ISBN: 978-0-907764-50-2

FULFORD

THE EMPEROR NERO'S POTTERY AND TILERY AT LITTLE LONDON

36

# THE EMPEROR NERO'S POTTERY AND TILERY AT LITTLE LONDON, PAMBER, BY SILCHESTER, HAMPSHIRE

## THE EXCAVATIONS OF 2017

MICHAEL FULFORD

BRITANNIA MONOGRAPH SERIES
No. 36

Published by the Society for the Promotion of Roman Studies
2022

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## THE EXCAVATIONS OF 2017

By Michael Fulford

*With contributions by*

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**Britannia Monograph Series**
**No. 36**

Published by the Society for the Promotion of Roman Studies
Senate House Malet Street London WC1E 7HU
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Published by the Society for the Promotion of Roman Studies
Senate House, Malet Street, London WC1E 7HU

Britannia Monograph Series Editor: Paul T. Bidwell, OBE, FSA

This monograph was published with the aid of a grant from Paul Chadwick and the University of Reading



British Library Catalogue in Publication Data
A catalogue record of this book is available from the British Library

ISBN 978 0 907764 50 2

*Cover illustrations*:

*Front*: Kiln 4 looking south (painting © by Jenny Halstead)

*Back*: Trench 1 with Tile Kilns 1 and 2, view looking east

Produced by Short Run Press Ltd, Exeter

Printed in Great Britain

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# KEY

(1040) context number
[1181] cut feature, e.g. ditch, pit, post-hole, etc.
**1155** structure, e.g. kiln

CBM ceramic building material

# PREFACE

The excavations at Little London were carried out in 2017 as part of a wider project to understand better the nature of the developments which took place at Silchester (*Calleva Atrebatum*) in the first three to four decades of the Roman occupation of Britain, particularly during the reign of Nero (A.D. 54–68). Prior to modern excavations, the Roman town had produced only one example of a 'Nero tile', one stamped with the emperor's name and titles. Excavations of the forum-basilica (1980–86), Insula IX (1997–2014) and Insula III (2013–16) had produced a further eleven stamped tiles. House 1 which dominated the area under excavation in Insula IX had revealed that column fragments and blocks of Bath stone had been recycled from an earlier, demolished building into its first, otherwise timber phase, which was dated to the late first/early second century. What monumental building might have been the source of this stone? The accounts of the antiquarian excavations at Silchester gave no obvious clue to the location of the building but one possibility was a poorly understood structure in the south-east corner of Insula III which became the focus of excavation in 2013–14. Neither this, nor subsequent excavation in Insula III resolved the question of the whereabouts of the monumental building, but the finds provided further stimulus to take the enquiry in two new directions: to Little London, Pamber to explore the site of a possible tilery, where a second Nero-stamped tile was found in 1926, and the public baths of Silchester in Insula XXXIII, close to which the first Nero tile had been found found in 1903–4. The orientation of the bath-house suggested it was earlier than the late first-century date of the street grid, but fresh excavation could confirm the date and, potentially, enlarge our knowledge of the building, the materials used in its construction, how it was used and its impact on its local environment. The investigation at Little London could confirm whether or not it was the location of a tilery and, if that was the case, give insight into the scope and scale of production. Also, Little London appeared to be linked to the production of a distinctive, relief-patterned type of flue-tile — the tile used to convey the hot air from hypocausts up the walls of the room being heated and out and into the atmosphere. Confirmation of this combined with the study of examples of Little London products found beyond the kiln site also had the potential to enlarge our understanding of the reach of production.

# ACKNOWLEDGEMENTS

A happy combination of circumstances led to the excavation at Little London taking place. I am extremely grateful to Stephen and Caroline Butt and the Calleva Foundation, Sir Timothy Sainsbury and the Headley Trust and to Dr Peter Warry for their financial support which made the excavation and its publication possible. I thank most warmly the Englefield Estate, its Director of Estates, Edward Crookes, and its tenant, Ben Kolosowski, for permission to carry out the excavation. I particularly thank Ben for all his help in facilitating the excavation.

The project required the particular expertise of someone experienced in the processing and classification of Roman ceramic building material. Thanks to an earlier generous grant from Peter Warry, Sara Machin had begun her PhD on the ceramic building material from Silchester in 2014 and the excavation not only provided her with invaluable source material for her research, but it benefited from her expertise in the on-site processing and classification of the excavated brick and tile, some 17,000 fragments weighing 4.5 tonnes, which reduced the assemblage to a manageable archive for permanent retention. Her contribution, with its contextualisation of the Little London industry, has been crucial to this publication. The discovery of pottery kilns was completely unexpected and I warmly thank Dr Jane Timby for taking on the publication of the resulting large and important pottery assemblage. She, in her turn, wishes to acknowledge the help of Dr Paul Tyers for his invaluable comments and discussions of her chapter.

The excavation was supervised by Nick Pankhurst and Dan Wheeler assisted by Josh Hargreaves and Bunny Waring. Dr Emma Durham, Jenni Eaton and Rory Williams Burrell managed the finds and environmental processing and archiving. Little London has also contributed to the larger Silchester Environs Project, which is co-directed by Dr Cathie Barnett and I am grateful to her for all her help in delivering the project. I particularly wish to thank Dan Wheeler for his assistance with the post-excavation and production of this publication, especially its illustration.

I warmly thank Paul Chadwick and the Society for the Promotion of Roman Studies for their generous contributions towards the cost of publication. Finally, I thank Dr Lynn Pitts for copy editing this monograph and for guiding it into print.

The archive is currently held at the University of Reading but it is intended to deposit it with the Hampshire Cultural Trust, Chilcomb House, Winchester.

Michael Fulford
Department of Archaeology
University of Reading
September 2021

# CHAPTER 1

# INTRODUCTION

*By Michael Fulford*

Silchester is unique among the towns of Roman Britain and of the western provinces more widely in having testimony of a building project or projects in the name of the emperor Nero (A.D. 54–68). The evidence for this is in the form of ceramic roofing tile stamped with his name and titles, the first example of which was found in a pit next to the public baths of the town when they were first excavated by the Society of Antiquaries of London (Hope and Fox 1905). A subsequent find from a suspected tilery at Little London, some 3 km south-south-west of the Roman town suggested local manufacture (Karslake 1926). Several more finds from excavations since 1980 in a number of locations within the town (Insulae III, IV, IX, XXX) hint that the Nero project was of some scale. The survey and excavation reported here to explore the presumed tilery paralleled further investigations within the town, particularly on the site of the public baths, to gain a better understanding of the scope and scale of the Nero project at Silchester. At the same time this research also addresses a major gap in our knowledge of an industry which produced some of the most distinctive and abundant materials associated with the Roman occupation of Britain. As Peter Warry pointed out 'Ceramic building material (CBM) frequently represents the largest proportion of the finds in Romano-British excavations, yet the relationship with the industry that supplied this material is poorly understood, particularly by comparison with our understanding of the pottery industry' (2012, 48).

While excavations, for example, in Colchester, London and Verulamium as well as at Fishbourne (W Sussex) have given valuable insights into the nature of early Roman building in the province, Little London is the earliest tilery to have been operating in the pre-Flavian period to be investigated in Britain. Besides the kiln structure itself, the excavation produced a sample of just over 17,000 pieces (4.5 tonnes) of ceramic building material of which over 10,500 pieces could be identified to form (Ch. 5). As well as revealing information about the range of products, further analysis indicates the relative amounts of each type produced, and thus the degree of specialisation. This, in turn, gives insight into the aspirations of the architects of the day and the requirements of their builders.

Tileries are difficult to date because they seldom produce independently datable material other than the brick and tile and, in the recent past, reliance has been placed on archaeomagnetic dating of the last firing of the kiln, though the results can offer a wide range of possible dates. In the case of Little London we have complemented the dating evidence that the associated pottery provides (Ch. 4) with a series of both radiocarbon and archaeomagnetic dates (Chs 8–9). If the connection with Nero were to be confirmed, it would be important to determine whether production was confined to the short duration of Nero's reign, or whether the latter was but one brief episode in a much longer period of manufacture. The duration of production could give insight into the scale of supply to the town and to other settlements in southern England. If production proved to be short-lived and associated with Nero, the character of the assemblage could potentially inform us of the nature of the project or projects established in the emperor's name. That Little London supplied consumers other than those in Silchester itself is indicated by finds of relief-patterned flue-tiles identical to one found in the ploughsoil at Little London at locations as far afield as Cirencester (Glos.) to the north and Rockbourne (Hants.) to the south-west (Betts *et al.* 1997, die 39). The distribution of Little London products is pursued in

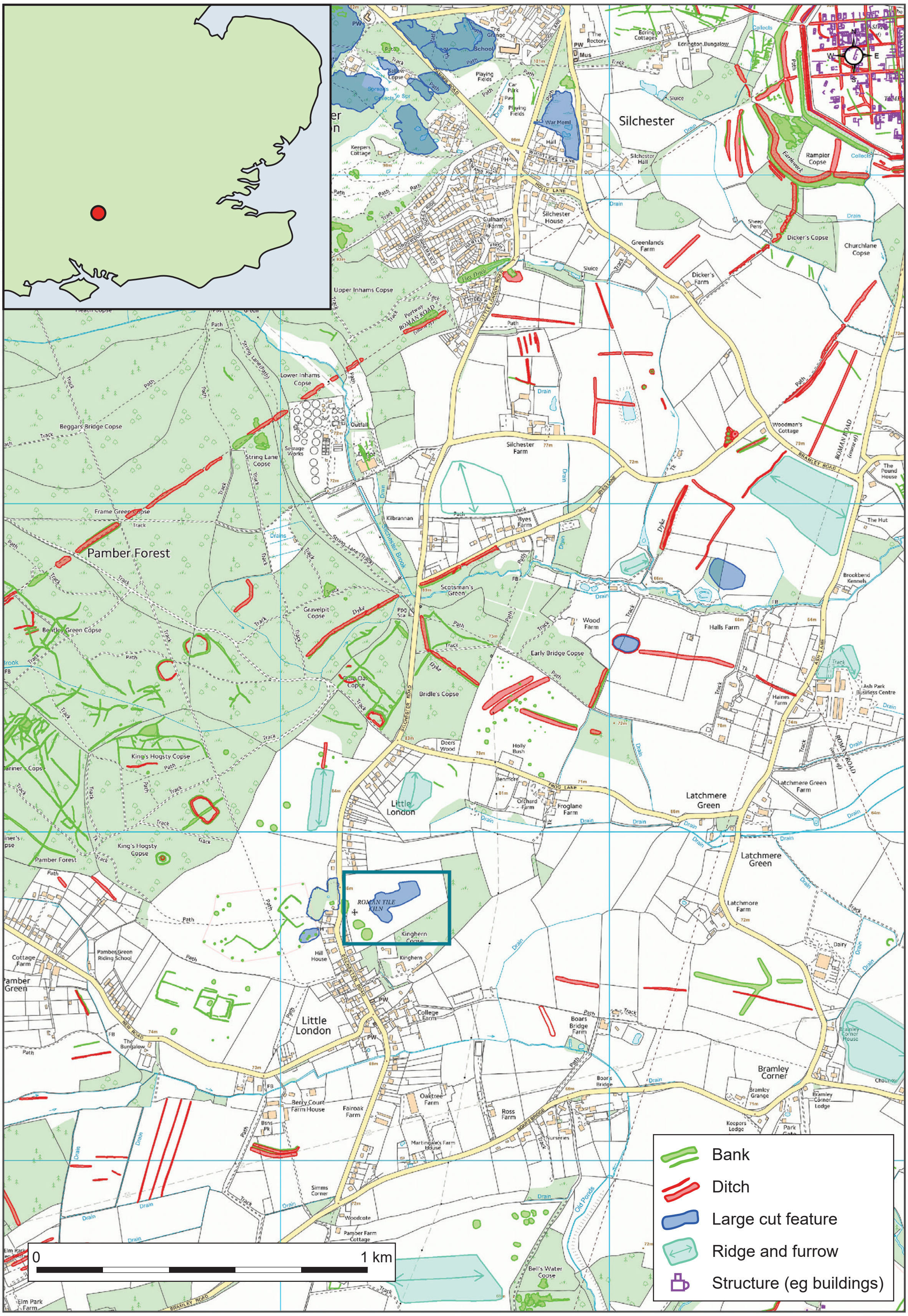


FIG. 1. Little London, Pamber, Hampshire. Location of the excavation in 2017 (*Crown Copyright and Database Right* (*2017*) *OS* (*Digimap Licence*))

Chapter 5. Nero-stamped tile, however, has, to date, only been found at Silchester and Little London.

