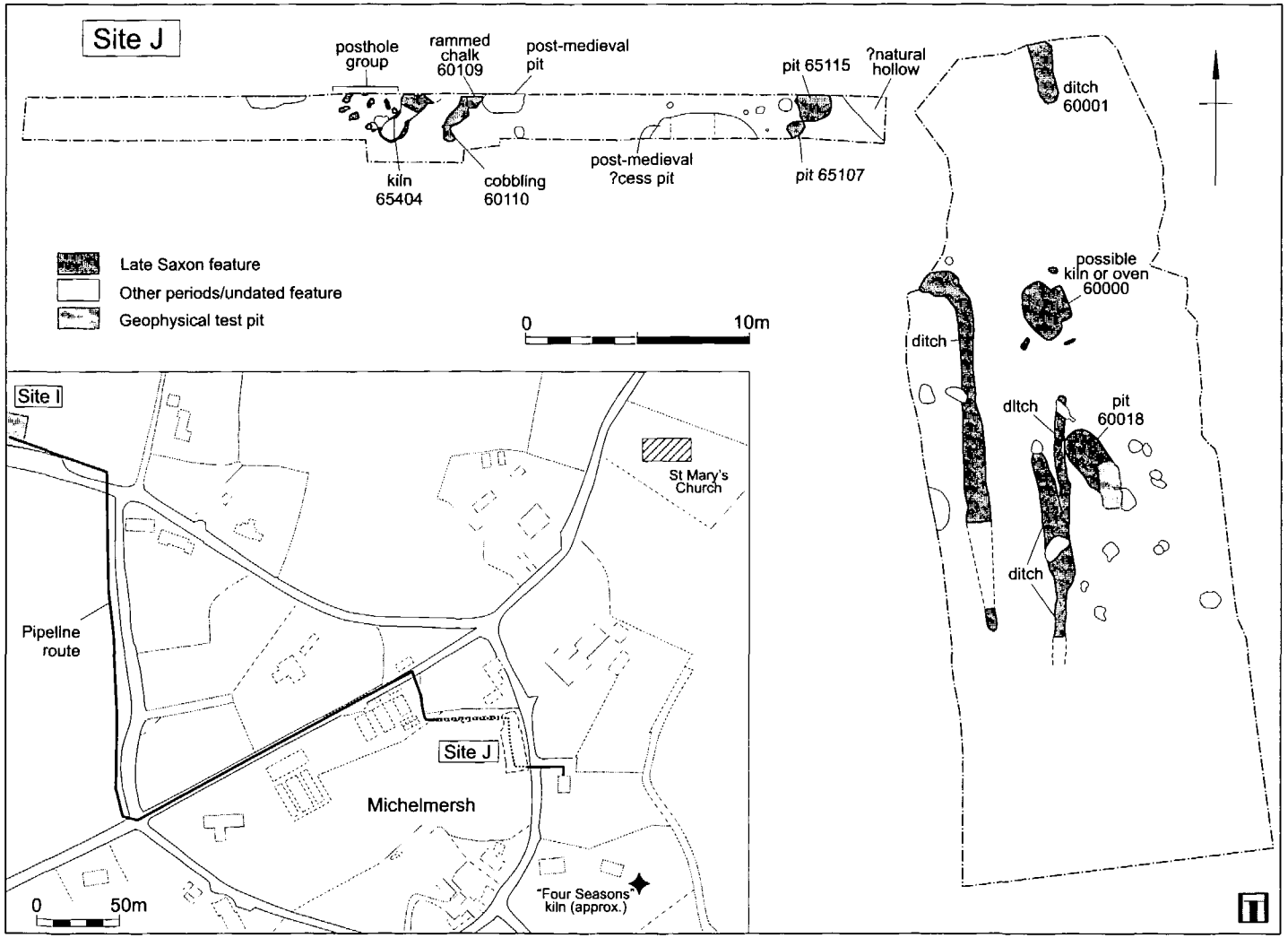

Fig. 2 The Michelmersh site: plan of excavated features with (inset) site location

north-west, which may have helped to protect the excavated kiln.

Methods

Two areas were excavated (Fig. 2), targeted on an increased magnetic response identified by geophysical survey (GSB Prospection 2001, 2). In the eastern part of the site, an area *c.* 13 m × 37 m was stripped of topsoil, exposing archaeological features cut into the natural sandy clay. To the west of this, five 2 m square test pits were hand-excavated along the centre line of the pipeline easement, one of which encountered a kiln structure (below). In order to minimise disturbance to this part of the site, the contractors changed their methodology, avoiding the need to strip a wide easement. The topsoil between the test pits was removed by machine, forming a trench measuring 2 m × 38 m with a small southerly extension. Only features in the centre of the proposed pipeline were excavated, allowing others to be preserved *in situ.*

RESULTS

A total of 35 features was exposed, mostly late Saxon or undated. A few post-medieval features were identified and a small quantity of residual Romano-British material was also recovered. This report focuses on the late Saxon period.

Kiln 65404

Kiln 65404 (Fig. 3) was figure-of-eight shaped, aligned north-east to south west, and cut to a depth of 0.32 m into the natural sandy clay subsoil. It was approximately 1.40 m long and the (excavated) south end was 1.0 m wide, narrowing towards the central flue to 0.60 m. The stokehole at the north end was approximately 0.80 m wide. The base and sides of the firing end and stokehole were lined with a layer of puddled, rammed chalk. Overlying this was a deposit of blackish fine soil mixed with crushed charcoal and charcoal fragments (65402), remnants of the burnt fuel. Five complete fired jars were found *in situ* within the kiln, embedded in the burnt layer (Fig. 4, which shows the kiln as first identified within a test pit). Two of the vessels are illustrated in Figure 5 (nos 1–2). A sixth jar, visible in the section face was probably *in situ,* but was so fragmentary on lifting that it was included with the sherd material. The vessels were covered by a dump of some 50 kg of sherds in an identical fabric. In the absence of any evidence for a superstructure, it is likely that piled turves or the mass of sherds would have served as the clamping material.

Archaeomagnetic dating of 17 samples taken from the burnt natural clay base of the kiln date the last firing to the late 10th or early 11th century AD (Appendix 4). On the basis of well-preserved charcoal samples recovered from layer 65402 (Appendix 3), the kiln had been fired using narrow roundwood hazel (*Corylus avallana*), ash (*Fraxinus excelsior*), hawthorn/*Sorbus* group (Pomoideae), willow (*Salix* sp.) and/or poplar (*Populus* sp.), supplemented with larger billets or logs of more mature oak (*Quercus* sp.). Charred cereal grains and chaff, pulses and, more unusually, stems of reeds and sedges were recovered from the kiln and from within one of the vessels. These had probably been used as kindling and/or as packing material, although the wetland plants may have been selected to achieve particular effects (Appendix 2).

Associated features

Immediately to the west of the kiln a group of postholes seems to have been part of an associated structure. The postholes were very shallow, all less than 0.10 m deep. They were filled with greyish-brown sandy clay with small flint pieces and several contained chalk lumps and charcoal that may have derived from kiln activity. Two produced pottery of the type found in the kiln. This flimsy structure may have combined several functions, as temporary shelter, wood store and/or drying rack.

To the east of the kiln were deposits that may have been directly associated with pottery production and firing, although no dating evidence was recovered. A patch of flint cobbling (60110) may have been part of a con-

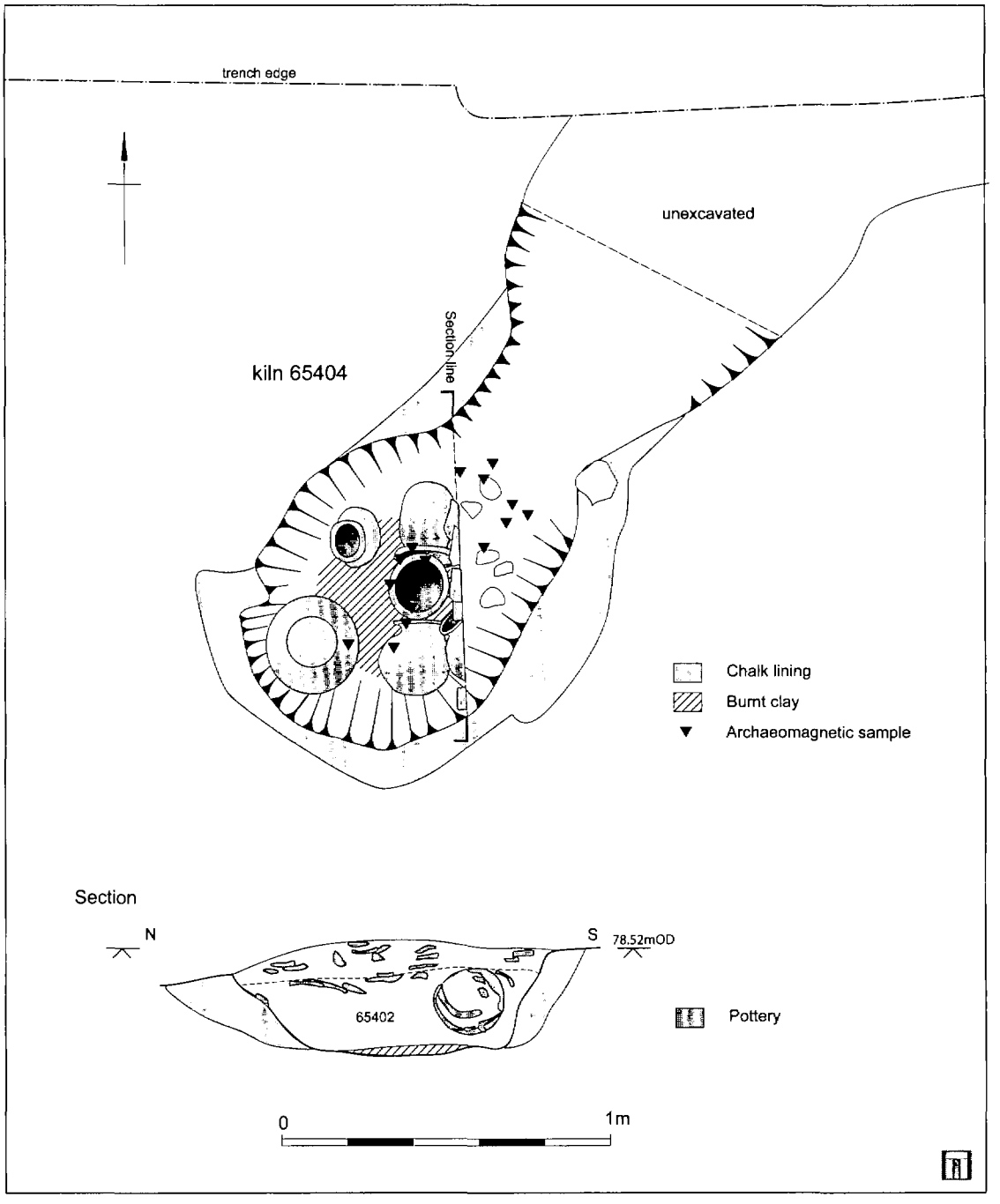

Fig. 3 Plan and section of kiln 65404

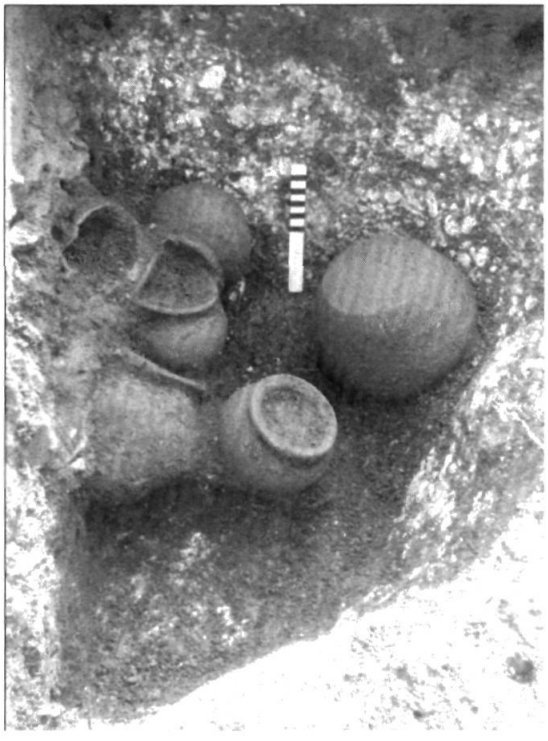

Fig. 4 View of kiln 65404 as first exposed, looking south-west, showing the firing chamber and vessels *in situ*, 0.2 m scale

solidated working surface, while an area of rammed chalk (60109), measuring by 0.55 m by 0.65 m and 0.06 m thick, may have been a base or pad for a related structure.

Other features

Further east lay a vertical-sided pit (65115), approximately 1.5 m in diameter and 0.70 m deep. The single fill produced a small collection of animal bone and late Saxon pottery in the same fabric as the kiln products, but there was little to indicate its original purpose. An adjacent, smaller pit (65107) to the south contained similar material. Nearby features, which included a probable cess pit and several postholes are likely to relate to post-medieval activity.

Several parallel ditches, all relatively shallow (0.30–0.40 m deep) and aligned approximately north-south, crossed the western part of the site. The ditches had filled by a process of natural silting and erosion and produced no datable finds, with the exception of ditch terminal 60001, which contained late Saxon pottery and large quantities of burnt material, possibly derived from nearby kiln firings. It is assumed, but cannot be proven, that the other ditches were contemporary and formed part of an enclosure system broadly contemporaneous with the phase of pottery production.

A keyhole-shaped pit (60000) measuring 2.9 m by 2.06 m and 0.10 m deep, may represent the base of another kiln or oven (Fig. 2), although no evidence of burning was present. A lining of flint pebbles and clay was recorded around its upper edges. Its remaining fills appeared to have resulted from natural erosion: no burnt horizons were recorded. Three shallow postholes or timber slots surrounding the pit may have been associated with it. To the south was a more substantial irregular hollow, or series of intercutting hollows (60018), measuring 4.34 m by 1.64 m with a maximum depth of 0.52 m. Several sherds of late Saxon pottery were recovered from the fill.

The remaining scatter of small pits and postholes in the western part of the site are undated. A few contained quantities of charcoal and burnt flint and might relate to activity contemporary with pottery production, although some clearly post-dated the enclosure ditches. No clear structural arrangements were recognised.

Discussion

The main importance of the site lies in the information it provides on late Saxon pottery production and distribution, discussed in detail below. Relatively little is known about the scale of the Michelmersh industry or the size and nature of the contemporary settlement. The excavation indicates some probable late Saxon activity nearby, including several pits and a system of enclosures, and illustrates the potential of further fieldwork in the area. There are no indications of habitation on the site itself and no

evidence that industrial activity was particularly extensive or intensive, although it is possible that the site lies towards the edge of the area of late Saxon activity. Although the kiln products may indicate the beginnings of craft specialisation (Mepham, below), most other material indicates a largely rural milieu. Fragments of at least two quern stones were recovered from probable Saxon contexts (Knight: archive report), while environmental analyses (Appendices 2 and 3) suggest a community with ready access to managed woodland and primary processing waste from harvesting barley, rye and wheat, as well as the utilisation of resources from the nearby wetlands.

THE LATE SAXON POTTERY FROM MICHELMERSH

Kiln 65404 by Lorraine Mepham

The single definite kiln (65404) excavated produced a total of 2749 sherds (50,721 g) of late Saxon pottery. This included five complete vessels (four unbroken and one fragmentary) apparently still *in situ* on the base of the kiln, and a substantial quantity of sherd material dumped over them. A further 197 sherds (3209 g) of similar material came from other contexts on the site and are also likely to derive largely from pottery production.

This section aims to describe and discuss the pottery recovered from the kiln against the background of what is already known about late Saxon pottery production in Michelmersh, which largely relates to a similar kiln previously excavated in the village, in the garden of the 'Four Seasons'. The results of this earlier excavation have never been fully published although a brief note summarised the range of kiln products (Addyman *et al.* 1972). Accordingly, the pottery associated with kiln 65404 is described and quantified here, while that from the 'Four Seasons' kiln is presented in the following section. This is followed by a discussion section which draws together the evidence from both kilns in order to review our knowledge of late Saxon pottery production in the Michelmersh area and in the wider regional context.

Fabrics

The overwhelming majority of the pottery from the site is in a single fabric type, which can be described as follows (the fabric has been coded within the Wessex Archaeology regional type series: *see* Morris 1994). This fabric type represents the known and presumed products of kiln 65404.

E404 Hard-fired, medium-grained, sandy fabric with a slightly powdery, slightly granular texture. Colour is generally mid grey, although there are darker grey examples, and a proportion of the sherds is partially or completely oxidised.

This fabric type is comparable to products of the 'Four Seasons' kiln (Addyman *et al.* 1972), although the latter have a wider variation in the size of the quartz sand inclusions, and in firing colour (a higher proportion are oxidised, apparently deliberately so). However, E404 is perhaps more closely comparable to Late Saxon Sandy Ware (LSSW), a wheelthrown ware, generally reduced, and identified in Winchester (Biddle and Collis 1978). It had been assumed that LSSW and Michelmersh ware were closely associated, and both occur in Winchester at approximately the same period (mid-9th to 11th century), although LSSW is apparently more common in mid-9th to mid-10th century contexts in Winchester than Michelmersh ware, which becomes more common from the mid-10th century.

Recent characterisation studies by Alan Vince (Appendix 1), however, have indicated that the relationship between Michelmersh kiln products and the visually similar wares seen in Winchester may be more complex. These studies demonstrate that the two ware types were made from different clay sources, although both utilising Tertiary Reading Beds clay. This conclusion has an obvious implication for the marketing of the Michelmersh kiln products, and is discussed further below.

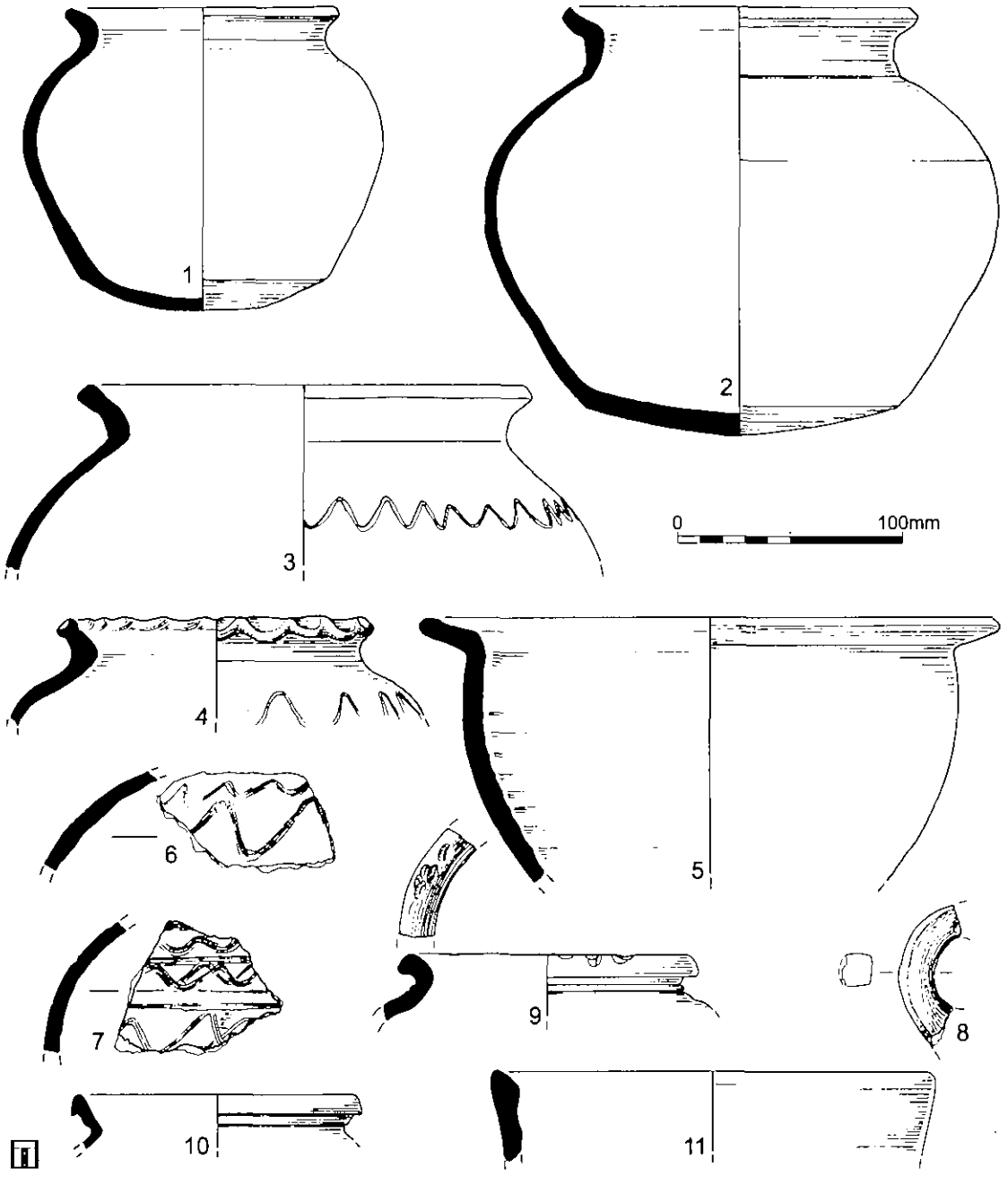

Fig. 5 Kiln 65404: late Saxon Pottery, nos 1–11

Eight other fabric types are represented. Three of these are known regional types (Laverstock-type ware; Kennet Valley wares); the other five are either sandy or flint-tempered. The likelihood of their contemporaneity with the kiln assemblage (i.e. late 10th or early 11th century) is discussed below.

E422 Laverstock-type coarseware: *see* Mepham 2000a for description.
E441 Kennet Valley flint-tempered ware: *see* Mepham 2000b for description.
E442 Kennet Valley chalk-/flint-tempered ware: *see* Mepham 2000b for description.
FL400 Sparse, coarse, patinated flint in slightly sandy matrix.
FL401 Micaceous fabric with sparse patinated flint and quartz.
QU400 Coarse sandy fabric, abundant, well sorted, subangular/subrounded quartz, some iron-stained.
QU401 Coarse sandy fabric, poorly sorted, some patinated flint, irregular.
QU402 Moderately coarse sandy fabric, pale-firing; sparse, fairly well sorted, subangular/subrounded quartz grains, iron-stained.

The flint-tempered fabrics FL400 and FL401, and sandy fabric Q401, could also be accommodated within the regional Kennet Valley ware tradition, in this instance the flint-tempered wares (Vince 1997, fabric group A; Mepham 2000b, fabric E441). The sandy fabric QU400 is broadly comparable to the Laverstock-type coarsewares, and has a probable source area within north-west Hampshire or south-east Wiltshire. Fabric Q402 is of unknown source, although the pale-firing fabric suggests a source within the band of London Clay and Reading Beds which supplied the Laverstock kilns. Apart from the Kennet Valley wares, none of the other fabrics include diagnostic sherds.

Forms

Two vessel forms are represented amongst the products of kiln 65404 and overlying waste. These are defined here using nationally recommended nomenclature (MPRG 1998):

> Rounded jars (MPRG *form* 4.1.7) with everted rims, some with a very slight internal lid seating, and sagging bases (Fig. 5, nos 1–4)
> Rounded bowls (MPRG form 5.1.6) with everted rims and sagging bases (Fig. 5, no. 5)

Out of a total of 272 rims (counting joining rim sherds as one), 180 are measurable and attributable to type – 167 jars and 13 bowls. Using rim percentages to give Estimated Vessel Equivalents (EVEs) gives totals of 25.686 (jars) and 1.40 (bowls).

The five complete vessels recovered from the base of the kiln (and therefore almost certainly representing the remains of the final kiln firing) are all jars, and demonstrate that this basic form was produced in a range of sizes – the capacity of the four unbroken vessels ranges from *c.* 0.8 litre (1.5 pints) (Fig. 5, no. 1) to *c.* 4 litres (7 pints) (Fig. 5, no. 2). The largest is the only one of the four which shows obvious signs of firing faults – it has a crack across the base, which the potter tried to repair (or to hide) by smearing slip along it, both on the inside and the outside. It still would not have been functional, at least to hold liquids. Rim diameters for the jars from the whole kiln assemblage have a maximum range of 110 to 250 mm, although the majority fall within the range of 140 to 190 mm; Fig. 6 shows the range of rim diameters against EVEs.