The background to the project takes us to 1925 when deep ploughing of the field to the east of the road running through the village of Little London (Pamber, Hants.) and opposite The Plough Inn revealed a spread of Roman brick and tile including highly fired pieces (FIG. 1). This prompted an excavation to explore the possibility that this was the site of a Roman brickworks (Karslake 1926). Although the precise location and extent of the excavation was not reported, it was claimed that Roman brick and tile were found to a depth of 8 ft 10 in (2.7 m). As no kiln structure was found, only large quantities of ceramic building material, it is possible that Karslake's trenches lay within a backfilled clay pit. Among the finds was a single tile, now in the British Museum, and the only surviving piece from the excavation, which was stamped with the abbreviated name and titles of the emperor Nero: NER[O] CL[AUDIUS] CAE[SAR] AUG[USTUS] GER[MANICUS] (Greenaway 1981). Its discovery followed the earlier find in 1903–4 by the Society of Antiquaries of London of a similar stamped tile in a cesspit adjacent to the latrines of the public baths of the Roman town at Silchester (Hope and Fox 1905, 366, fig. 13). Further finds of fragments of Nero-stamped tile were made during the excavations of the forum-basilica at Silchester (1980–6) and at Insula IX (1997–2014) (Fulford and Timby 2000, 118–19; Machin 2020, 423–5) (Warry, Appendix 1, pp. 176–8). All of these pieces are in a similar pale brown or yellowish-brown to pink fabric which Kevin Hayward found to be identical to that of tile collected from the surface of the field at Little London in 1957 and 1993 and retained in the Hampshire Cultural Trust's store at Chilcomb House, Winchester (Warry 2012, 50–1). No Nero-stamped tile has yet been found incorporated into a built structure.

As well as the finds of pieces of Nero-stamped tiles, the excavation at Insula IX also produced evidence of the re-use of monumental masonry in Bath stone in the foundations of an otherwise timber-framed town-house constructed towards the end of the first century A.D. (Fulford *et al.* forthcoming (a)). This pointed to the existence of an already demolished but earlier first-century monumental building or buildings at Silchester and raised the question whether the building project implied by the Nero tiles and the monumental masonry were connected (Fulford 2008). To pursue the question of the nature and extent of the Nero project at Silchester excavations were undertaken of a possible early building in Insula III (2013–16) (Fulford *et al.* 2013; 2014; 2015; 2016; forthcoming (b)), while re-examination of the public baths in Insula XXXIIIA to confirm whether or not the long-held belief that they were of Neronian date began in 2018 (Boon 1974, 121–37; Fulford *et al.* 2018b; 2019; forthcoming (b)). Further pieces of Nero-stamped tile were recovered from Insula III and also from the excavation of a newly discovered temple in the east of the town in Insula XXX (Fulford *et al.* 2017b; forthcoming (b)). Thus, every substantial modern excavation within the town, from Insula IX in the north-west to Insula XXX in the east, has produced examples of Nero tiles.

In contrast to the projects undertaken within the town walls to understand better the nature of the built Nero project at Silchester, the survey and excavation at Little London were designed, as we have seen, to confirm the existence or not of a Roman brick kiln or kilns and to undertake a systematic study of the recovered ceramic building materials, as well as of other finds, including associated environmental evidence, particularly the charcoal associated with the firing of the kiln (Ch. 6). Since there has been no other modern investigation of a Roman tilery in close proximity to, and demonstrably a supplier of, one of the major towns of Roman Britain, excavation at Little London has the potential to reveal some of its workings and working environment, as well as its full range of products.

Following geophysical survey by Historic England in 2015 (Ch. 2), which revealed indications of eight kiln-type structures as well as an extensive modern disturbance in the middle of the field, two areas (Trenches 1 and 2) with magnetic anomalies suggestive of at least three kiln structures were selected for open area excavation centred on SU 622 597 (FIG. 1). This took place over a period of four weeks in the summer of 2017. Following a summary of the results of the geophysical survey (Ch. 2), the excavations are described in Chapter 3. An unexpected discovery was that the kilns discovered in Trench 2 were, primarily at least, for the production of pottery. The large pottery assemblage is reported and its wider associations discussed in

Chapter 4, while the ceramic building material, mostly associated with the tile kiln found in Trench 1, is the subject of Chapter 5. Charcoal, evidence of the fuel used in the firing of the kilns, is reported and discussed in Chapter 6 and the radiocarbon dates analysed in Chapter 8. The enigmatic archaeomagnetic dating suggesting a medieval firing of the tile kiln is presented in Chapter 9. The results of the excavation are brought together and their wider significance discussed in the concluding Chapter 10.

CHAPTER 2

# THE GEOPHYSICAL SURVEY

*By Neil Linford, Paul Linford and Andrew Payne*

Vehicle-towed caesium magnetometer and Ground Penetrating Radar (GPR) surveys were conducted over the suspected Roman tile production site prior to the excavation, with full details of the methodology and results provided in Linford *et al.* 2016. Results from both techniques

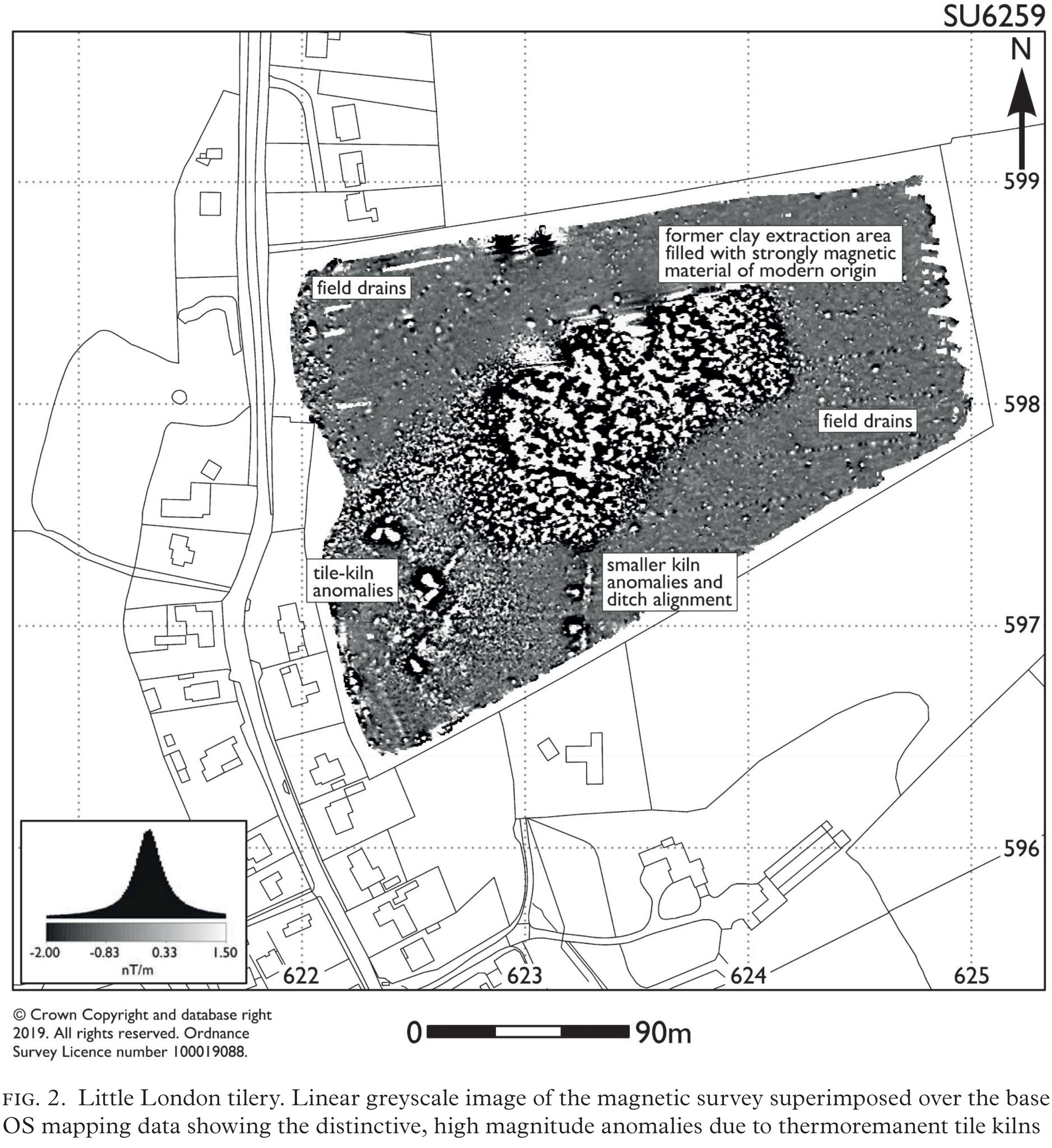




FIG. 2. Little London tilery. Linear greyscale image of the magnetic survey superimposed over the base OS mapping data showing the distinctive, high magnitude anomalies due to thermoremanent tile kilns

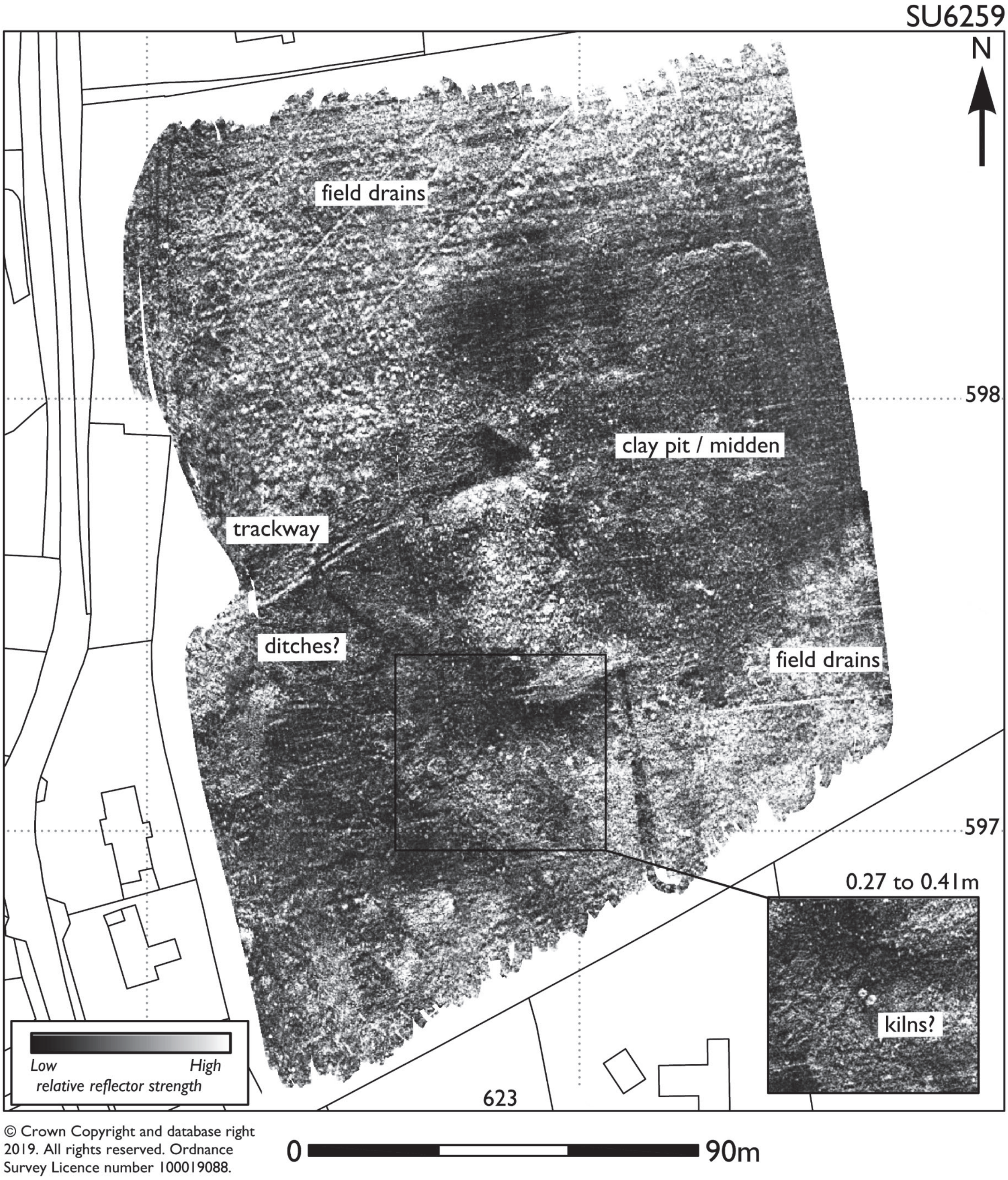


FIG. 3. Little London tilery. Greyscale image of the GPR amplitude time slice from between 7.2 and 9.6 ns (0.41 to 0.54 m) superimposed over the base OS mapping data, showing the response to field drains, the former trackway and geomorphology as high amplitude reflectors (white), together with low amplitude ditches (black). The inset figure shows the two possible kiln type anomalies shown at a depth of 0.27 to 0.41 m

were partially affected by known nineteenth-century clay pit workings associated with the brick-making industry in the area, although beyond this disturbance the plateau drift gravel deposits proved more responsive here than over the site of a prehistoric enclosure found approximately 100 m to the west (Linford *et al.* 2019). The caesium magnetometer survey covered an area of 5 ha using a 0.1 m x 0.5 m sample interval (Linford *et al.* 2018) and identified linear anomalies including a cluster of high magnitude, discrete thermoremanent responses characteristic of the remains of a group of approximately eight kiln-type structures, with some further less certain outliers. These kilns appear to be clustered in groups of two or three and the majority are located close to anomalies suggestive of probable linear boundaries and access trackways.