The complete jars have profiles identical to those in Late Saxon Sandy Ware from Winchester (Biddle and Collis 1978, fig. 4, 3–4). Very similar forms occur within the dumped sherd material, but this group also includes a wider range of rim profiles (although all within the overall form of rounded jar), comparable to examples from the 'Four Seasons' kiln, and from Wilton (Andrews *et al.* 2000, fig. 6, 4–5).

The bowls are far more restricted in size range; rims range from 240 to 280 mm, with ten of the 13 examples at 260 mm. This form is apparently not found within the 'Four Seasons'

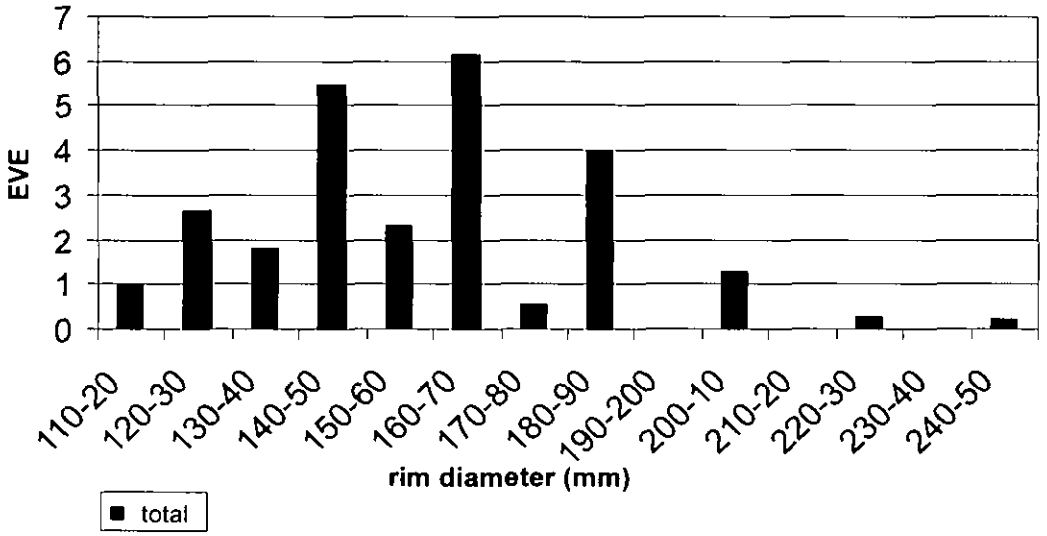

Fig. 6 Kiln: 65404: chart showing rim diameters by EVE

kiln assemblage (open forms there were limited to shallow dishes). Its occurrence in Winchester is uncertain, and it does not, as far as is known, appear in other published Michelmersh-type assemblages elsewhere.

There is little evidence of decoration. A very small number of sherds (36) bear shallow curvilinear incision or combing around the shoulder, sometimes in a single band, sometimes in two (or more) bands (Fig. 5, nos 3, 4, 6, 7); it is assumed that all of these are jar forms (none of the identifiable bowl rims are decorated), although this is not absolutely certain. One body sherd has incised chevrons, and one jar rim is finger impressed (Fig. 5, no. 4). In comparison, jars from the previously excavated kiln do not appear to bear curvilinear decoration on the body, but a few vessels have finger impressed rims. Jars in LSSW recently identified in Wilton carry the same curvilinear decoration around the shoulder (Andrews *et al.* 2000, fig. 6).

The kiln assemblage

The kiln assemblage comprises the five complete vessels found on the base of the kiln, a dumped deposit of 2657 sherds (45,264 g) overlying these and filling the surviving kiln structure, two sherds (50 g) from the chalk lining of the kiln, and a further 51 sherds (375 g) recovered from the surface of the surrounding subsoil (and which may originally have derived from the dumped material). The whole assemblage has the appearance of a homogeneous group, in other words there is no obvious difference in character between the complete vessels and the overlying material, or the sherds from the surrounding subsoil. Both fabric and forms are replicated in each group. The only distinction is that the complete vessels do not include any bowl forms, but this is inconclusive evidence given such a small sample. A single possible handle amongst the dumped material (Fig. 5, no.8) is of similar proportions, although not of similar profile, to the pitcher handles from the 'Four Seasons' kiln (Fig. 10). The complete jars cover much of the size range observed within the dumped sherd material (115–160 mm). The evidence suggests, therefore, that the complete kiln assemblage represents material deposited over a relatively short time-span.

The five sherds in other fabric types (all plain body sherds, fabrics E442, QU400, QU401,

FL400, FL401), most of which came from the dumped sherd material, are presumed to be contemporary with the kiln products. The presence of Kennet Valley chalk-/flint-tempered ware could be considered problematic, since this ware generally has a later currency (late 12th to late 14th century) within the Kennet Valley (Vince 1997, fabric group B). However, variants within this regional ware tradition do occur earlier (from the 10th century) on sites in north Hampshire, such as Faccombe Netherton (Fairbrother 1990, fabrics A6-A18). Kennet Valley flint-tempered wares, which could encompass fabrics FL400, FL401 and QU401, have a start date in the 11th century at Newbury, Berks (Vince 1997, fabric group B). Laverstock-type coarsewares also have a lengthy currency, as is demonstrated by their occurrence together with Late Saxon Sandy Ware in Wilton (Andrews *et al.* 2000), long before their manufacture at the excavated 13th-century kilns.

Pottery from other contexts

Late Saxon pottery was recovered from 16 other contexts on Site H (two unstratified, eight feature fills, and six subsoil contexts). Of this material, 182 sherds (3013 g) are in fabric E404, and are presumed to originate from kiln production in the vicinity. The range of variation within this group is greater than that observed within the kiln assemblage. There are examples of the hard-fired, mid-grey fabric which is predominant within the kiln assemblage, but there are also examples that are less hard fired, and with the whole range of reduced to oxidised firing colours. Rim forms also exhibit more variation. Of the ten rims which could be identified to form, only three (all jars) are of similar profile to the kiln products. Two other profile variants amongst the jar rims were identified (Fig. 5, nos 9–10), and there is a single bowl or dish with internally thickened rim (Fig. 5, no. 11), a form not seen within the kiln assemblage.

A further 15 sherds (196 g) are in other fabrics. Six fabrics are represented: E422 (Laverstock-type coarsewares), E441 and E442 (Kennet Valley wares), QU400, QU402 and FL401. Generally speaking there is no reason why these fabrics should not be contemporary with Late Saxon Sandy Ware. The potential date ranges of the Kennet Valley and Laverstock-type wares (and, by extension, fabrics FL401 and QU400) are discussed above. Two sherds, however, both from feature 65115, appear anomalous. One is a rim sherd in Kennet Valley chalk-/flint-tempered ware, which comes from a dish with inturned rim, a form not known to occur before the 12th century (Mepham 2000b, 62, fig. 15). The second is the single sherd of fabric QU402 which, in appearance, matches the pale-firing Laverstock products of the 13th century.

The non-kiln assemblage supports the identification of five further features on the site as being of probable late Saxon date: ditch 60001, pits 65107 and 60018, and two components of the structure to the west of the kiln, postholes 60104 and 60112 (above, Kiln 65404). The material from pit 65115 is largely late Saxon but the presence of two sherds of probable later (early medieval) date can be noted. Additionally several late Saxon sherds were found in the deposits which had accumulated in a natural hollow east of the kiln.

List of illustrated vessels (Fig. 5)

1. Small rounded jar. PRN (Pottery Record Number) 693, Obj. No. 64004, context 65402, primary deposit in base of kiln.
2. Large rounded jar with 'repaired' firing fault. PRN 696, Obj. No. 64001, context 65402, primary deposit in base of kiln.
3. Rounded jar with curvilinear decoration around shoulder. PRN 556, context 65402, dumped sherd material.
4. Rounded jar with finger impressed rim. PRN 692, context 65402, dumped sherd material.
5. Rounded bowl. PRN 596, context 65402, dumped sherd material.
6. Decorated body sherd; double wavy line. PRN 514, context 65402, dumped sherd material.
7. Decorated body sherd; double wavy lines within bands. PRN 513, context 65402, dumped sherd material.
8. Possible handle. PRN 748, context 65402, dumped sherd material.

9. Jar with everted rim. PRN 700, context 60080, pit 60081.
10. Jar with everted rim. PRN 719, context 65116, feature 65115 (TP 65100).
11. Flared bowl or dish with internally expanded rim. PRN 718, context 65116, feature 65115 (TP 65100).

The 'Four Seasons' kiln by Lorraine Mepham and Andy Russel

The exact circumstances of the discovery and excavation of the 'Four Seasons' kiln are unclear, as no site records have been located. The following details have been gleaned from the short published note on the site (Addyman *et al.* 1972), and from notes prepared by Andy Russel who, for a number of years, co-ordinated the processing of the kiln pottery by the Lower Test Valley Archaeology Study Group.

Sometime in the late 1960s, a very limited excavation took place in the garden of the 'Four Seasons', Michelmersh, near Romsey, where rabbit burrowing had brought pottery sherds to the surface. This small exploration, carried out by the owner, Basil Hopkins, revealed quantities of pottery of late Saxon date, including a complete spouted pitcher. A subsequent magnetometer survey undertaken by Southampton University Department of Archaeology located two major magnetic anomalies, of which one was excavated (again with the help of Southampton University), revealing a small kiln associated with large quantities of pottery. The pottery was identified as Saxo-Norman, and dated on typological grounds to the 11th century.

The kiln was described as a small structure, comprising a circular firing chamber about 1.5 metres in diameter with a single stokehole. The firing chamber was lined with flints set in puddled chalk; there was no indication of any surviving superstructure. The complete pitcher found during initial investigations had probably come from the kiln itself. Even these details, however, were subsequently questioned by Basil Hopkins, who stated some years later that the 'kiln' showed no signs of burning, and that the 'firing chamber' was not at all kiln-like, and offered the alternative interpretation of a clay-processing feature later filled with wasters (Hopkins pers. comm.).

In the light of the magnetometer survey results, however, and the discovery of the second kiln in 2001, the original interpretation as a small pottery kiln seems the most probable.

The structure is an example of Musty's type 1a single-flue kilns with no internal structure, and is comparable to other excavated late Saxon kilns, for example at Ipswich, Suffolk and Torksey, Lincolnshire (Musty 1974, fig. 1). Kiln 65404 was also of this type, and of slightly smaller dimensions (the firing chamber was about one metre in diameter), but lacked the flints set into the chalk lining.

Some 12 years after the original excavation, Basil Hopkins loaned the pottery from the 'Four Seasons' kiln to the then Test Valley Archaeological Trust for examination. By this stage most of the original containers and labels had decayed, and only a small proportion could be assigned to a specific context. Given these circumstances the pottery was treated, and is presented here, as an essentially unstratified assemblage. None of the vessels shows any signs of domestic use such as sooting and all appear to be kiln waste, if not 'wasters' within the strict definition of the term.

The complete assemblage amounts to some 350 kg. After division into vessel types, rim diameters (in 20 mm classes) and rim percentages were calculated. Quantification throughout has been by weight rather than by number of sherds. Cross-fitting was attempted but, despite much labour, produced few joining sherds.