The GPR survey covered an area of 3.1 ha targeted over the kiln anomalies using a 0.075 m x 0.075 m samples density (Eide *et al.* 2018), with significant reflections recorded to an approximate depth of 2.3 m. The GPR results provided complementary detail of the anomalies mapped by the magnetometer survey and the historical land use of the area, including a network of field drains and a response to the geomorphology. Two discrete GPR anomalies, both with a diameter of 2 m and buried approximately 0.3 m from the surface, could possibly represent small kilns, although there is only a partial correlation with a corresponding high amplitude magnetic response.

# CHAPTER 3

# THE EXCAVATIONS

*By Nicholas Pankhurst and Daniel Wheeler with Michael Fulford*

## INTRODUCTION

Two trenches, approximately 50 m apart, were hand-excavated after machine-stripping of the ploughsoil in the south-west corner of the field opposite The Plough Inn. To the west Trench 1, centred on SU 62258 59718, overlay one of a pair of strong magnetic anomalies identified by the geophysics, while Trench 2, centred on SU 62328 59713, overlay two similar anomalies adjacent to a north–south-aligned linear feature (FIGS 4–5). The total area excavated amounted to 850 m².


FIG. 4. The caesium magnetometry survey of the field with trench outlines

FIG. 5. Aerial view from the west of Trench 1 (bottom) and Trench 2 (upper) under excavation

## TRENCH 1

Trench 1 (FIG. 6) was located above one of the clearest signals from the magnetometry survey, showing a pair of structures grouped close together with a potential linear feature running north-east towards the modern quarry pit to the north. A trench measuring 20 m by 20 m was opened with the removal by machine of the modern topsoil and a probable post-medieval ploughsoil on to a clear archaeological horizon which, despite having been scored by ploughing, already showed elements of the structures hinted at in the geophysics. Roman brick and tile were found in all the excavated features.

### TRACKWAY DITCH 1 (FIGS 7–12)

Two parallel ditches running north-east/south-west and approximately 10 m apart were probably the earliest features within Trench 1. Interpreted as boundary ditches flanking a trackway, the absence of obvious post-conquest finds within the lower fills of both of these ditches hints at a pre-Roman date for their construction. The positioning of the kilns in relation to the western ditch seems deliberate with the firing chamber sunk into the remnant outer bank and the hollow of the ditch used for the stokehole and the second smaller kiln. Further analysis of the geophysics image shows that other potential brick kilns on the northern side of the trackway are similarly positioned to exploit the surviving earthwork; a pattern seen more clearly within Trench 2.

The most visible of the two ditches ran for approximately 25 m diagonally across the trench; it was generally V-shaped in profile with a flat base and measured a maximum of 2.65 m in width and 1.2 m in depth. The ditch was excavated at three points across the trench, most fully as [1181] in the north-east corner where it contained eight fills (FIGS 8–9). The primary fill was (1137): a friable, mid-reddish-grey, silty clay that had formed from the early erosion

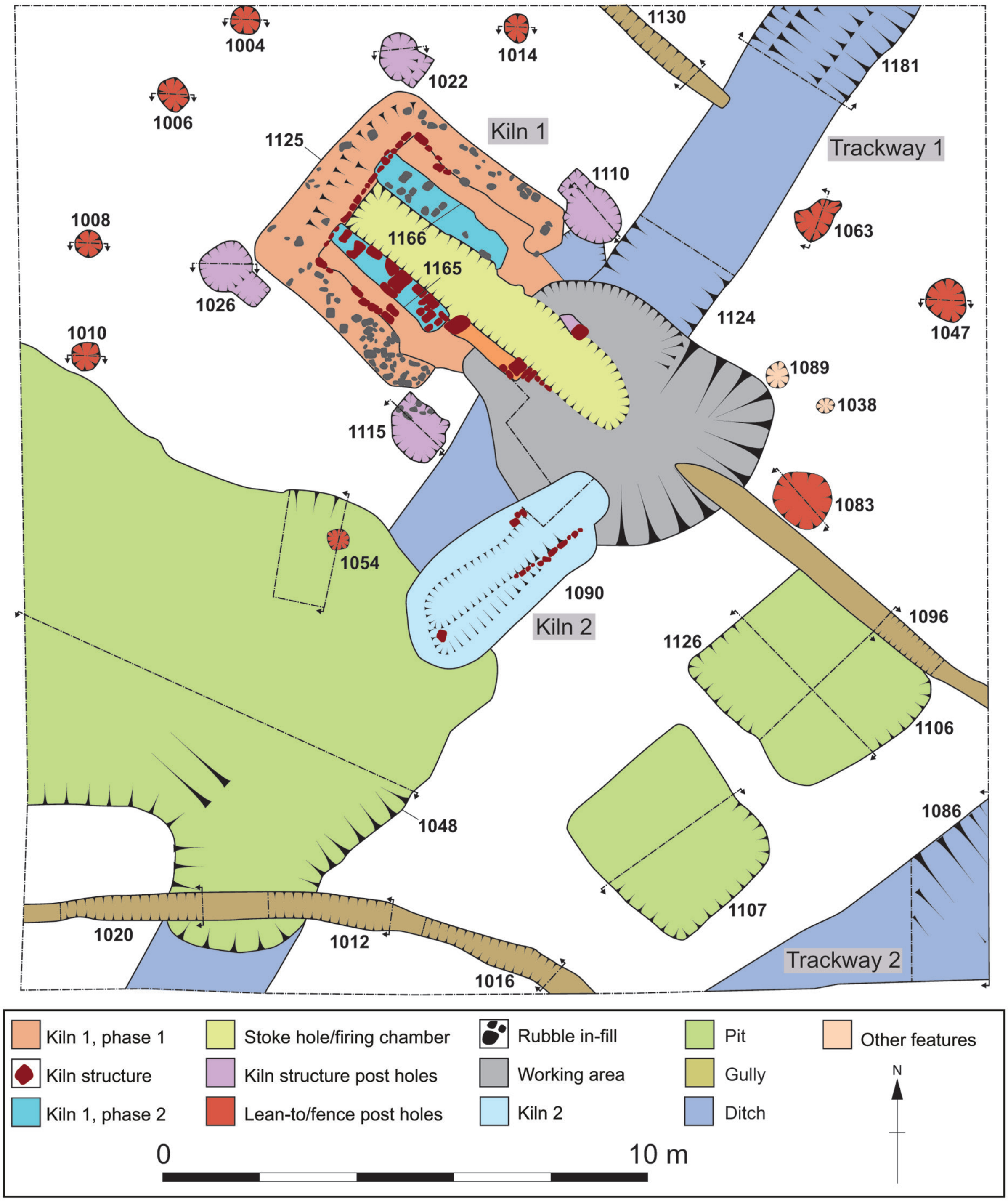


FIG. 6. Trench 1 showing cut features

of the sides and associated bank. (1137) measured 1 m wide and 0.2 m thick and produced 11 sherds of non-Little London kiln pottery of pre- or immediate post-conquest date which included the only imported Gallo-Belgic ware recovered from the site (Timby, below, p. 64). The subsequent four fills within the ditch were devoid of finds, perhaps suggesting a more rapid formation, possibly the result of deliberate backfilling to level the area. Overlying (1137) was (1134) which appeared to tip in from the south-eastern side. Measuring 1.58 m wide by 0.18 m thick, it was a friable, mid-bluish-grey, clay sand that was rich in redeposited London clay. Atop this was (1133): a firm, mid-reddish-brown, silty clay which measured 1.08 m wide by 0.22 m thick. There was then a substantial deposit (1136) which was 2.28 m wide and 0.44 m thick.

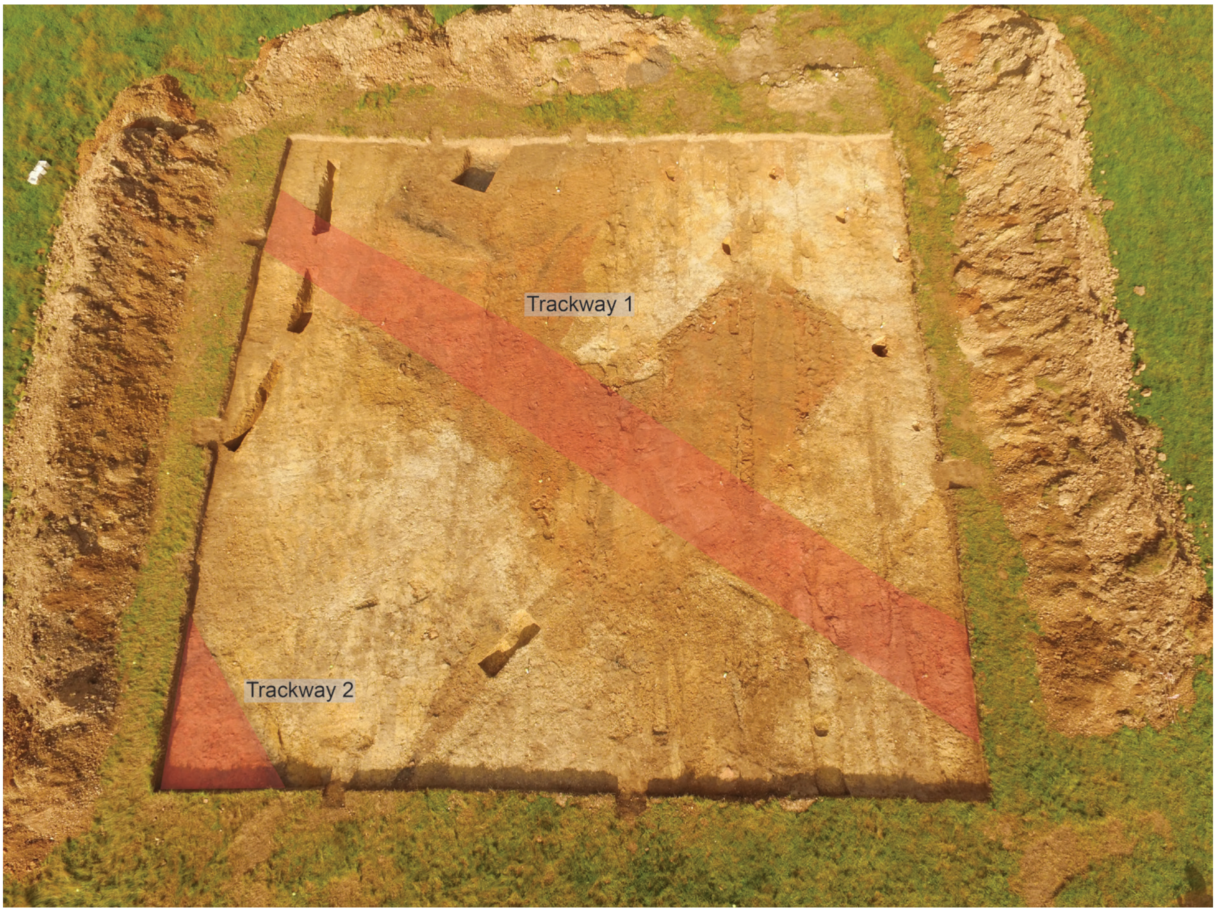


FIG. 7. Trackway ditches across Trench 1, looking west

Consisting of a friable, mid-reddish-grey, clay sand, this was probably the result of levelling the ditch hollow in preparation for the construction of the kiln to the south-west; the upcast natural clay from the cut of the kiln structure being used to consolidate the surrounding area. Overlying (1136) was a small deposit of thick clay (1135). Firm and light bluish-grey in colour, it measured 0.52 m wide and 0.12 m thick. The succeeding three deposits had all probably slumped into the top of the ditch during the use and subsequent abandonment of the nearby kilns and therefore gave an indication of what the ground surface was like in the local area — dirty and strewn with charcoal and waste material. Fill (1120) was a loose, dark blackish-brown, silty clay containing around 60 per cent charcoal and ash. Measuring 2.4 m wide and 0.16 m thick, this deposit was indicative of the general conditions surrounding the kiln during its use. Succeeding this dark layer was a firm, mid-reddish-brown, sandy silt (1037) which contained a significant amount of rubble-like brick and tile. Measuring 1.34 m by 0.62 m and 0.39 m thick, this was probably formed after abandonment of the kiln, possibly after the initial structure went out of use when the surrounding area was cleared of rubble in preparation for the installation of the two later, smaller kilns. The uppermost fill (1112) then formed in the remnant hollow of the ditch and measured 1.4 m wide and 0.22 m thick. Consisting of a loose, pinkish-grey, silty clay, (1112) contained both a significant amount of charcoal and waste ceramic building material (henceforth abbreviated CBM) suggesting it was formed during the later use of the kilns. Both horizons (1120) and (1112) produced small quantities of well-fragmented pottery comprising a mixture of local first-century coarse wares and Little London kiln wares (Timby, p. 64).

A south-west-facing section through the trackway ditch was also seen where the working area of the large kiln [1126] cut through it. Although not fully excavated to the base, it was recorded here as [1124] and measured 2.65 m wide and 0.54 m deep. Four fills were excavated in plan from the ditch at this point; the lowermost of which was (1142), probably the equivalent of

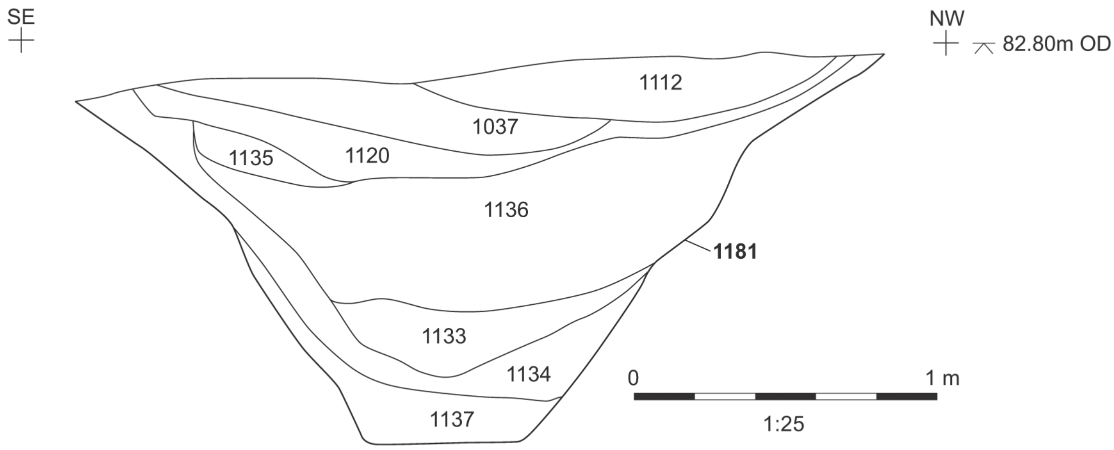


FIG. 8. Ditch [1181]

FIG. 9. Ditch [1181] looking south-west

(1136). (1142) was a firm, light reddish-brown, silty clay measuring 2.2 m wide and 0.25 m thick. Succeeding this was a firm, yellowish-grey, silty clay (1123) that was 0.6 m by 0.45 m and 0.1 m in thickness. Overlying this was a dark fill (1122) comprising around 80 per cent ash and charcoal; a very similar fill in look and feel to (1120). (1122) measured 0.8 m by 1.1 m and 0.09 m thick. The uppermost deposit – (1121) – was a firm, mid-greyish-brown, silty clay containing a good deal of waste CBM, ash and charcoal. Similar in composition to (1037), it measured 1.35 m by 1.8 m and 0.1 m in thickness. The upper three fills of ditch [1124] all contained waste brick and tile but no pottery.

The trackway ditch was also seen in the long cross-section dug through the large quarry pit [1048] on the western side of Trench 1 (FIGS 10 and 35). As the quarry pit sloped upwards on its eastern sides it cut through the upper extent of the ditch leaving just the base: cut [1078], measuring 0.88 m wide and 0.4 m deep. Like [1181] to the north, [1078] exhibited an almost-

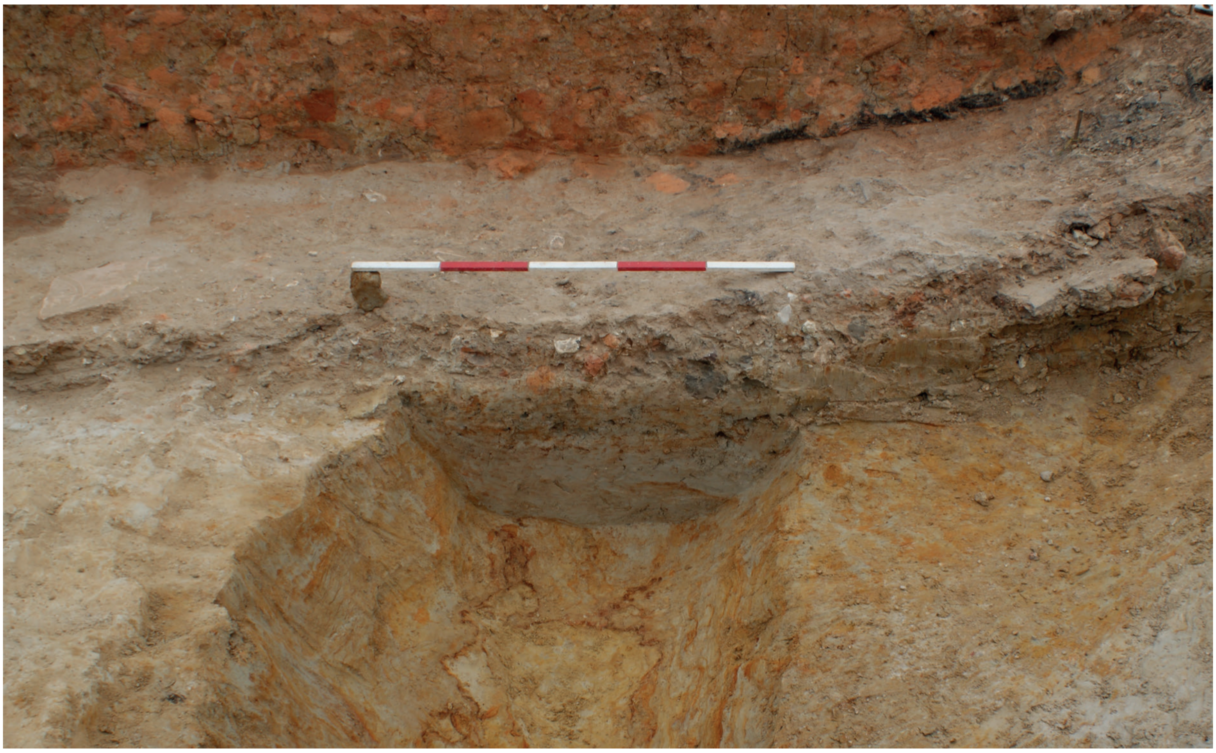

FIG. 10. Base of ditch [1078] cut by quarry pit [1048], looking north-east

flat base turning sharply towards straight sides at a 45 degree angle. Only a single fill was seen within the cut: (1079) which was similar in make-up to (1137), the base fill of the ditch to the north. (1079) was a firm, light bluish-grey, silty clay of the same dimensions and was probably formed from redeposited natural clay mixed with early wash. (1079) contained 31 sherds of pottery most of which come from a Silchester ware lid and a copy of a Cam. 2 platter in grog-tempered ware (GR4). There were also five sherds of Little London kiln ware and a handful of pieces of CBM which may be contamination from the quarry fill (Timby, p. 64).

Further north, the upper fill of the ditch was also seen in the area between quarry pit [1048], Kiln 2, and the working area for the large kiln [1126]. Recorded as (1143) but not excavated, it was a friable, mid-bluish-black, sandy loam containing around 30 per cent charcoal. Similar to the dark fills seen in the upper areas of the ditch further along, (1143) measured 1.5 m by 0.9 m in plan.

## TRACKWAY DITCH 2 (FIGS 11–12)

Located in the south-east corner of the trench was a small portion of a corresponding near-parallel ditch [1086] which was similar in size and form to [1181]. The upper deposits, probable slumps into the remnant hollow of ditch [1086], are similar to those seen at the top of [1181] also representing the appearance of the area surrounding the kilns during their use.

Excavated obliquely against the eastern side of the south-east corner of Trench 1, [1086] was 2.95 m wide and 1.43 m deep with straight, moderately sloping sides and a rounded base. Seven fills were contained within the ditch, the lowermost of which was a firm, orange-and-blue-mottled grey, clay sand (1094). The latter measured 1.18 m wide and 0.4 m thick and was made up of redeposited London clay that had eroded into the ditch during its initial stabilisation. Overlying was (1093), a firm, light brown, clay sand measuring 1.94 m wide and 0.4 m thick. Atop this was (1062): a firm, greyish-brown, clay sand which measured 2.28 m wide and 0.6 m thick. No finds were recovered from the lower two horizons but fill (1062) yielded 85 sherds of first-century A.D. pottery, none of which were Little London kiln wares but did include ten amphora sherds (Timby, p. 64). The overlying fill (1092), a loose, light brownish-grey, silty

FIG. 11. Oblique section through trackway ditch [1086], looking east

sand, appeared to have been tipped in from the north-western side, and was 1.62 m wide and 0.5 m in thickness. To this point, the initial four fills had no evidence of kiln wares, suggesting, like the parallel trackway ditch, that the lower deposits formed prior to the start of brick-and-tile-making in the area. The succeeding three layers, however, are obviously evidence of the functioning of the kilns and compare with the sequence seen in the corresponding trackway ditch across the trench. The next deposit, (1056), was rich in CBM and contained 26 sherds of Little London kiln ware (Timby, p. 64). Measuring 2.25 m wide and 0.28 m thick, it was a firm, mottled-orange/bluish-grey clay. Sealing across the top of the ditch was a dark burnt layer (1041) containing a substantial amount of ash and charcoal, 3.32 m wide and 0.12 m thick. It produced just five potsherds, three of which were oxidised Little London kiln wares (Timby, p. 64). The

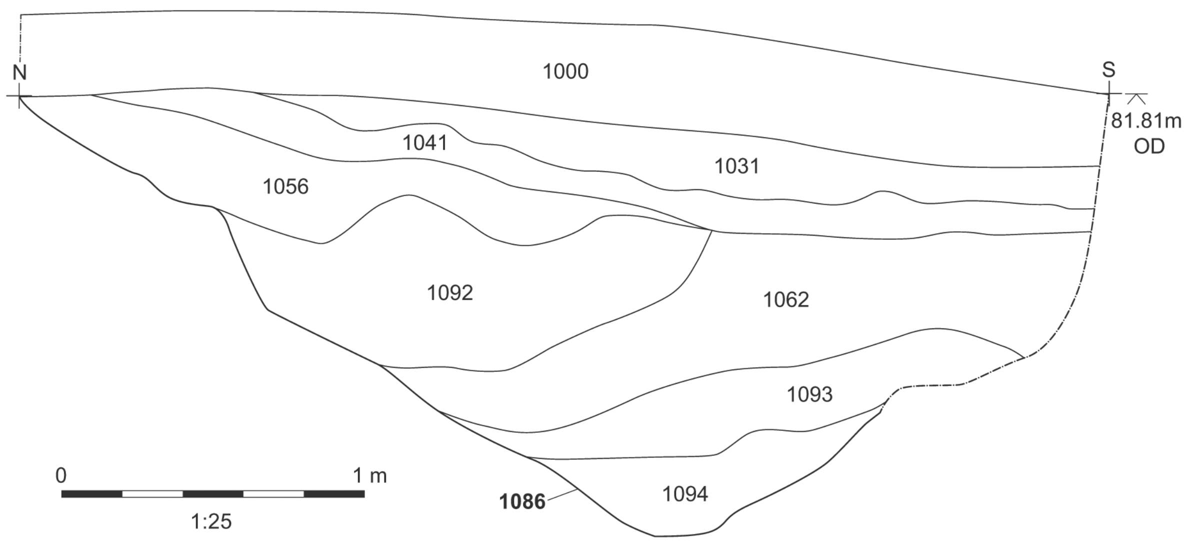


FIG. 12. Trackway ditch [1086]

final horizon, (1031), consisted of a substantial layer, 2.88 m wide and 0.2 m thick, of crushed and degraded brick and tile, perhaps discarded wasters or a demolition deposit resulting from the destruction or modification of one of the kilns.

## KILN 1, PHASE 1 (FIGS 6, 13–20)

The brick-built structure of the main kiln measured 4.8 m by 7.2 m, comprising a roughly-rectangular firing chamber oriented north-west/south-east with a narrower, 2 m-long stokehole extending out from the south-east side. The firing chamber was cut 2.05 m deep below the base of the ploughsoil although it may have been slightly shallower initially. Each of the side walls was faced with thin, well-made bricks laid in uneven courses, as the facing of a brick rubble core. Emerging from the south-west side inside the structure were three short stubs of stacked bricks keyed into the main wall. These were the remnants of internal cross-walls that would have supported the surface on which the unfired bricks and tiles were placed. Where the stokehole met the entrance to the firing chamber a curving stack of four voussoir tiles on the south-west


FIG. 13. Kiln 1, with main structural elements highlighted

side probably formed the springer of an arched flue. It is likely that the cross-walls were similarly arched to allow the hot gases to circulate the full length of the firing chamber.

The construction cut [1125] for the kiln structure measured 4.8 m by 7.2 m and was 2.05 m deep to the base of the firing chamber. As none of the kiln walls were removed it was not possible to tell the exact method of construction, but it can be assumed that the foundation cut was packed with a dense rubble core of broken brick (1180) up to 1.2 m thick between it and the internal facing of brick. The back wall of the firing chamber **1161** was 1.2 m thick with a 0.36 m high façade of bricks surviving facing south-east. The bricks on all sides of the kiln were generally wide and thin, varying in size from 0.05 m in thickness and a width of 0.1 m to a thickness of 0.1 m and a width of 0.42 m. In the north-east corner, **1161** consisted of six courses of bricks arranged in a very rough stretcher bond. Although there was no recognised bonding material, the rubble core (1180) that backed the bricks acted as a binding matrix to aid stability. Central to the back wall and emanating from the firing chamber was a 1.5 m wide and 0.72 m high block of vitrified bricks, fused together and green and glassy in appearance (FIG. 14). The edges of this conglomerated lump were defined by the later narrowing of the firing chamber in its second phase (see below), suggesting it was the result of higher temperatures reached within the kiln once it was remodelled.