Fabric

The fabric of the pottery is basically sandy, but there is a considerable range in the size and frequency of quartz inclusions. In general it is macroscopically comparable to the fabric range observed in the products of the 2001 kiln, in other words, medium-grained with a slightly granular texture. The range in size of the quartz inclusions, however, does appear to vary more widely (up to 1 mm in size, although the majority are around 0.5 mm). The spouted pitchers tend to be fairly fine, but there are

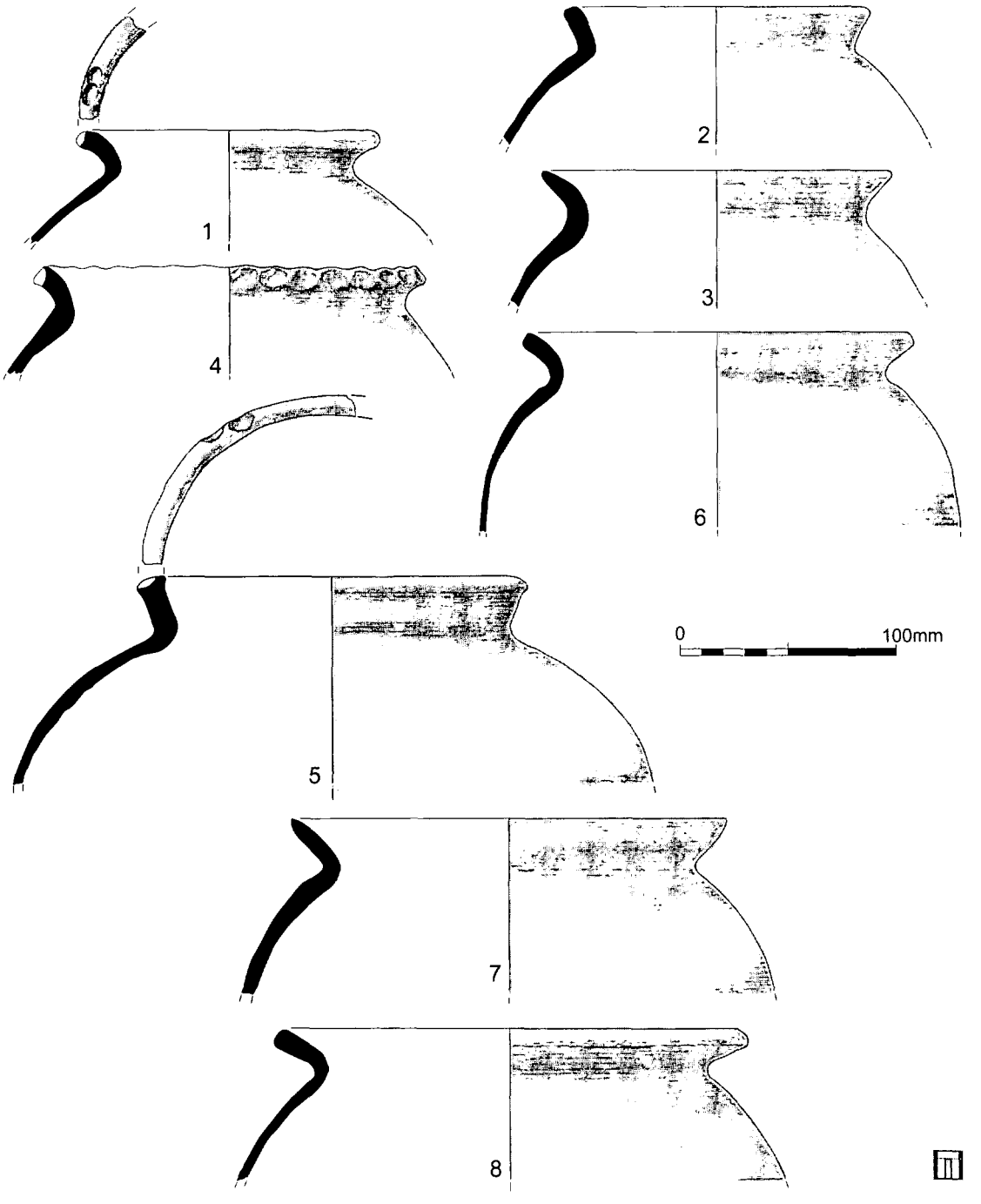

Fig. 7 'Four Seasons' kiln: late Saxon pottery nos 1–8

Table 1 'Four Seasons' kiln: breakdown of pottery assemblage by vessel form and EVE

Form	*EVEs*
Jar	96.32
Spouted pitcher	14.00
Dish/lid	2.71
'Tulip neck' jug	1.04
Plain jug	0.88

also examples in a relatively coarse fabric variant. The pitchers tend towards oxidisation (although this is not consistent), while jars are generally unoxidised (ditto).

Vessel forms

All the vessels appear to be wheelthrown. This assemblage is perhaps best known for the group of elaborately decorated, spouted pitchers (Addyman *et al.* 1972, fig. 37), but jars are actually more common, and there are other forms present in small numbers. Vessel form definitions used here follow nationally recommended nomenclature (MPRG 1998). Table 1 presents a breakdown of the kiln assemblage by vessel form and EVEs.

Jars (Fig. 7–8, nos 1–12; Fig. 12, no. 37)

Jars are by far the most common form – measurable rim percentages give a total of 96.32 EVEs. The wheelthrown jars have hand-finished sagging bases. Profiles are rounded (MPRG 1998, 4.1.7), and rims are everted and either simply rounded or squared. No complete vessels were found, but, on the available evidence, the jars appear comparable in profile to those recovered from kiln 65404 (Mepham, above). Unlike the latter vessels, there is no sign of curvilinear tooling or incision on shoulders, but a small proportion have finger impressed rims, with either continuous impressions or with widely spaced paired or triple impressions (Fig. 7, nos 1, 4 and 5; Fig. 8, no.10). There are also a few jars with broad horizontal rilling, similar to Cunliffe's 'Portchester Ware' jars (Fig. 12, no 37; Cunliffe 1976, 187–9, fig. 122, 376). The form is also comparable to jars in Late Saxon Sandy Ware from Winchester (Biddle and Collis 1978, fig. 4).

Jar rims range in diameter from 140 mm to 280 mm. When plotted, the quantities of measurable rims (by both weight and EVEs) show a marked peak at 160 mm (36.66 EVEs), and a second, less marked, at 240 mm (10.20 EVEs) (Fig. 9). Interestingly, the range differs considerably from that of kiln 65404 (Fig. 6), which although having a similar range of variation (of approximately 140 mm) from smallest to largest, has a greater emphasis on the smaller sizes, although still displaying a peak at 160–70 mm.

In the absence of complete profiles capacities cannot be calculated but, on comparison with vessels from kiln 65404, where capacities could be directly observed from the complete vessels, jars of 160 mm diameter would hold approximately 4 litres (7 pints).

Spouted pitchers (Figs 10–12, nos 13–36)

Spouted pitchers appear to have accounted for only a small proportion of the kiln's output – measurable rim percentages give a total of 14.0 EVEs. The rims are easily distinguished from the jar forms (inturned, externally thickened and flattened), but otherwise the manufacturing techniques and profiles are similar – wheelthrown, rounded bodies, with hand-finished sagging bases. Rim diameter, however, is far more consistent than for the jars – all measurable examples were of 100 mm diameter, with a capacity of *c.* 5.1 litres (9 pints). These vessels appear to have been produced in a single, carefully standardised size.

The basic profile of the pitchers was modified by the addition of a short tubular spout, probably wheelthrown, and a small, vertical loop handle placed opposite the spout. Both components were applied to the body by luting on to the surface rather than by riveting through the vessel wall. This joining technique quite clearly resulted in points of weakness at the joins, and many handles were found detached from pitchers.

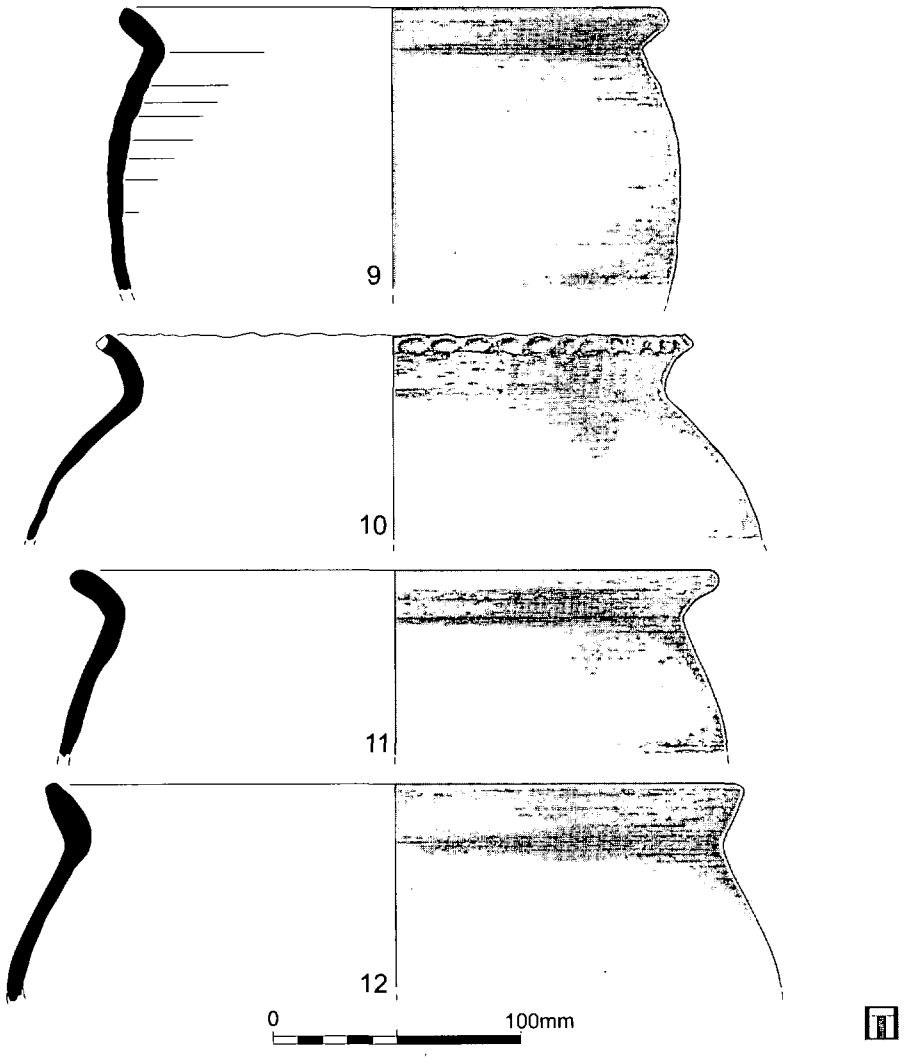

Fig. 8 'Four Seasons' kiln: late Saxon pottery nos 9–12

While vessel size may have been carefully regulated, the individuality of the potter(s) was expressed instead through the decoration, which was perhaps the most distinctive element of the spouted pitchers, and it is likely that no two vessels were exactly alike. All examples have one, sometimes two (Fig. 12, no. 36), and rarely three applied cordons around the neck and above the spout and handle. In some cases the cordon is left plain, but most examples are decorated, either with diagonal incision to produce a 'cabled' effect or by fingertip impression. Rims may also be diagonally cut to similar effect, or finger impressed. Further decoration appears below the cordons, and was executed after the application of the spout and handle. The most common technique involved the repeated

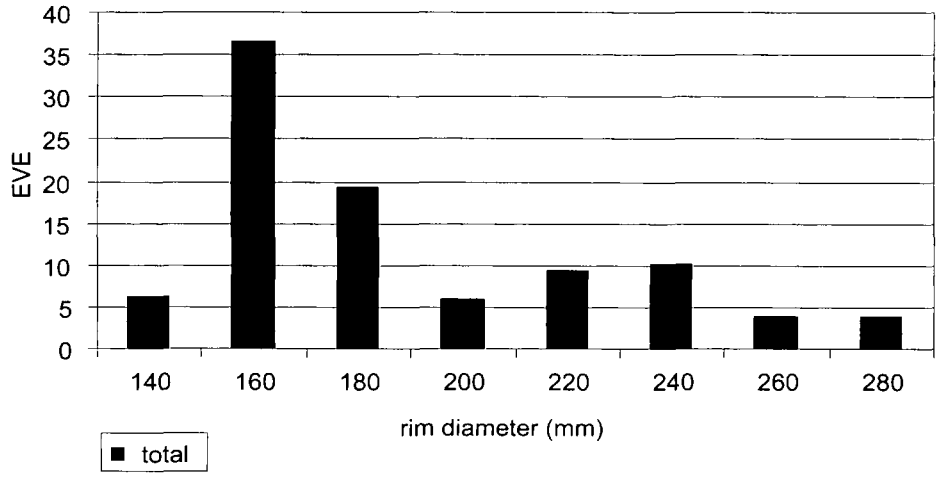

Fig. 9 'Four Seasons' kiln: chart showing rim diameters by EVE

Table 2 'Four Seasons' kiln: breakdown of pitcher assemblage by decorative scheme and EVE

Decorative scheme	*EVEs*	*Decorative scheme*	*EVEs*
Circles	0.2	Single wavy line	0.5
Cartwheel circles	0.9	Double wavy lines	0.2
Cartwheel stamps in rows	0.0	Stamped on applied strips	0.9
Spiral?	0.8	Stamped cordon	0.3
Spirals	2.4	Stamped on rim top	0.4
Cartwheel spiral	0.6	Small stamp	0.3
Interlocked swags	2.8	Three cordons	1.2
Interlocked swags with small stamps	0.4	Spout only	0.3
Stamps in broad arrows	1.0	Undefinable	0.3
Square mesh of stamped lines	0.7	Total EVEs	14.0

application of a small, circular stamp of 'hot cross bun' form. A small proportion of vessels carry the stamps on applied strips (Fig. 11, nos 27–8), but generally stamps were directly applied to the vessel wall. Sometimes the stamps are carefully spaced; sometimes they are overlapping, as if in imitation of a roulette wheel. Occasionally a larger 'cartwheel' stamp was used, nearly always for single central motifs within designs of the smaller stamps (e.g. Fig. 10, no. 16). Stamped designs vary from simple linear bands through a range of curvilinear and circular designs of varying complexity. Stamps are occasionally used on the rim (Fig.