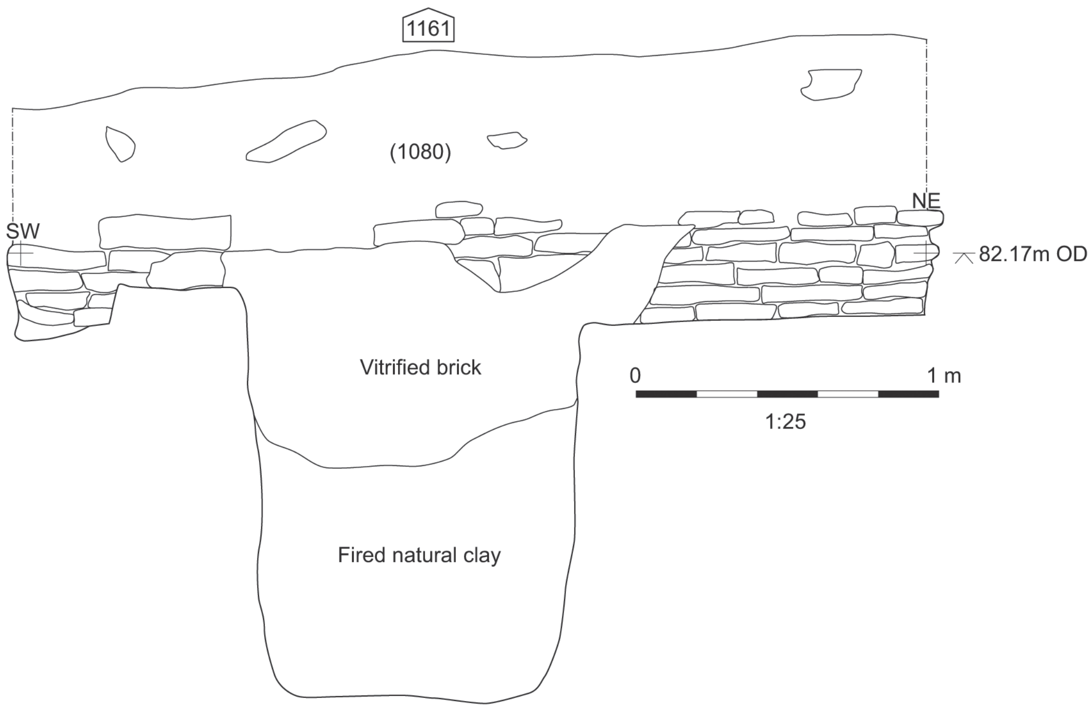


FIG. 14. **1161**: back wall of the firing chamber

The south-western wall of the kiln **1155** measured 4.6 m long by 0.88 m wide including the rubble core and was faced by a surviving brick frontage 2.6 m wide and 0.58 m high. Similarly roughly-coursed and with the same range of brick sizes as the back wall, **1155** included eight surviving courses, preserved particularly well because of the increased stability afforded by three cross-walls extending across the firing chamber. Likely to have originally been arched across the firing chamber, the cross-walls **1156**, **1157** and **1158** remained only as short stubs, each measuring 0.3 m wide with the best surviving – **1156** – being eight brick courses high (FIGS 15–16). The opposite kiln wall **1171** was much less well preserved with only a small element of brick-facing surviving in the northern corner. Overall the wall measured 4.8 m long and 0.72 m wide with the structural element three brick courses high and 1 m in length. A single cross-wall stub, **1170**, emerged from the north-east wall. Measuring 0.35 m wide and just 0.15 m long, it consisted of three courses of similar bricks and, although not entirely aligned with it, was probably the opposite match of **1158** across the firing chamber.

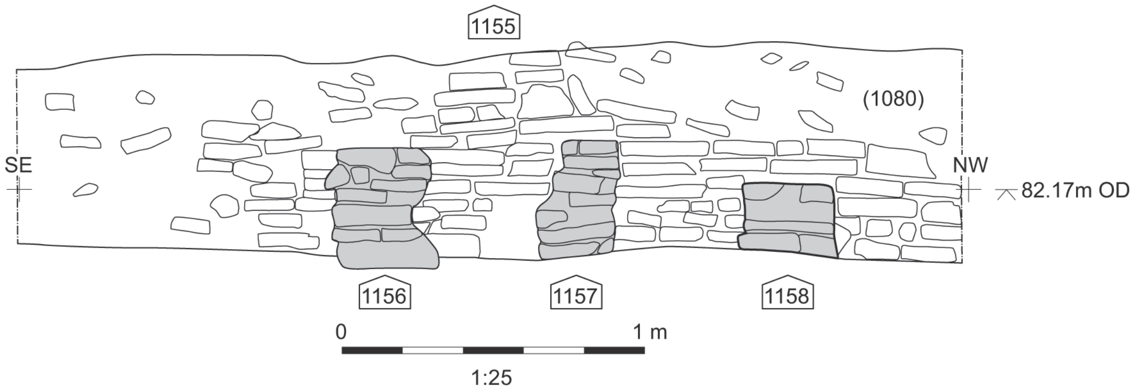


FIG. 15. Kiln wall **1155** with cross-walls **1156**, **1157** and **1158**

FIG. 16. Kiln wall **1155** looking south-west

The stokehole of the kiln ran for 2.4 m from the firing chamber towards the working area outside. Comprising two brick-built walls 1.12 m apart, the south-west side **1176** survived much more intact than the north-east side **1177**, which had almost entirely collapsed (FIG. 17). **1176** included up to six courses of bricks laid in a rough header/stretcher bond 0.38 m high. Centrally the bricks had once again vitrified, forming a conjoined mass 0.88 m wide. At the north-west end, closest to the kiln entrance, were four stacked voussoir tiles arranged as the springer for the arched entrance to the firing chamber (FIG. 18). The opposing wall **1177** was considerably poorer in preservation, with the structural element measuring just 0.6 m long and 0.2 m wide and consisting of one course of brick.

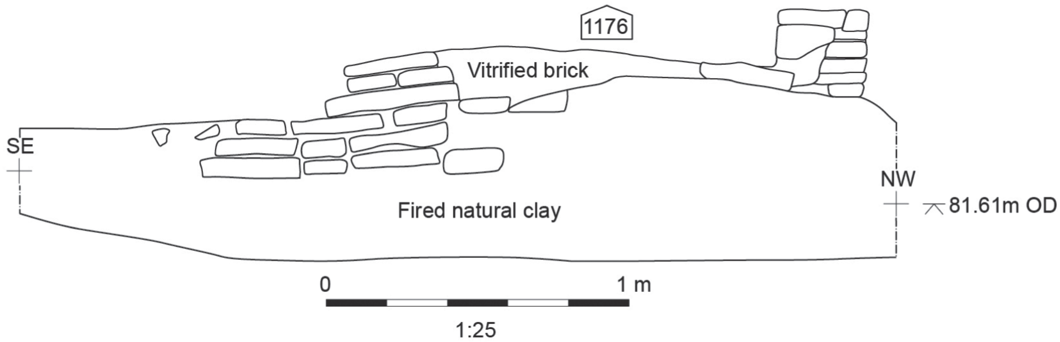


FIG. 17. North-east-facing side of stokehole, **1176**

FIG. 18. Springer for the stokehole arch at the entrance of the firing chamber, looking south-east

FIG. 19. Looking north-west from working area [1126] into Kiln 1

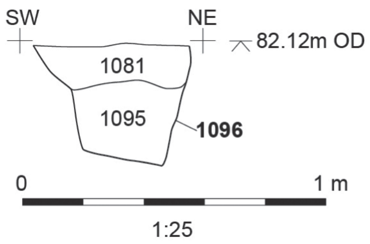


FIG. 20. Drainage gully [1096]

To the south-east of the flue-arch was a large open working area [1126]. This was sub-square in plan, measuring approximately 4 m by 5 m and sloping up from the flue-arch to around 0.8 m below the ploughsoil. It was sat within the hollow of the early ditch and appeared to serve — in their latest phases at least — both the main, larger kiln (Kiln 1) and the smaller example to the south-west (Kiln 2) (FIG. 19 and below, p. 27). The majority of the lower deposits within the working area were rich in burnt material as a result of the regular raking-out of the stokehole; however it is assumed that these deposits were associated with the later phase of the kiln and are thus described below. Running out from the working area on the same general alignment was a narrow, square-cut gully [1096], 0.47 m wide, 0.45 m deep and extending south-east for 6.8 m before reaching the eastern edge of the trench (FIG. 20). This straight-sided feature may have been dug as a drain, taking advantage of the natural slope down to the south-east and running into the hollow of the trackway ditch [1086]. The gully contained two fills, the lower of which was (1095): a compact, mid-yellowish-orange, silty clay, measuring 0.37 m wide and 0.34 m thick and containing no finds. Overlying was (1081) which was a compact, mid-greyish-brown, silty clay, 0.47 m wide and 0.18 m thick. Within was a high concentration of charcoal and some CBM, but no other dating evidence.

## KILN 1 SUPERSTRUCTURE (FIGS 21–24)

Surrounding the kiln were a number of post-holes and other features aligned and associated with the structure. At each of the four corners of the firing chamber, just outside the rubble packing of the walls, was a substantial post-hole. Although varying in depth between 0.15 m and 0.6 m, each was over 0.6 m in diameter and [1110] had clear evidence of a central post-pipe, approximately 0.48 m in diameter. Associated with each post-hole was a shallow, rectangular, step-like cut, as illustrated in FIG. 21. Their function is unclear; perhaps they acted as the seating for buttressing or replacement posts. Although little can be inferred about the roofing of the structure, it seems almost certain that the posts inferred from these post-holes would have provided its support. No dating evidence was recovered from any of the four features.

FIG. 21. Post-holes around Kiln 1 with shallow steps highlighted. Looking south-east

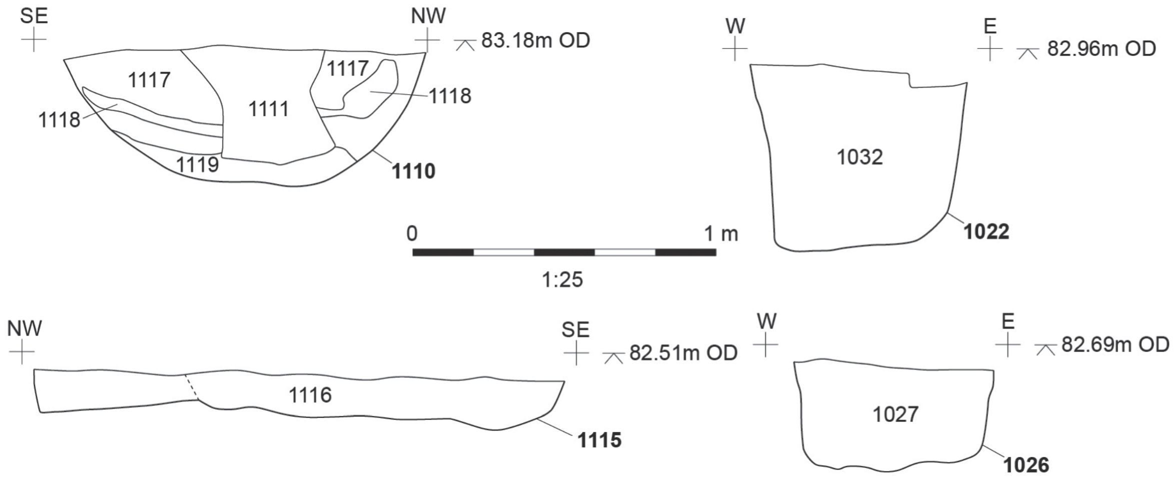


FIG. 22. Kiln 1 superstructure: profiles of post-holes

Of the post-holes at the front of the kiln, [1110], at the eastern corner, was the best preserved (FIGS 6, 22–23). It included three fills and an obvious central post-pipe. It was 1.2 m in diameter and 0.5 m deep, with the stepped extension to the north-west measuring 0.66 m by 0.3 m and 0.12 m deep. The lowermost fill (1119) was a soft, mid-orangish-yellow clay; probably natural clay disturbed during the cutting of the post-hole. It measured 0.8 m wide by 0.1 m thick and contained some CBM fragments. Overlying this was the larger post-packing fill (1117) measuring 1.2 m wide and 0.4 m thick. Consisting of a friable, light yellowish-brown sandy silt, this deposit had little of the typical packing material of brick and tile, otherwise seen in three of these four post-holes. Within (1117) was a darker lens of rubble-rich material probably scraped from the ground surface into the post-hole when it was backfilled. (1118) measured 1.02 m wide by 0.05 m thick and was a soft, mid-reddish-brown, sandy silt containing around 70 per cent

FIG. 23. Post-hole [1110] with central post-pipe

FIG. 24. Tile packing surrounding post-pipe within post-hole [1022]

brick rubble. The post-pipe was then defined by a significantly redder fill, indicative of infilling of kiln waste material once the post had been removed. This deposit (1111) was a soft, mid-brownish-red, sandy silt measuring 0.45 m wide and 0.35 m thick.

The corresponding post-hole at the front of the kiln was similar in shape to [1110] but considerably shallower (FIG. 22). Measuring 0.9 m by 0.7 m but only 0.15 m deep, [1115] also included a rectangular step extending to the north-west which was 0.52 m by 0.58 m and 0.15 m deep. Within the post-hole was a single fill, (1116), a friable, light yellowish-brown, clay sand of the same dimensions.