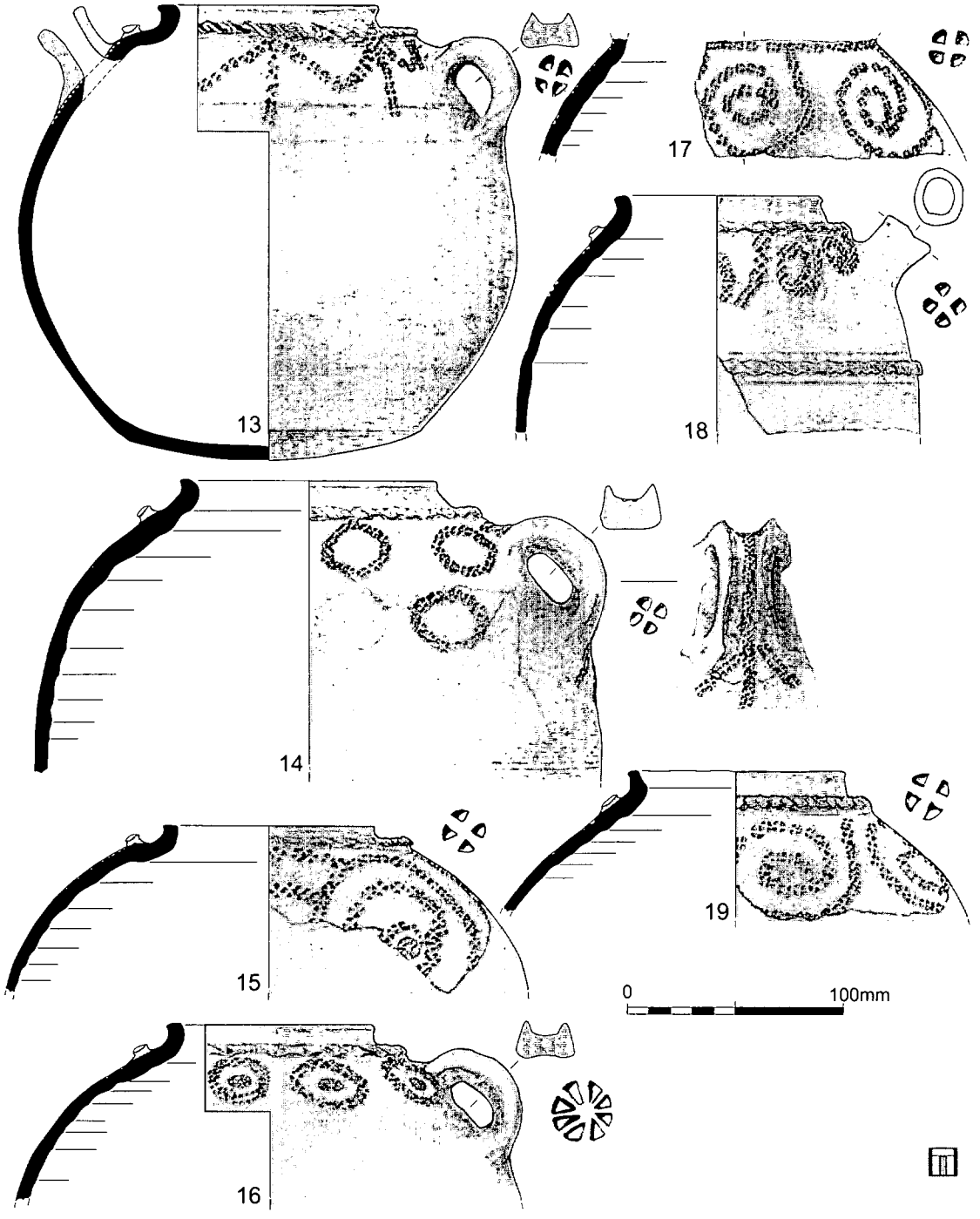

Fig. 10 'Four Seasons' kiln: late Saxon pottery nos 13–19

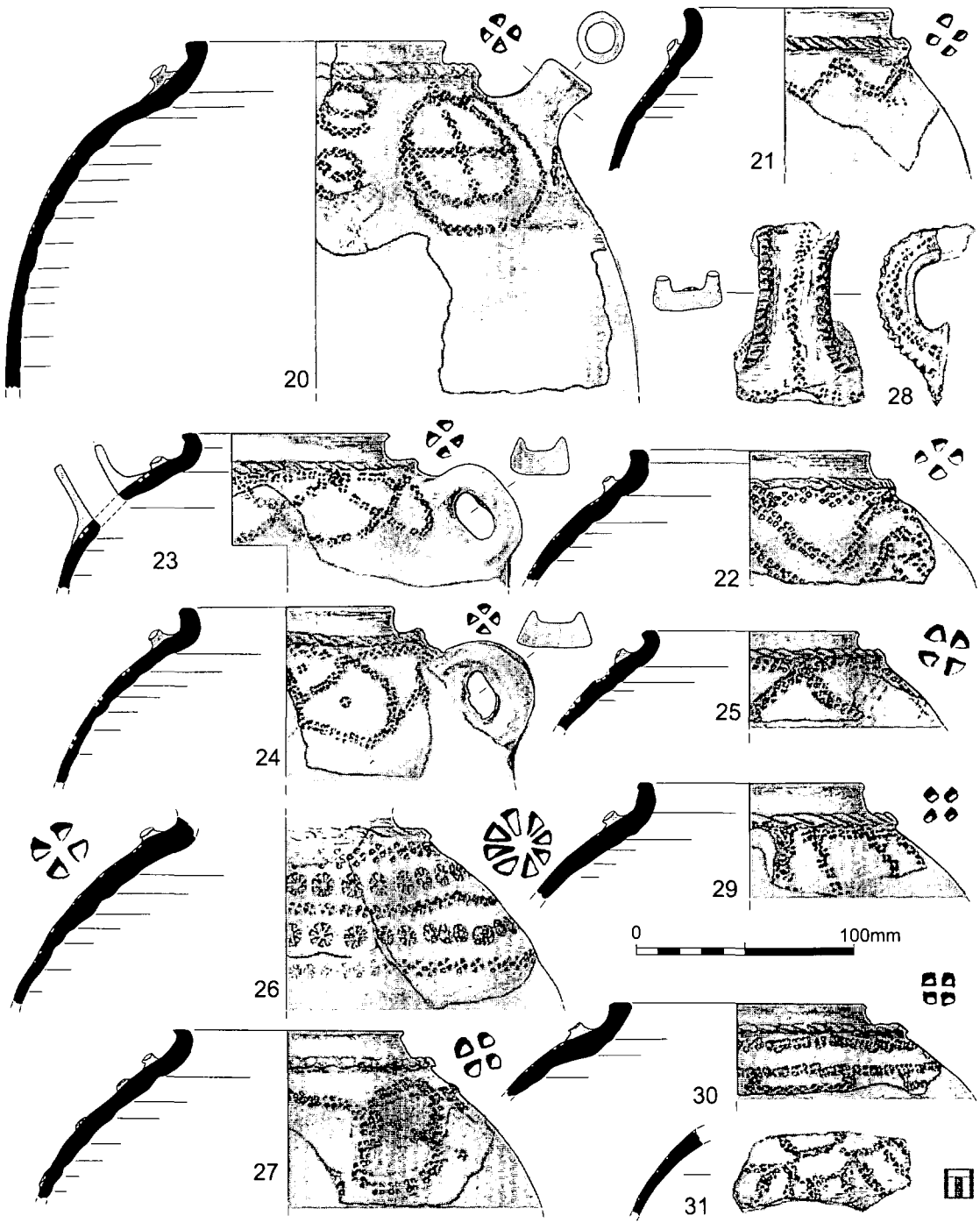

Fig. 11 'Four Seasons' kiln: late Saxon pottery nos 20–31

12, nos 34–5), sometimes on handles (Fig. 10, no.14; Fig. 11, no. 28) and sometimes on the cordon (Fig. 12, no. 33).

These designs have been classified into 18 separate decorative schemes, based on size and type of stamp, and other decorative elements such as applied strips (*see* Table 2).

It may be observed that these spouted pitchers are not particularly practical vessels. Handles are too small to hold comfortably, or to lift the vessel by, and the method of joining, as already mentioned, suggests frequent breakages at this point. When full, the vessel would surely have been too heavy to lift (perhaps it was tilted on the base?), and the small tubular spout seems too narrow for efficient pouring.

Dishes or lids (Fig. 12, nos 38–40)
There is a small group of heavy, shallow vessels, with either gently rounded profiles or with a slight basal angle. Rims are mostly plain and squared off, with at least one internally expanded. These vessels are assumed to be dishes; the possibility that they were used as lids can be noted (e.g. Fig. 12, no. 40), particularly since there is perhaps a slight tendency for these vessels to be better finished on external rather than internal surfaces. However, the rim diameters (ranging from 280–320 mm) would have put them beyond all but the largest of the jars.

Bowls and dishes are known in late Saxon assemblages, although never a particularly common form, but no direct parallels have been found for these distinctive rounded, shallow forms.

'Tulip-necked' jugs or pitchers (Fig. 12, nos 41–2)
These unusual vessels, again very sparsely represented amongst the kiln assemblage, have a 'dished' neck profile, some with an applied, decorated neck cordon. Measurable rim diameters range from 110–120 mm. No parallels have been found for these vessels.

Plain jug (Fig. 12, no. 43)
A single example was identified of a thin-walled, plain-rimmed jug, of uncertain body profile. The rim diameter is 100 mm.

Other forms (Fig. 12, nos 44–5)
Two very unusual forms, a looped handle and a small, applied, tubular spout are in very fine fabrics and may have been trial pieces.

Discussion: the Michelmersh pottery industry
by Lorraine Mepham

The Michelmersh kilns

The significance of these kiln assemblages lies in the identification of the wares produced within the national and regional ceramic sequence for the late Saxon period, and the archaeomagnetic date obtained for the last use of kiln 65404 (late 10th/early 11th century). This is one of only two late Saxon kilns in the south of England (the other being at Chichester) to have produced an archaeomagnetic date. The assemblage from the 'Four Seasons' kiln was dated on typological grounds to the 10th/11th century, based largely on similarities with Portchester ware (Addyman *et al.* 1972, 130).

While the vessels from kiln 65404 are broadly comparable in form and fabric with the products of the 'Four Seasons' kiln, there are some significant differences, most notably in the range of vessel forms. The 'Four Seasons' kiln was producing a range of forms, dominated by jars but also including spouted pitchers, many of them elaborately decorated with stamped motifs. Shallow dishes and jugs of varying forms, present in small quantities, may also be kiln products, or may derive from another kiln(s) nearby. The material from kiln 65404 includes no spouted pitchers (although a single looped handle was present), and vessel forms are more closely comparable to those found in Late Saxon Sandy Ware in Winchester. It had been assumed from the evidence from Winchester that LSSW and Michelmersh wares were closely associated, with LSSW predominant in earlier contexts and Michelmersh-type wares later. There are also slight textural and colouring variations. Evidence from kiln 65404 might suggest that LSSW can be identified as a Michelmersh product that was still being produced in the 10th/11th century, post-dating its apparent *floruit* in Winchester.