The two equivalent post-holes at the back of Kiln 1 each had straight sides and were smaller in diameter than the bowl-shaped examples seen at the front (FIGS 6 and 21). [1026] at the western corner of the kiln was the shallower of the two, measuring 0.65 m across and 0.33 m deep, with the extended step to the south-east 0.56 m by 0.62 m and 0.08 m deep (FIG. 22). The sides of the post-hole were straight and vertical, turning sharply into a flat base. Contained within was a single fill (1027), a friable, mid-yellowish-brown, sandy clay of the same dimensions as the cut. Like the two front post-holes, this fill contained little packing material.

[1022] on the northern corner of Kiln 1 measured 0.82 m in diameter and 0.6 m deep, with its step to the south-east 0.72 m by 0.38 m and 0.1 m deep (FIGS 22 and 24). Within was a single fill (1032) which included a large amount of packing of roof-tile. It was a firm, mid-yellowish-brown, sandy loam.

The absence of much packing in all but one of these post-holes suggests that they were part of the original structure of the kiln, excavated and filled before the kilns were fired. The one post-hole with much packing probably indicates a replacement post. Similar arrangements of large posts around the kiln have been noted at the later, rural tile kilns excavated at Crookhorn (Hants.) and Arbury, Cambridge. The similarity with the arrangement at Crookhorn is particularly striking (McWhirr 1979b, 175; Soffe *et al.* 1989, 101).

## ANCILLARY STRUCTURES (FIGS 25–27)

Surrounding Kiln 1 were a number of post-holes and a beam-slot suggestive of secondary structures adjoining the main kiln (FIG. 25). After being formed and moulded, bricks and tiles would have been left to dry for a number of days before being fired. Storing these under-cover and close to the firing chamber may have utilised the residual heat from the kiln to aid this process. Likewise, firing the kiln would have required immense amounts of wood which would probably have been collected during the winter months. Storage structures would have allowed for the drying of the wood and, if built close to the kiln, could similarly have assisted drying. Alternatively, if the kiln was only employed seasonally, a surrounding fence or barrier might have proved useful for keeping out livestock or wildlife.

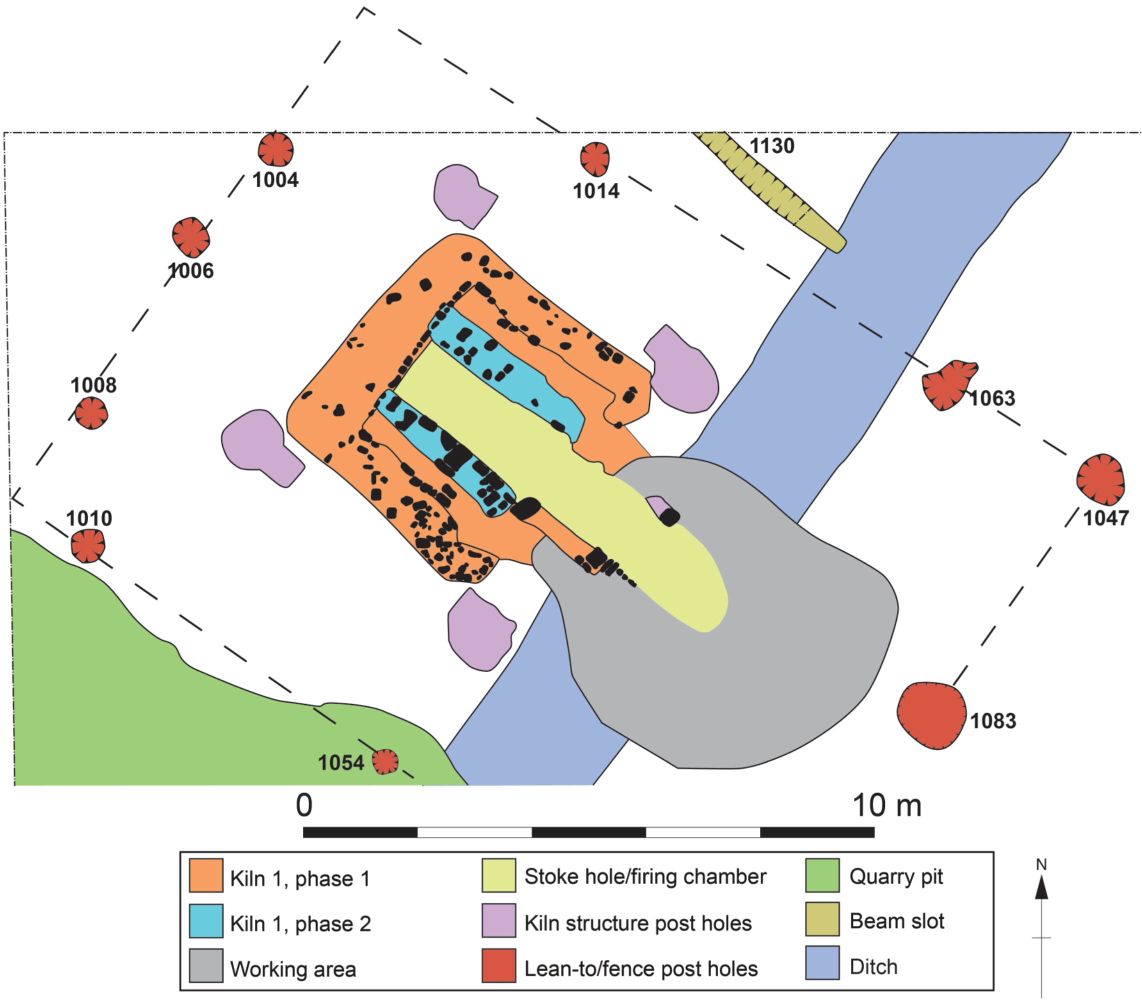


FIG. 25. Ancillary structures surrounding Kiln 1

A short stretch of beam-slot [1130] aligned with the wall of the firing chamber was located 3.5 m to the north-east of Kiln 1 (FIG. 26). Measuring 2.6 m long, 0.42 m wide and 0.2 m deep, the beam-slot may have supported some kind of lean-to shed which shared the north-east wall of the kiln. Within [1130] was a single fill, (1129): a firm, orangish-yellow clay of the same dimensions.

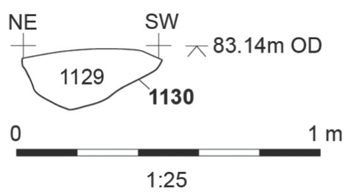


FIG. 26. Beam-slot [1130]

In the north-west corner of the trench was a line of three post-holes aligned with the back wall of the kiln: [1008], [1006] and [1004]. As with the beam-slot, these may have supported some kind of satellite building or a fence-line. A fourth post-hole [1010] slightly further south suggests that this alignment may have turned 90 degrees or curved sharply, but further examples in the direction leading towards [1054] were not located, perhaps because they were cut into the residual bank of the trackway and subsequently ploughed away. A similar arrangement is seen on the north-east side: three post-holes, [1014], [1063] and [1047], flank the kiln wall before turning south-westwards to a single example [1083] in line with the firing chamber of the kiln. Similarly, a gap is evident where the remnant of the trackway bank and surviving ditch would have been. The nine post-holes are summarised below (FIGS 25 and 27):

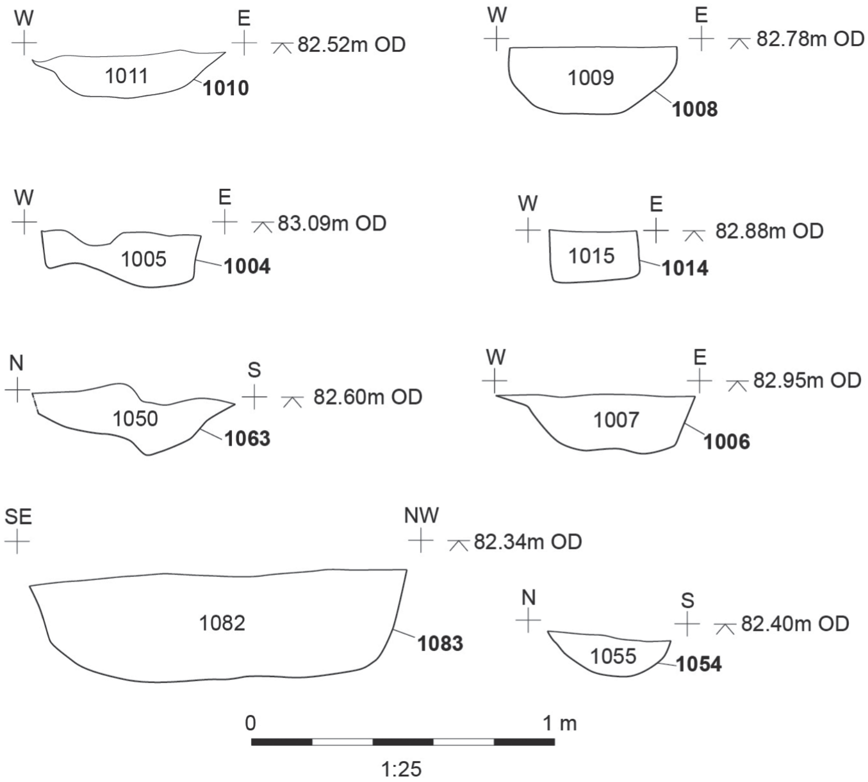


FIG. 27. Profiles of post-holes around Kiln 1

[1010] was circular in shape with a diameter of 0.64 m and a depth of 0.14 m. The sides were straight and moderately-sloping towards a flat base. Within was a single fill (1011) which was a firm, light brownish-grey clay including a large proportion of brick and tile.

[1008] was circular, measuring 0.55 m in diameter and 0.23 m deep. The sides sloped gradually to a rounded base. The single fill (1009) was a firm, light brownish-grey clay which consisted of around 40 per cent CBM packing. Two pieces of tile from (1009) were in the form of a skylight: a *tegula* with a central, circular hole (below, Machin, p. 100, FIG. 80).

[1006] was sub-rectangular in shape with moderately-sloping convex sides and a rounded base. Measuring 0.58 m by 0.31 m and 0.22 m deep, it contained a single fill. (1007) was a loose, light yellowish-grey clay containing CBM packing.

[1004] was circular in shape and measured 0.54 m in diameter by 0.24 m deep. The sides were straight and near-vertical with a sharp break of slope to a sloping base. Contained within was a single fill of the same dimensions as the cut. (1005) was a firm, mid-reddish-brown, silty clay consisting of around 50 per cent brick/tile and fired clay kiln furniture.

[1014] was ovoid in shape measuring 0.4 m by 0.44 m and 0.18 m deep. The sides were steep and straight leading to a flat base. Within was a single fill (1015): a soft, mid-brown clay containing four pieces of pottery and some degraded CBM packing.

[1063] was ovoid in shape, measuring 0.88 m by 0.77 m and 0.32 m deep. The base was undulating and irregular, turning gradually into gently-sloping convex sides. The northern side of the cut was heavily truncated by a plough-scar. Within was (1050): a friable, mid-brown, clay sand with around 40 per cent made up of brick and tile packing with a single sherd of Little London kiln ware.

[1047] was an irregular oval in shape, measuring 0.74 m by 0.65 m and 0.3 m deep. The sides were concave and moderately-sloping with a rounded base. Within was a single fill (1040): a soft, mid-yellowish-brown, sandy silt which included around 30 per cent CBM. 48 pieces of pottery from within (1040) included Little London kiln ware, Silchester ware, grog-tempered storage jar and a black sandy ware.

[1083] was the largest of the nine examples, measuring 1.3 m by 1.12 m and 0.35 m deep. Ovoid in shape with moderately-sloping, concave sides and a flat base, it included a single fill. (1082) was a soft, mid-greyish-brown, sandy silt with no finds and relatively few inclusions. The lack of brick and tile packing within [1083] may suggest that it was an unrelated pit rather than a post-hole.

[1054] was the smallest of the nine examples measuring 0.3 m in diameter and 0.15 m deep. It had shallow, concave sides leading to a flat base and contained a single fill. (1055) was a friable, greyish-black, sandy silt comprising over 50 per cent charcoal. The relatively shallow depth of this post-hole is probably because it had been cut into the remains of the since-ploughed-out trackway bank.

With the certain exception of the largest, [1083], all the above features contained CBM, a few also contained pottery including Little London kiln ware. This implies that, unlike the roof supports of the kiln, these post-holes were cut well into the life of the kiln and the associated pottery production located to the east (Trench 2).

## KILN 1, PHASE 2 (FIGS 28–30)

A second phase of kiln use involved the reduction in width of the firing chamber. Although badly preserved, the surviving brick courses indicate a similar structure to that of the original with a number of brick arches supporting the floor of the firing chamber. The previous firing chamber was cut into and brick rubble was used to fill the gap between the primary and secondary structures. Evidence of the use of the kiln was indicated by the depth of 0.75 m to which the base of the firing chamber was worn or cut below the lowest course of the secondary brick lining. With this modification, the firing chamber almost became an extension of the stokehole, being approximately the same width (1.4 m), while continuing 3.15 m to the original back wall of the kiln. Much of the structural integrity of this second phase was seen to have been retained by the part-vitrification of the walls caused by the intense heat. This was particularly apparent at the back of the firing chamber (FIG. 28) where the entire wall had melded together into a green, glassy surface. This modification of the kiln would have resulted in the firing of smaller loads of brick. Whether this was caused by falling demand or by the difficulty of maintaining effective temperatures when firing the kiln in its original state is unclear.