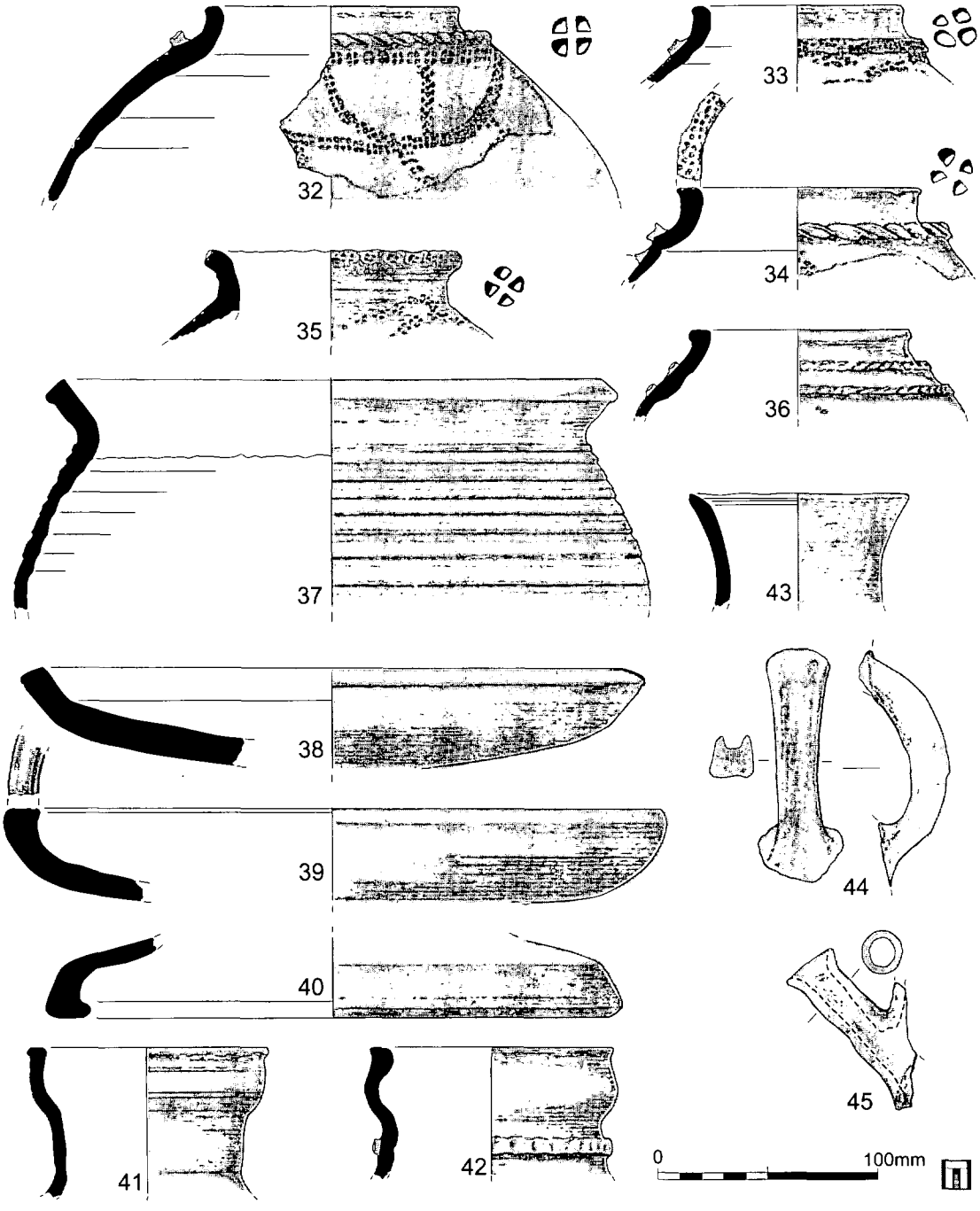

Fig. 12 'Four Seasons' kiln: late Saxon pottery nos 32–45

However, as noted above (*see* also Appendix 1), recent characterisation studies have revealed significant differences between the fabric of the kiln 65404 material and that of samples of LSSW from Winchester, indicating that the Winchester vessels have a different source. This suggests that 'Michelmersh wares' should perhaps be regarded as a 'ceramic tradition' rather than one specific type with a single source, but also raises the question of where Michelmersh products were going if not to Winchester, which would have seemed the obvious local market.

How long would each of the kilns have been in use? At Laverstock, for example, an estimate of five years per kiln has been suggested for the 13th century kilns excavated there (based on one kiln replacing another, and firing once a week during the summer). This may be an underestimate – the lifespan may have been twice that length (McCarthy and Brooks 1988, 46), with less than one firing per week. It is possible that each of the Michelmersh kilns was only in use for a single season. The construction is so simple it may have been easier to construct a new one each year, or for each firing episode. We can assume that potting was a seasonal operation conducted in conjunction with agricultural activities – pots would only be made and fired over the summer months as they would not have dried out properly at colder, wetter times of the year. The winter would have been used as a period for weathering the clay ready for use in the spring or summer.

Distribution of Michelmersh-type wares

The distinctive spouted pitchers represented in the 'Four Seasons' kiln have been found across Hampshire, for example in 11th century contexts in Winchester (Addyman *et al.* 1972, 129; Collis 1978, fig. 81, 23, fig. 97, 53) and at Portchester Castle (Cunliffe 1976, 189–90, fig. 118, no. 335). Another link with Portchester is the presence in the 'Four Seasons' kiln of a few jars with the distinctive horizontal rilling commonly seen at Portchester (Cunliffe 1976, 187–9, fig. 122, 376). The earlier published note mentions two pitcher sherds from Southampton and one from Bishops Waltham (Addyman *et al.* 1972, 129–30; Barton 1985, fig. 16, 11). Another pitcher has been identified from more recent excavations in Southampton (A. Russel pers. comm., SOU 1230). At least one example is known from Romsey (*ibid.*), and other sherds of wheelthrown Michelmersh ware have been identified from the town (Rees 1993). Michelmersh ware is apparently absent, however, from the late Saxon manorial site at Faccombe Netherton, in the north of the county (Fairbrother 1990). It has been noted (above) that the pitchers were rather impractical vessels: perhaps they were of symbolic or decorative significance. That most findspots are limited to no more than one or two examples indicates that the form did not achieve lasting popularity.

Imitiations (or poorer quality products) have also been identified, for example in Southampton, where it is suggested on the basis of clay samples that they do in fact derive from the Michelmersh area (Brown 1994, fig. 3, 23–4); and in Winchester in contexts dating from the mid-9th to late-10th century (McCarthy and Brooks 1988, 189). A few sherds with applied, stamped strips in a similar but not identical fabric type from Amesbury, Wilts, could also be Michelmersh variants (Wessex Archaeology, 2005). At the same period in Winchester, although declining after the mid-10th century, is the reduced Late Saxon Sandy Ware which, on the evidence of the kiln 65404 assemblage, is also a Michelmersh type, although not necessarily made at Michelmersh. This ware has also been identified in Amesbury (Wessex Archaeology, 2005) and Wilton, Wilts (Andrews *et al.* 2000).

However, the relative lack of pre-Conquest sites excavated in Wessex means that we are almost certainly not seeing the full distributional extent of this ware. It does not, apparently, reach as far as Ilchester, Somerset or Trowbridge, Wilts, or Newbury, Berks, although further reassessment of possible pre-Conquest assemblages might reveal a few more occurrences.

Late Saxon pottery production

On current evidence, the Michelmersh 'ceramic tradition' had a lifespan of two or even three

hundred years, and had a distribution area centred around Winchester, extending at least into Wiltshire. The wider distribution appears to have been almost exclusively in the form of decorated pitchers – jars are known only from Winchester, Wilton and Amesbury. In Southampton three Michelmersh-type fabrics have been identified (fabrics 909, 910, 911), of which only one (fabric 911) is a direct petrological match for the 'Four Seasons' kiln products, although the other two are considered also to have originated in the Michelmersh area (Brown 1994, 135).

The two excavated kilns at Michelmersh are likely to have formed part of a village-based industry, producing a range of wheelthrown vessel forms in sandy fabrics; further kilns almost certainly remain to be discovered here. In this respect the Michelmersh industry provides an interesting contrast with the production of other late Saxon types. The broad distribution areas for late Saxon pottery types are relatively wide, with little apparent overlap (*see* Vince 1981, fig. 21.1A). During the late Saxon period pottery production was much more regionally based – a few production sites each supplying a wide area. There are only around 20 late Saxon kilns known from the whole of England, and most of these are concentrated in the Midlands and East Anglia (e.g. Thetford, Ipswich, Stamford, Chester). In the south of England kilns are known only at Michelmersh, Chichester, Sussex and Exeter, Devon. Apart from Michelmersh, all these kilns were located in, or very close to urban centres, although a rural production centre supplying the royal palaces at Cheddar, Somerset has been inferred (Rahtz 1974, 104), and there are presumed to be kilns supplying Portchester (Cunliffe 1976, 188). Many of the known pottery types at this period are wheelthrown, as at Michelmersh (although handmade wares were made alongside these, and often both types in the same centre). Nevertheless, they indicate a certain level of skill, and a concentration of craftsmen in one location, involved in a workshop mode of production.

This can be contrasted with the dispersed, household-based industry which is assumed to have dominated the period between the collapse of the Romano-British pottery industries in the late 4th and early 5th centuries and the reappearance of wheelthrown wares in the 10th century. Imported wheelthrown wares are known at this period, although rarely outside the *wics* (e.g. *Lundenwic, Hamwic*), but do not appear to have influenced the local potters – an innate conservatism which may have been an expression of *habitus* or habitual practice at the expense of functional efficiency (Blinkhorn 1997).

There is some evidence that this ceramic change coincides with growing urbanisation, and the growth of the burgher class – the elitist element of society who both supplied the markets and stimulated demand for more goods. Other factors, however, may have contributed to the breakdown of the prevailing *habitus*, including increased cross-channel links and a growing process of 'Carolingisation' by the Saxon elite. Economic reforms led to changes in Saxon cultural practice, such as the introduction of coinage and stone building, in imitation of Frankish practices. A corresponding change in cooking and/or eating habits could have created a demand for well-made, wheelthrown pots with affinities to the contemporaneous northern French tradition which may, at least at first, have been produced by immigrant potters.

This is the economic and social background against which the Michelmersh industry should be viewed. This is not, of course, to say that the Michelmersh kilns were operated by immigrant potters (although this might indeed have been the case), merely that the prevailing economic and social conditions stimulated the demand for high quality, standardised pots heavily influenced by continental forms, manufacturing techniques and production levels.

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The fieldwork was directed by Bob Davis, and the project was managed for Wessex Archaeology by Mark Roberts, Lisa Brown and Bruno Barber. Environmental analyses were managed by Michael J Allen. The project was monitored on behalf of Hampshire County Council by successive County Archaeologists, Ian Wykes and David Hopkins. The final publication text was compiled and edited by Bruno Barber, guided by comments and advice from Lisa Brown, Bob Davis, Julie Gardiner, Chris Stevens, Nick Stoodley, and Karen Walker. It is anticipated that the archive for the entire pipeline project will be deposited with the Hampshire Museums Service on completion of the second part of this report. A microfilm copy of the archive will be deposited with the National Monuments Record Centre and another retained at Wessex Archaeology under the project code 47527.

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APPENDIX 1: CHARACTERISATION STUDIES OF MICHELMERSH WARE by Alan Vince

Six samples of Michelmersh ware were analysed, by thin section and chemical analysis. Three thin sections were produced at the Department of Earth Sciences, University of Manchester, and were stained using Dickson's method (Dickson 1965).

The following inclusion types were noted:

Rounded and subangular quartz. Abundant grains up to 0.5 mm across. Most are monocrystalline and unstrained but a minority are strained, and some of these are polycrystalline with sutured grain boundaries.
Rounded opaques. Sparse rounded grains up to 0.5 mm across, but mainly up to 0.2 mm across.
Rounded chert. Sparse grains, too coarse-textured for flint and without the chalcedonic texture of lower Cretaceous chert.

All three sections have a groundmass of optically anisotropic baked clay minerals with few visible inclusions but in two cases the clay has a light brown colour whilst in the third it is lighter in colour.