The renovation of Kiln 1 largely consisted of cutting into the base of the existing firing chamber and installing rubble-founded supports on which to set a new series of cross-walls/arches. Recorded as [1165] and [1166], the cuts on the south-west and north-east sides respectively were effectively contemporaneous. A remodelling to clear out and increase the depth of the firing chamber may have taken place at this point, although, as its original depth was unknown, this cannot be assumed. On the south-west side a core of rubble (1168), measuring 2.9 m along the length of the firing chamber, 0.54 m wide and 0.28 m thick, was then inserted. On the opposite side a similar arrangement (1169) was installed: 3.15 m long by 0.68 m wide and 0.32 m thick.

Upon and within both (1168) and (1169) were set tile stacks as springers to support the cross-walls/arched supports. Similar to the arrangements in Phase 1, the remnant stubs survived significantly better on the south-west side than on the north-east, where none remained. Six

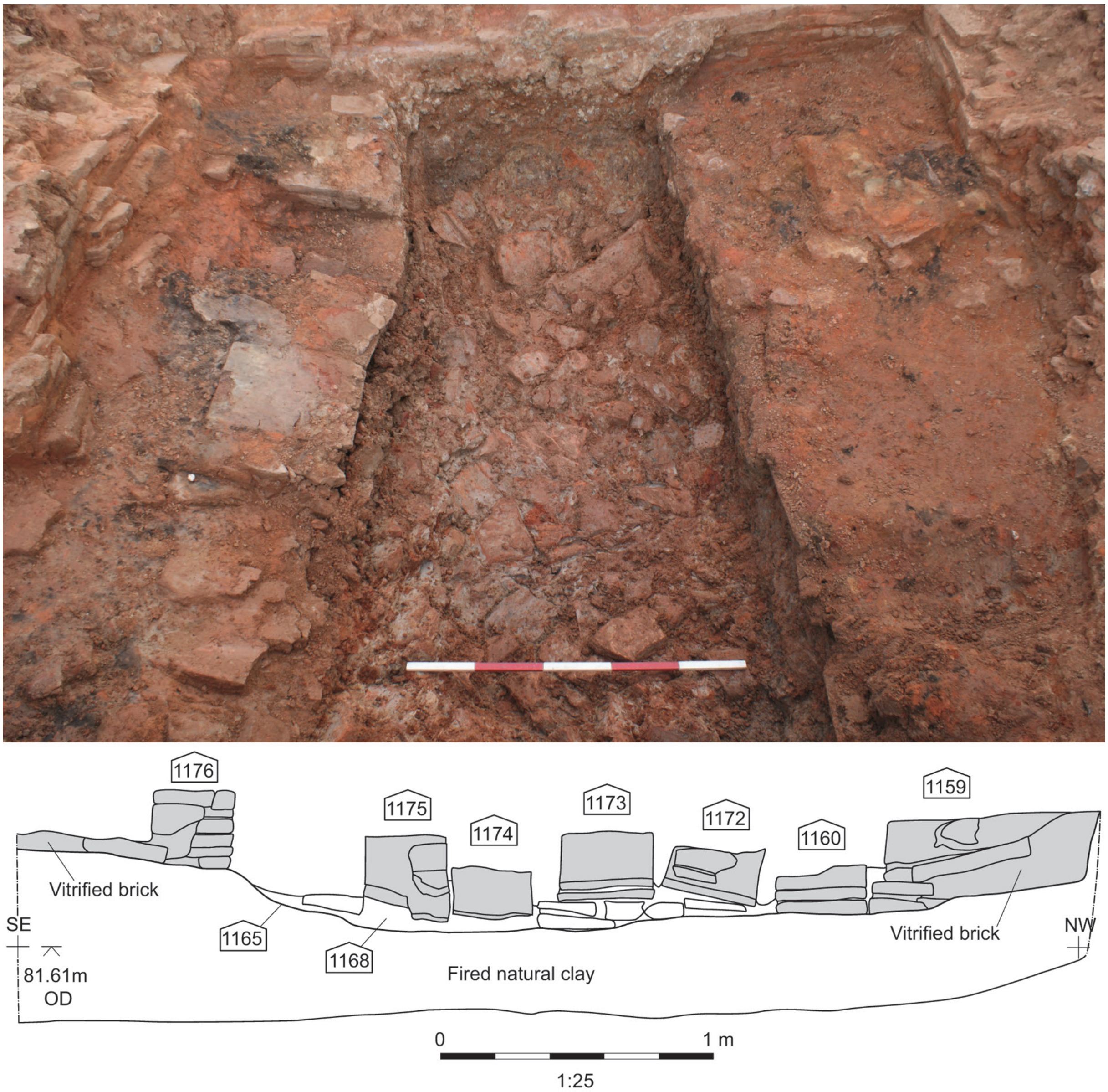


FIG. 28. (Top) Looking north-west into the reduced firing chamber of Kiln 1 with the new cross-walls/ arch springers (left). Post-abandonment collapse material sits at the base of the firing chamber against the vitrified back wall. (Bottom) North-east-facing wall of the remodelled firing chamber

distinct stacks were recorded upon (1168): **1159**, **1160**, **1172**, **1173**, **1174** and **1175** (FIG. 28). Although varying in their state of preservation, they were generally similar in size, with all but **1159** measuring around one tile width (approximately 0.3 m) and surviving up to four courses in height. In terms of length, **1173** extended the full distance of 0.52 m across (1168) whereas **1174** measured only 0.16 m. At the north-west end, **1159** had survived better due to its part-vitrification and fusing to the kiln back wall. **1159** measured 0.68 m by 0.42 m and consisted of three courses of tile.

Evidence of the final use of the kiln was visible at the base of the firing chamber in the form of a deposit of scorched clay measuring 5.62 m long by 1.38 m wide (FIG. 29). (1138), which was unexcavated, mostly consisted of the baked natural clay into which the firing chamber was cut, mixed with occasional ash and charcoal. The overlying deposits, rich in brick and tile wasters and degraded kiln furniture, represented the abandonment of the structure and its subsequent collapse. A substantial abandonment deposit lay across the entire base of the firing chamber measuring 4.4 m long, 1.4 m wide and up to 0.62 m thick. Excavated in four connected

FIG. 29. Scorched clay (1138) as the base of the firing chamber

segments so as to control spatially any finds, the deposit was recorded as (1087), (1097), (1098) and (1103). Consisting of a soft, light yellowish-blue clay, the layer was full of brick and tile, comprising around 75–90 per cent of the total bulk of the deposit. The last of the four areas to the south-east, (1103), included a piece of armchair voussoir with partial extrados (below, Machin, p. 118, FIG. 109). A radiocarbon sample taken from within (1098) returned a date range of 28–208 cal A.D. (juvenile *Betula sp.* charcoal 1903±24 BP, SUERC-90867).

On the south-west side of the kiln, overlying the six remnant cross-wall stubs, was a finer accumulation of burnt material from the later use of the kiln. Measuring 3.02 m by 0.68 m and 0.05 m thick, (1141) consisted entirely of residual ash and charcoal from the firing of the kiln. Sealing over the firing chamber to the level of the vitrified side wall **1176** (see above) was a thick post-abandonment layer, potentially a backfilling or levelling event. (1074) measured

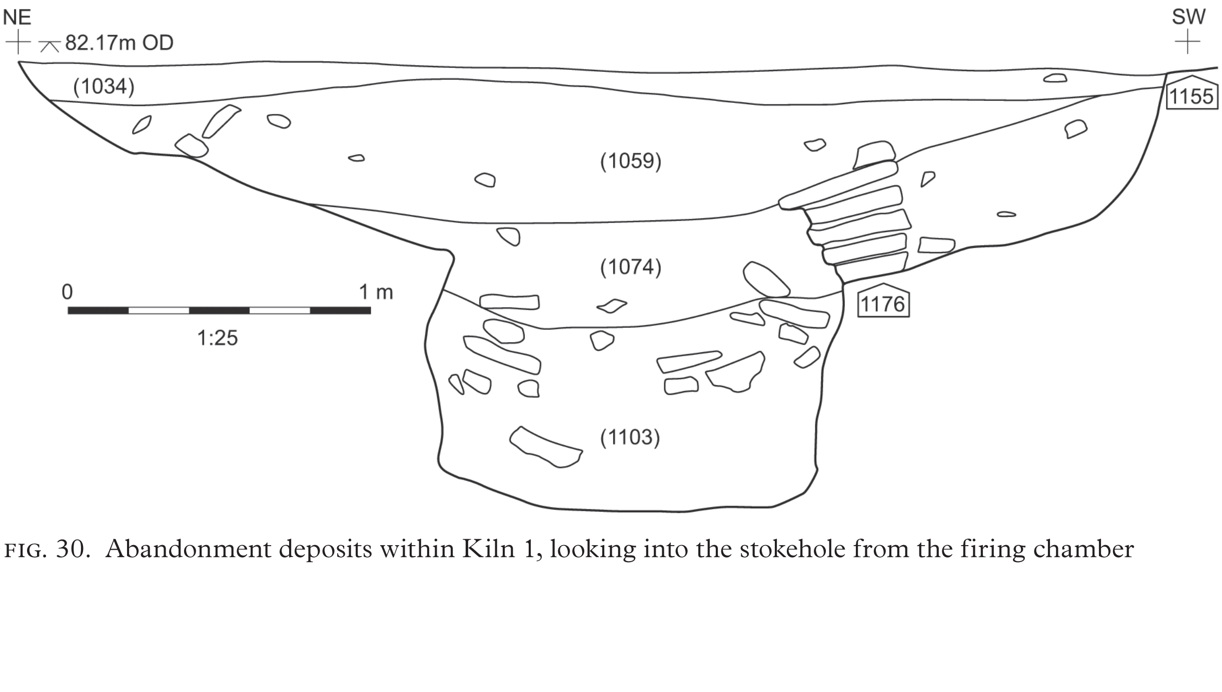


FIG. 30. Abandonment deposits within Kiln 1, looking into the stokehole from the firing chamber

3.1 m by 3.1 m and 0.4 m thick and was a friable, greenish-red, silty sand, which consisted of around 30 per cent waste CBM interleaved with a number of lenses of green sand (FIG. 30). The presence of five abraded sherds of pottery and an iron nail from within this layer also suggests it had formed not just from the collapse of the kiln superstructure. The overlying deposit (1059) was similarly mixed with the remains of the demolished kiln resulting from the silting up and potential levelling of the area long after the structure had gone out of use. Measuring 8 m by 4.6 m and 0.42 m thick, this compact, mid-reddish-brown, silty sand consisted of around 25 per cent brick and tile rubble including a piece of ceramic waterpipe.

## KILN 2 (FIGS 6 and 31)

As predicted from the geophysics, a smaller second kiln was located central to the excavation trench. Measuring 4.5 m in length, 2.26 m in width and up to 0.8 m in depth, the kiln was set within a foundation cut [1090] dug into and on the same alignment as the early trackway ditch and exploiting its residual hollow. The structure itself was poorly constructed with walls up to 0.4 m thick made of packed rubble with only a very small amount of brick-facing surviving on the south-east side. The kiln was uniform in shape along its length with no obvious differentiation between the firing chamber and the stokehole. The internal space measured only 2.9 m in length by 0.8 m in width. Its shape and construction method were very similar to the secondary phase of Kiln 1 and, considering they both shared the same working area, it seems likely that they were contemporary. Kiln 2 was almost entirely devoid of pottery, unlike the smaller kilns seen in Trench 2 (below), suggesting it was used exclusively for tile production.

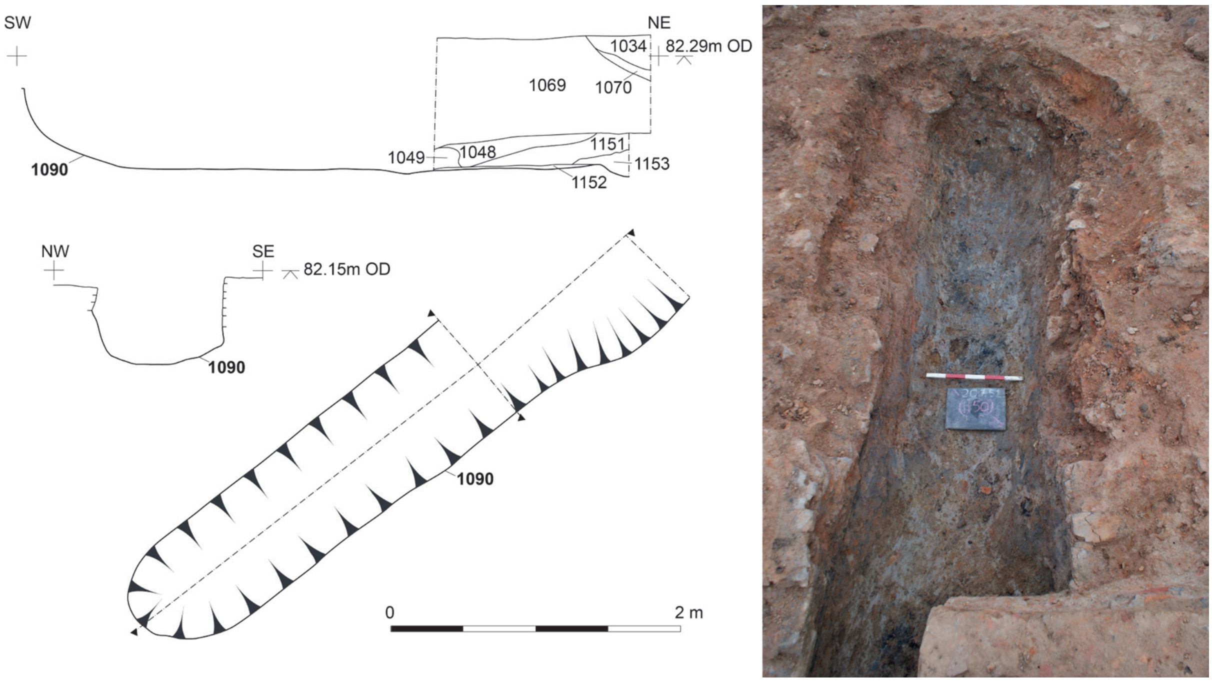


FIG. 31. Kiln 2: plan, profile and view of the kiln and its basal deposit (1150)

At the base of the kiln was a thin deposit of light bluish-grey clay with frequent inclusions of charcoal. Measuring 4 m by 0.78 m and 0.03 m thick, (1150) was probably material resulting from the firing of the kiln mixed with scorched natural clay disturbed during the raking-out process. Succeeding this layer was a looser, dark grey, silty sand (1149) that contained more charcoal and CBM as a result of the use of the kiln. This deposit had the same dimensions in plan as (1150) but was 0.05 m thick.