The sand temper seen in these Michelmersh samples is very similar to that found in samples of sand-tempered wares of late Saxon and medieval date from Winchester, but the quantity of iron-rich, opaque and near-opaque inclusions is much lower. These inclusions appear to be naturally present in the clay rather than being detrital grains. The Michelmersh pottery is located on or close to the outcrop of the Reading Beds and this is almost certainly the source of the clay, some of which is light-firing whilst some has a noticeably higher iron content. The Winchester samples include Winchester Late Saxon Sandy Ware (Biddle and Collis 1978). Visual examination shows that the fabric of this ware is very similar to that of the Michelmersh samples but the thin section analysis makes it clear that the Winchester vessels have a different source.

The chemical analysis of the sherds was carried out using Inductively Coupled Plasma Spectroscopy at the Department of Geology, Royal Holloway College, London, under the supervision of J N Walsh. A range of major elements (measured as percent oxides) and minor elements (measured as parts per million) were measured. This data is available in the project archive.

Estimation of the silica content was made by subtracting the total measured major elements from 100% and gives a value of 82.3% ± 1.2%. This value will include silica from the clay mineral groundmass as well as from the added quartzose sand. This is appreciably higher than the 73.7% ± 1.6% silica estimated for the Winchester Late Saxon Sandy Ware samples.

To take account of this difference in silica content, which would 'dilute' the values of all other measured elements, the raw data were normalised to the Aluminium content of the samples. The mean normalised values and their standard deviations for the major elements for both wares are shown in Table 3. They show that despite the evidence from the thin sections there is little chemical differ-

Table 3 Mean normalised values and their standard deviations for the major elements for both wares

	Al_2O_3	Fe_2O_3	MgO	CaO	Na_2O	K_2O	TiO_2	P_2O_5	MnO
Michelmersh Mean	11.21	0.33	0.05	0.08	0.01	0.03	0.04	0.04	0.00
SD	1.41	0.07	0.00	0.04	0.00	0.01	0.00	0.05	0.00
Winchester LSWT Mean	15.46	0.33	0.05	0.08	0.01	0.13	0.04	0.07	0.00
SD	0.53	0.03	0.01	0.04	0.00	0.01	0.01	0.05	0.00

Table 4 Mean normalised values and their standard deviations for the minor elements for both wares

	Ba	*Cr*	*Cu*	*Li*	*Ni*	*Sc*	*Sr*	*V*	*Y*	*Zr**	*La*	*Ce*	*Nd*	*Sm*	*Eu*	*Dy*	*Yb*	*Zn*	*Co*
Michelmersh Mean	13.51	5.75	1.12	2.25	3.39	0.91	5.69	6.88	3.14	5.81	7.25	11.48	6.88	1.25	0.21	0.62	0.24	5.54	1.19
SD	6.88	1.01	0.21	0.64	0.46	0.08	2.95	0.96	1.79	0.75	6.49	10.04	6.22	1.14	0.18	0.43	0.09	2.53	0.26
Winchester LSWT Mean	29.43	6.25	3.04	1.78	2.40	0.93	9.46	7.09	1.19	5.10	2.00	3.89	1.67	0.30	0.06	0.21	0.14	6.16	0.65
SD	8.77	0.09	1.05	0.47	0.49	0.02	2.56	0.27	0.28	0.54	0.29	0.51	0.29	0.06	0.01	0.05	0.02	3.45	0.06
Means more than 1 SD apart?	yes	no	yes	no	yes	no	no	no	yes	no	yes	yes	yes	yes	yes	yes	no	no	yes

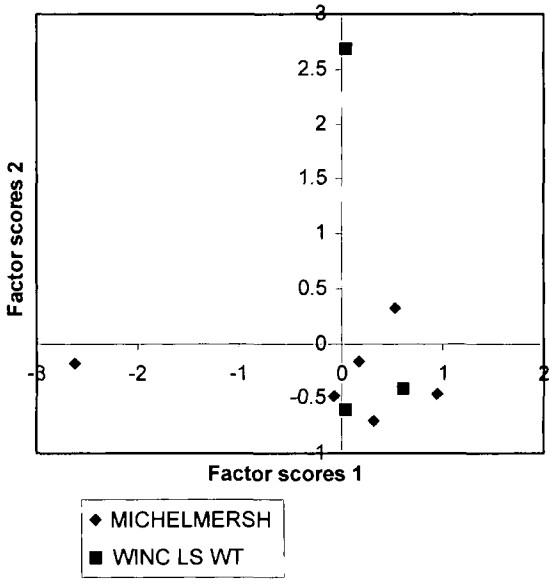

Fig. 13 Factor analysis of chemical data for the two groups of pottery

ence between the two wares. The Winchester samples have a higher Potassium content and a higher Manganese context and these are the only significant differences between the major elements in the two groups.

For the minor elements, there are more differences, with the Barium, Copper, Nickel, Yttrium, Lanthanum, Cerium, Neodymium, Samarium, Europium, Dysprosium, and Cobalt values being clearly distinguished. However, these elements fall into two groups: the first consists of Barium and the rare earth elements and the second consists of three metals: copper, nickel and cobalt. The first group are all attracted to phosphate, both in detrital minerals such as monazite and in post-depositional phosphate concretions. As shown in Table 4, there is no difference in the phosphate contents of the two groups but it could be that the phosphate concretions in the two groups have adsorbed rare earth elements from the surrounding groundwater after burial. In the case of the metals copper is higher in the Winchester samples and Nickel and Cobalt are higher in the Michelmersh samples. The Nickel and Cobalt values are positively correlated with the rare earth elements and probably, therefore, post-depositional but the Copper values are not correlated and possibly, like the Potassium values, reflect an original difference in clay composition. A factor analysis of the chemical data for the two groups excluding the rare earth elements and others potentially affected by deposition and excluding the Potassium and Copper values shows no separation of the two groups of samples (Fig. 13). Instead, it indicates a single cluster, containing seven of the samples with one Winchester outlier distinguished by its Factor 2 score and one Michelmersh outlier distinguished by its Factor 1 score. These are due to a high Manganese value in sample V2313 and a low Vanadium value in sample V2300.

Conclusion

The six samples of Michelmersh ware all have similar petrological and chemical compositions and were clearly made from the same raw materials. Very similar materials were used to make the Late Saxon Wheelthrown ware found at Winchester but with a small number of definite differences which are hard to explain as being due to burial conditions. In particular, the appearance of the clay matrix itself in thin section must reflect an original difference between the clay used for the three thin-sectioned Michelmersh samples and the Winchester Late Saxon Wheelthrown ware.

Despite this, it is likely that both wares were made from Tertiary Reading Beds clay, or, in the case of Winchester, clay-with-flints consisting of reworked Tertiary clay. The fact that pottery made from the same clay outcrop and with a very similar sand temper can be distinguished using a combination of thin section and chemical analysis indicates the potential for the use of these two techniques in combination to characterise the relatively bland, sandy fabrics found in south central England.

APPENDIX 2: PLANT REMAINS by Chris Stevens

Five samples were examined, all from late Saxon contexts, all of which produced charred plant remains (Table 5). Four came from kiln 65404, including one from a complete vessel found within it. The other sample came from pit 65115.

Cereal remains were quite prolific in the kiln samples with barley (*Hordeum* sp.) and free-threshing cereals represented by both rachis fragments and grains. Of particular interest was that the rachis fragments appeared to be from two-row barley (*Hordeum distichon*), which is rarely recorded on Saxon sites, but is associated with brewing. A variety of seeds of wild species were also present. It is probable that many of these species represent weeds growing within the late Saxon fields, although some may have been deliberately selected as fuel or packing for the kiln. This is most likely to be the case with those associated with wetlands, such as sedge (*Carex* sp.).

By contrast, the sample from pit 65115 contained very few remains. Both barley and free-threshing wheat grains were present although no chaff was recorded. Very few seeds of wild species were present, only vetch/wild pea (*Vicia/Lathyrus*) and a single seed of fat-hen (*Chenopodium album*).

The location of the material within the kiln

Some of the rachis fragments from barley, free-threshing wheat and rye were joined, in particular those from the vessel sample. Such delicate material preserves best via charring in conditions where oxygen is limited, and would have been protected by the vessel. Its occurrence may also be related to the crop processing sequence. Rachis fragments of free-threshing cereals frequently remain intact as a whole rachis during threshing, becoming fragmented during charring. The majority are usually hence removed within the earlier stages of processing, by raking and coarse sieving (Hillman 1981). This is also true of straw or grass culms and nodes that are also removed by the same stages. Another component removed by these same stages are those seeds that readily remain intact within the seedhead. This is especially true of stinking mayweed (*Anthemis cotula*), although some seeds will inevitably become dislodged from the seedhead during threshing and be removed rather by fine sieving.

While it is possible that such material was kept or brought to the site deliberately for use within the kiln, it is more probable that it came from processing conducted immediately following harvest. On the evidence of later medieval documentary references and the apparent non-intensive nature of production at Michelmersh, it is likely that rural pottery production in the late Saxon period would have been an activity conducted around harvest (Mepham pers. comm.). As such this processing waste might have been readily available when pottery production was being carried out.

The distribution of this material was notably higher within the stokehole and the vessel than elsewhere. While this may, in part, reflect local preservation conditions, it may also indicate the deliberate use of this finer tinder material in particular parts of the kiln. As the vessels were not placed in the kiln upside down the material within the vessels may not have necessarily been deliberately placed within them before firing.

Material present in all the samples, but particularly prevalent in the stokehole, were remains of reeds and sedges, a possible source of the frequent seeds of sedge, spikerush (*Eleocharis palustris*) and also bur-reed (*Sparganium erectum*), in the samples. This may indicate the deliberate cutting of swathes of reeds from nearby marshland for use in the kilns. Finally, although not abundant, all the samples contained fragments of hazelnuts and two of sloe as well. The source of this material is more probably domestic waste.

As narrow roundwood was in use as a fuel (Appendix 3), the possibility should be considered that other plant material was selected for some other purpose. The choice of fuel for firing can be quite important to both glazing

Table 5 Charred plant remains from Michelmersh

Period			*Late Saxon*		
Feature		*Kiln*		*Vessel*	*Pit*
Feature No.	*65404*	*65404*	*65404*	*65004*	*65115*
Context	*65402*	*65402*	*65402*	*62001*	*65116*
Sample	*63001*	*63007*	*63008*	*63002*	*63006*
Vol	*20*	*10*	*10*	*4.5*	*10*
Flot Vol	*20*	*125*	*150*	*350*	*100*
Roots	*100*	*25*	*22.5*	*35*	*15*
CEREALS			(stokehole)		
Hordeum sp. (grains)	10	21	27	17+2 tail	3
H. cf. *distichon.* (2 row barley rachis frgs)	5	4	24	44	–
Triticum sp. (grains)	–	5	–	–	–
Triticum monococcum (grains)	–	1	–	–	–
Triticum aestivum sl (grains)	16	18	25	22	5
Triticum aestivum sl (rachis frgs)	6	29	23	14	–
Triticum aestivum/durum (rachis frgs)	–	–	–	1/1	–
Triticum aestivum sl (basal rachis frgs)	–	–	2	3 (x 3 joined)	–
Secale cereale (grains)	4	cf.3	5	6+4 tail	–
Secale cereale (rachis frgs)	1	3	4	2 joined	–
Cereal indet. (grain)	8	5	1	2	1
Cereal indet. (grain frgs)	6	39	8	–	5
Cereal indet. (terminal culm/basal rachis)	–	–	–	3	–
Cereal indet. (culm node)	–	2	3	14	–
Cereal indet. (basal culm node)	–	–	1	–	–
OTHER SPECIES					
Ranunculus subg. *Ranunculus* arb	–	–	1	2	–
Crateagus monogyna (stones)	–	–	–	cf.1	–
Prunella spinosa	–	1	1	–	–
Corylus avellana (frgs)	6	8	1	5	2
Caryophyllaceae/Chenopodiaceae	–	1	–	–	–
Chenopodium album	–	–	–	–	1

Table 5 (cont.) Charred plant remains from Michelmersh

Period			*Late Saxon*		
Feature		*Kiln*		*Vessel*	*Pit*
Feature No.	*65404*	*65404*	*65404*	*65004*	*65115*
Context	*65402*	*65402*	*65402*	*62001*	*65116*
Sample	*63001*	*63007*	*63008*	*63002*	*63006*
Vol	*20*	*10*	*10*	*4.5*	*10*
Flot Vol	*20*	*125*	*150*	*350*	*100*
Roots	*100*	*25*	*22.5*	*35*	*15*
Brasica sp.	–	–	–	1	–
Agrostemma githago	–	cf.1	–	–	–
Silene sp.	–	2	–	–	–
Persicaria sp.	1	–	–	–	–
Rumex sp.	4	3	3	–	–
Rumex crispus	13	14	12	13	–
Plantago lanceolata	–	–	–	1	–
Prunella vulgaris	–	–	1	–	–
Trifolium sp.	3	1	1	–	–
Medicago sp.	–	–	1	–	–
Lathyrus/Vicia sp.	8	9	6	10	3
Odonities vernus	1	–	–	–	–
Galium aparine	2	6	1	2	–
Torialis sp.	–	–	3 min	–	–
Asteraceae seed head cf. *Anthemis cotula*	–	–	1	–	–
Anthemis cotula	13	30	41	10	–
Chaerophyllum sp.	–	–	–	1	–
Cirsium/Carduus sp.	–	–	–	1	–
Eleocharis palustris	1	2	4	–	–
Carex sp. (lenticular)	2	3	5	7	–
Carex sp. (trigonous)	1	5	1	9	–
Poaceae indet. (*Avena/Lolium/Elymus*)	–	4	1	–	–
Poaceae (culm nodes)	–	6	7	8	–
Poaceae (culm internodes)	4	7	14	25	–
Poaceae (basal culm nodes)	2	–	3	–	–

Table 5 (cont.) Charred plant remains from Michelmersh

Period	*Late Saxon*				
Feature		*Kiln*		*Vessel*	*Pit*
Feature No.	*65404*	*65404*	*65404*	*65004*	*65115*
Context	*65402*	*65402*	*65402*	*62001*	*65116*
Sample	*63001*	*63007*	*63008*	*63002*	*63006*
Vol	*20*	*10*	*10*	*4.5*	*10*
Flot Vol	*20*	*125*	*150*	*350*	*100*
Roots	*100*	*25*	*22.5*	*35*	*15*
Lolium sp.	–	–	–	4	–
Poa sp.	1	–	6	2	–
Poa/Phleum sp.	5	8	7	–	–
Bromus sp.	–	2	–	–	–
Avena sp. (grain)	10	16	14	16	–
Avena sp. (floret base)	–	1 wild	–	–	–
Sparganium erectum	–	–	1	–	–
Seed indet.	–	–	4 min	–	1 min
Large Seed indet.	–	–	1	–	–
Parenchyma indet.	–	3 frgs.	–	–	–
Reeds, sedges and charred matrix (frgs)	2 frgs	3 frgs.	100+	4	–
Fish bone (eel)	–	–	1	–	–

as well as colour. It may be that sedges were deliberately selected, in combination with the reducing conditions within the kiln (Mepham, above), to create smoke to enhance the dark finish. Although this material may have been used for packing the pottery, its higher occurrence within the stokehole suggests otherwise, and it may be that such easily combustible material was added to keep the fire going as the oxygen to the kiln was cut off. Unless such material is regularly found within other late Saxon kilns, it is possible that they may represent nothing more than material that happened to be locally available during the kilns use, perhaps old thatch, matting or baskets.

The late Saxon agricultural economy

The main crops present upon the site, barley, rye and free-threshing wheat are all recorded from other Saxon sites (Greig 1991). Two-row barley is less commonly recorded from Saxon sites although it has been recorded by Murphy from 11th century Norwich (Murphy 1989).

That earlier processing waste appears to have been used within the kiln itself would seem to imply that the crop was threshed, winnowed and at least coarse sieved before it was put into storage. Unfortunately only one sample was available from the excavations to compare the kiln sample with. This did however produce cereal remains, and a few larger seeds of vetch/

wild pea, what might be regarded as typical waste from processing relatively clean stored grain for daily consumption. The grain would appear to have been ground using simple hand querns, fragments of which were found in a number of contexts across the site.

The high proportion of stinking mayweed in the samples compares well to that seen for the middle Saxon site at Abbots Worthy (Carruthers 1992). This site did produce more seeds of Chenopodiaceae than the site at Michelmersh, as well as a variety of seeds of other species, but relatively few seeds of vetch/wild pea. This may indicate that the crops from the middle Saxon site were grown upon more fertile soils, or rather that they were predominantly sown in spring. The other differences are that Abbots Worthy produced evidence for six-row barley rather than two-row while remains of rye were relative rare.

Like Michelmersh, the assemblage from 11th to 12th century Brighton Hill South (Carruthers 1995) had relatively few weed seeds with approximately equal proportions of large and small. The individual components were less comparable. Stinking mayweed was relatively scarce in these samples, while vetches/wild pea were absent.

That a variety of weed seeds were recovered from the kiln sample does allow us to examine some aspects of crop husbandry. The problem with interpreting the seeds of wetland species has already been alluded to. Spikerush (*Eleocharis palustris*) certainly appears as a regular crop weed of prehistoric crops. Seeds of both sedge and spikerush appear to be common components of the middle Saxon assemblages at Abbots Worthy lying some 10 kilometres to the northeast (Carruthers 1992). That seeds of sedge (*Carex* sp.) were most numerous within a sample with fewer stems might suggest that some at least came from the cultivation of fields lying within or adjacent to seasonally flooded areas.

Unlike the finds of sedges there can be little doubt that the seeds of stinking mayweed arrived with the crop. The species is a common and particularly noxious weed of arable fields located upon very heavy clay soils. Few other species were indicative of particular soil conditions, both campion (*Silene* sp.) and selfheal (*Prunella vulgaris*) are generally found within drier calcareous conditions.

The general pattern for medieval farming was that wheat and rye were sown in autumn, barley in spring (Dyer 1988). Whether this sequence was conducted at Michelmersh is difficult to ascertain. Species commonly associated with spring sowing, such as those of the Chenopodiaceae, were relatively rare in the samples.

Harvesting appears to have been relatively low on the culm from the presence of low growing weeds such as clover (*Trifolium* sp.), although it is possible that a scythe was used. If the material within the kiln was waste from processing conducted after harvesting in bulk perhaps in the field rather than from the processing of cereals taken from storage then we may postulate how crops were stored. This would imply that crops were threshed coarse and possibly fine sieved after harvest and prior to storage. The problem with this interpretation may be that remains from every day domestic waste might also be present, so introducing waste from later processing stages. However, the relative absence of evidence for such stages from pit 65115 might confirm this interpretation.

Although no other crop remains were recovered from the samples, it is probable that both hazelnuts (*Corylus avellana*) and sloe (*Prunus spinosa*) were collected from the wild for food and so represent domestic waste. As sloe (*Prunus spinosa*) is only available from late September to November, it raises the possibility that the kiln was fired within late summer-early autumn.

APPENDIX 3: CHARCOAL by Rowena Gale

Charcoal was extracted for analysis from the same samples examined for charred plant remains. Charcoal was separated from plant macrofossils after standard processing. The charcoal mostly comprised large fragments of material (measuring up to 10 mm or more in cross-section), although entire pieces or radial segments of roundwood were relatively infrequent. The charcoal was mostly well-preserved. Standard methods were used to prepare the samples for microscopic examination (Gale and Cutler 2000). The taxa identified were matched to prepared reference slides of modern wood. When possible, the maturity of the wood was assessed (i.e. heartwood/sapwood) and stem diameters were recorded. It should be noted that charred stems may be reduced in volume by up to 40%.

Classification follows that of *Flora Europaea* (Tutin, Heywood *et al.* 1964–80). Group names are given when anatomical differences between related genera are too slight to allow secure identification to genus level. These include members of the Pomoideae (*Crataegus*, *Malus*, *Pyrus*, and *Sorbus*) and the Salicaceae (*Salix* and *Populus*). The taxa identified are presented in Table 6.

Charcoal from the kiln

The samples from kiln 65404 consisted predominantly of narrow roundwood from ash (*Fraxinus excelsior*), hazel (*Corylus avellana*), willow (*Salix* sp.) and/or poplar (*Populus* sp.), the hawthorn/ *Sorbus* group (Pomoideae) and oak (*Quercus* sp.). A few intact stems provided the following diametric measurements: hazel, 20 mm; ash, 23 mm; and willow/poplar, 25 mm. In addition, oak heartwood from largewood indicated the use of wider roundwood or cordwood. Charred cereal grain and chaff were also abundant (Appendix 2).

Charcoal from the pit

The function of a large, late Saxon pit (65115) was not clear. Charcoal (sample 63006) recovered from this feature included hazel, ash, the hawthorn/*Sorbus* group (Pomoideae), field maple (*Acer campestre*) and oak (*Quercus* sp.) including heartwood from largewood. Charred cereal grain and pulses were also recorded.

Character of the fuel used

The unusual (especially for the late Saxon period) discovery of a kiln with its contents intact provided a rare opportunity to assess the character of the fuel used. The kiln appears to have been fired largely with fairly narrow roundwood. Examples of stems which still retained intact cross-sections indicated the use of stems in the region of 20 – 30 mm in diameter. The use of narrow roundwood may reflect the source or provision of fuel, e.g., from managed woodland, but could also relate to the exploitation of the burning properties of narrow stems, since the high ratio of wood surface available to atmospheric oxygen would have had the potential to produce an intense, although short-lived, heat source. To have maintained a consistently high temperature in the kiln during the firing process would have required a large amount of roundwood, although, in this instance, it is clear that larger oak logs were also used, which would have extended the life of the heat-source. A traditional method of kiln-firing tiles, employing narrow roundwood to give a quick boost to the temperature, was observed recently in Italy (Ian Freestone, pers. comm.).

The roundwood used at the Michelmersh kiln was gathered from a range of species, which most probably grew in the close vicinity. The low-lying ground of the river valley would have provided ideal growing conditions for willow and/ or poplar, and the extensive use of salicaceous wood was evident from the fuel deposits. Ash and oak both frequent river banks or slightly damp (although not waterlogged) ground; and hazel also tolerates dampish soils, although fuel from a wide range of sources may be indicated. Use of material to hand is one interpretation of the large volume of charred cereal grain and chaff recovered (Appendix 2),

Table 6 The charcoal from Michelmersh

Feature	*Context*	*Sample*	*Acer*	*Corylus*	*Fraxinus*	*Pomoideae*	*Quercus*	*Salicaceae*
Kiln								
65404	65402	63001	–	8	–	1	8h, 3s	12r
		63007	–	8	–	1	12h, 3s	8
		63008	–	25r	3r	1	2h	2
Vessel								
65004	62001	63002	–	10	1r	3	13h	42r
Pit								
65115	65116	63006	2	10	3	13	12h	–

Key. h = heartwood; r = roundwood (diameter up to 30mm); s = sapwood (diameter unknown)

The number of fragments identified is indicated

which may have been used for kindling, additional fuel and/or as packing.

The volume of wood required to fire this kiln would have been considerable. Repeated firings and the presence of other kilns in the vicinity are indicated by the pottery assemblage and the 'Four Seasons' kiln evidence. Although it was not possible to assess use of coppiced rods or stems from the fuel remains, it seems likely that fuel would have been obtained from locally managed woodland, particularly if production was on a commercial scale. The use of a clamp kiln would have provided a quick and effective method of firing. Evidence of pit-firing in the Saxon period, an alternative method of pottery production, may be confirmed at a large-scale pottery complex currently under excavation at Bestwall Quarry, Dorset (L. Ladle, pers. com.).

Charcoal was also examined from a nearby pit (65115). Although the origin of the charcoal is unknown, the range of species identified was basically similar to that from kiln (with the addition of field maple and the absence of willow/poplar.

APPENDIX 4: ARCHAEOMAGNETIC DATING by Paul Linford

This section is extracted from the full archaeomagnetic dating report (Linford 2002).

Archaeomagnetic ID: MM, Feature: Michelmersh kiln 65404

After the exclusion of three samples as unstable or anomalous, the mean magnetic direction from the remaining samples was:

Dec (at Meriden) = 23.5° (24.2°); Inc (at Meriden) = 67.5° (68.4°); Alpha–95 = 1.8° (14 samples). This result gives a date span of 985 AD to 1015 AD at the 63% confidence level, or 965 AD to 1030 AD at the 95% confidence level.