Overlying (1149) was the first evidence of the abandonment of the structure, (1147): a firm, bluish-grey, silty clay comprising around 50 per cent vitrified brick. Sloping against the back end of the kiln, this deposit measured 0.78 m by 0.4 m by 0.15 m thick and was probably formed through the collapse of the brick-lined edges of the kiln as it fell into disrepair. A rubble-like layer (1145) then formed above, similarly localised to the back of the kiln. It was a soft, blue clay measuring 0.75 m by 1.6 m and 0.4 m thick which was made up of around 40 per cent collapsed kiln structure. A thick tip of material (1146) at the south-west end of the structure was then deposited, perhaps representing more collapse of the back end of the kiln. Measuring 0.3 m by 0.4 m and 0.5 m thick, it was a loose, light reddish-yellow, silty sand. This was then overlain by (1144): a loose, blackish-grey, silty clay that measured 0.88 m by 0.3 m and 0.35 m thick. Comprising around 60 per cent waste brick and tile, this particular deposit was rich in comb-decorated tiles, perhaps suggesting that a large number of these had been produced here with the broken wasters subsequently backfilled into the kiln after its abandonment.

Within the entrance/stokehole of the kiln were several small localised deposits, indicative of the kiln's repeated use and maintenance. As a remnant of a kiln firing, (1152) was an ash-rich layer of loose, black, silty sand comprising around 80 per cent charcoal and measuring 1.1 m by 0.88 m and 0.04 m thick. Atop this was a similar deposit (1153) with more disturbed natural clay and less charcoal. Measuring 0.3 m by 0.28 m and 0.2 m thick, this layer was the result of cleaning out of the kiln and was approximately equal to (1085) in the working area (see below). Overlying it was another charcoal-dense deposit (1151), possibly evidence of a single firing episode of the kiln. Consisting of a loose, mid-greyish-black, silty sand with around 70 per cent inclusion of charcoal, it measured 0.6 m by 0.72 m and 0.1 m thick. Another, sandier, layer of rake-out was then deposited; (1148) was a loose, mid-brownish-yellow, silty sand measuring 1.13 m by 0.76 m and 0.13 m thick.

Across much of the kiln firing chamber and stokehole were then a series of substantial post-abandonment layers. (1091) sealed over both (1148) and (1144) and measured 4.5 m by 2.6 m and 0.46 m in thickness. Consisting of a firm, mid-reddish-brown clay silt, it was packed with brick and tile, perhaps suggesting a deliberate backfilling using nearby waste material. Within the fill were recovered another armchair voussoir and a Nero-stamped tile (Machin, p. 123, FIG. 115). The overlying layer (1060) was then interpreted as the abandonment of the local area: a slowly-accumulating deposit mixed with slumped-in rubble and other waste material including a single sherd of grog-tempered ware. It was a friable, light reddish-brown, sandy silt filling the remnant hollow of the kiln, measuring 2.8 m by 2.9 m and 0.32 m thick. (1060) was essentially the same as the overlying fill (1034) that covered Kiln 1 and the associated working area (below).

## WORKING AREA (FIGS 6, 32–33)

With the — assumed to be contemporary — second-phase renovation of Kiln 1 and installation of Kiln 2 it seems likely that the associated working area may have been enlarged or at the very least cleaned out for its new dual purpose. Therefore it follows that all of the deposits contained within it would be contemporary with this later phase.

The lowermost layer within the working area was (1140): a remnant of material raked-out from one or both of the kilns. Measuring 2.82 m by 2.22 m and 0.18 m thick, the deposit consisted almost entirely of charcoal within a dark silty sand matrix. A radiocarbon sample taken from a hazelnut shell found within (1140) returned a date range of 29–130 cal A.D. (charred plant macrofossil 1918±21 BP, SUERC-90868). Above was a similar layer of raked-out charcoal, (1113), sat central within the working area. Consisting of a loose, dark grey, clay sand comprising around 70 per cent charcoal, the deposit measured 1.26 m by 2.12 m and 0.06 m in thickness. Overlying this was (1085) which was a substantial, friable, blackish-grey, clay silt layer spread across all of the working area and into the stokehole of Kiln 1. Measuring 5.96 m by 3.56 m and 0.06 m thick, it was probably a trampled layer: a mix of disturbed natural clay, charcoal and wasters formed through activity in the area during use of both kilns. The succeeding deposits were dumps around the edges of the working area indicating that maintenance of the area may have begun to wane even if the kilns had not gone entirely out of use. Layer (1102), tipped against the south-west side, consisted of a loose, light yellowish-brown, clay sand and measured 1.62 m by 0.7 m and 0.12 m thick. Across the working area was (1114) which was a combination

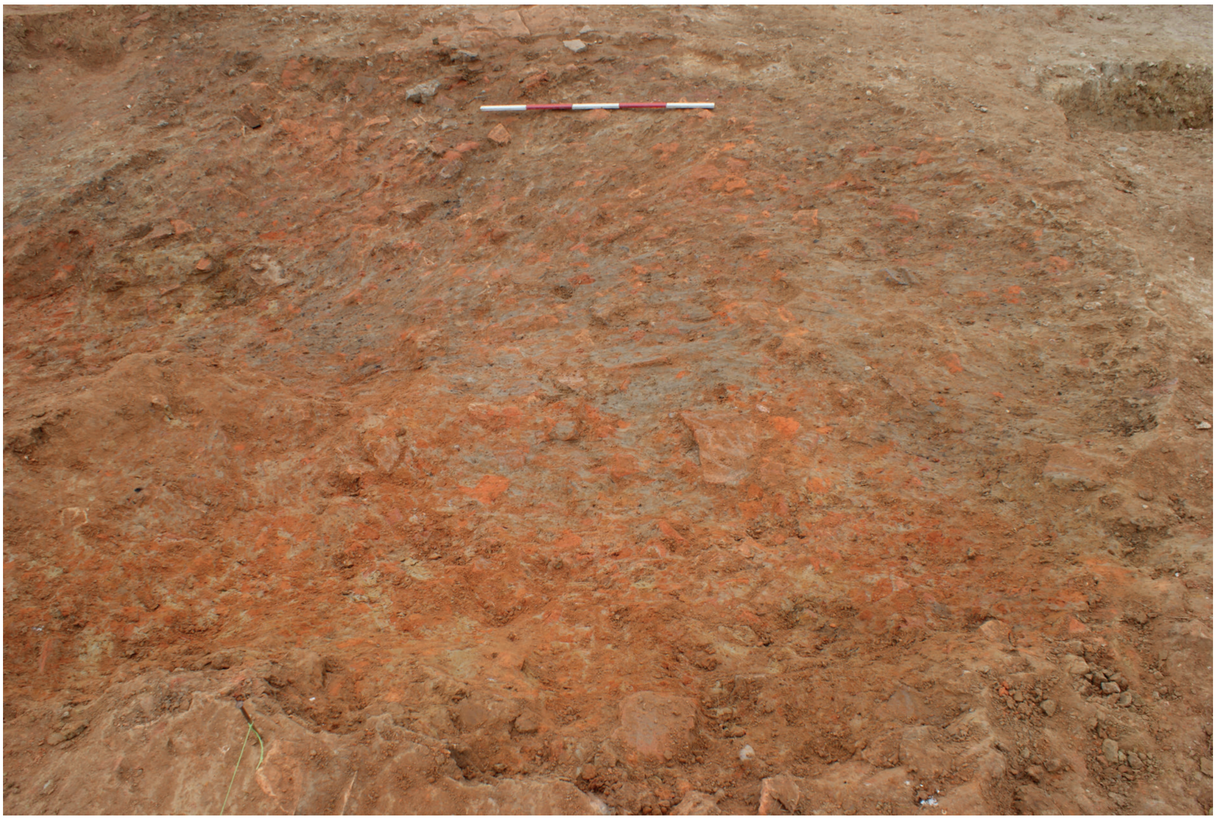

FIG. 32. Blue clay dump (1077) atop rubble (1071) within the working area

FIG. 33. Plough-scarred upper deposit (1034) across Kiln 1 and working area. Looking south-east

of various dumps sloping in from the north-east side. Overall, this was a firm, mottled-reddish-brown, silty clay measuring around 3.2 m by 1.6 m and 0.22 m thick.

Over both (1102) and (1114) was a larger deposit of rubble (1071) (FIG. 32), perhaps corresponding with the disuse of the kiln when the working area was used for dumping waste materials produced in the adjacent kiln(s) indicated by the geophysical survey (above, p. 5). Consisting of a mottled blue/reddish-brown clay, (1071) included 70–80 per cent tile wasters and measured 4 m by 3.24 m and 0.18 m thick. A thick layer of clay (1077) was then laid down, perhaps a deliberate levelling or surfacing indicative of the reuse of the working area. Alternatively, this may instead be backfilling with clay extracted from the quarry pit to the south-west that was unsuitable for brick-making and subsequently discarded. (1077) was a firm, light bluish-grey clay with very few inclusions; it measured 3 m by 2.5 m and was 0.4 m thick. There then followed a similar sequence: a large dump of waster-rich rubble (1069) overlaid by a thick deposit of blue clay (1070). (1069) consisted of a friable, mid-orangish-brown, clay silt which measured 3.26 m by 2.84 m and was 0.5 m thick. Found within the rubble was a second Nero-stamped tile (below, Machin, p. 123). (1070) was smaller in size, measuring 2.5 m by 1 m and 0.25 m thick, and was probably tipped into the working area from the north-east side. Consisting of a firm, light bluish-grey clay, it was also relatively lacking in inclusions of rubble and charcoal.

The succeeding deposits then illustrated the final abandonment of the kilns, with further backfilling of the working area followed by the gradual accumulation and erosion of nearby material into the hollow created by the redundant structures. Close to the stokehole of Kiln 1 was a small deposit of friable, light yellowish-brown, sandy silt: (1064). Measuring 1.5 m by 1.2 m and 0.15 m thick, it was relatively sterile with a small proportion of brick and tile waste. On the east side of the working area, overlying (1070), was another typical backfill dump of rubble. (1073) was a friable, mid-reddish-brown, sandy silt which measured 3.5 m by 1.5 m and was 0.2 m thick.

Uppermost and covering the entirety of the internal space of Kiln 1 and the working area was (1034) (FIG. 33): it is interpreted as the result of the slow weathering of the remaining kiln structures and the continuing silting-up of the residual depression. Consisting of a friable, mid-yellowish-brown, sandy silt, the deposit contained around 10 per cent brick and tile and had been further disturbed by later agricultural activity. Overall, (1034) measured 9.18 m by 3.4 m and was 0.3 m thick.

## QUARRY PIT (FIGS 6, 34–37)

Two large circular hollows in the west and south of the field suggested the presence of quarrying associated with the tile and brick production (FIG. 34). The northern of these two potential extraction pits, [1048], measured approximately 35 m by 27 m and filled much of the west side of Trench 1 (FIG. 36). Excavation of approximately half the area of the pit as exposed in the trench revealed it to be relatively shallow with gradually sloping, concave sides and an uneven, undulating base sloping from east to west. From the surface, the fills of the pit could be seen to be hugely varied and difficult to follow but upon excavation a clearer picture of the sequence was established. Deposits in the excavated section measured 8.3 m by 4.7 m with a depth of 1.05 m. A smaller sondage (2.2 m by 1 m) was dug into the northern edge to compare the sequences but was stopped at 0.2 m below the surface. The proximity of this quarry pit to the kilns suggests contemporaneity and it is likely that quarrying for clay was spread over several years, perhaps corresponding with the life of the kilns. Subsequently, once enough clay had been removed it would have made the perfect place to dump waste material and thus, as expected, the lower fills within the pit consisted almost entirely of kiln rake-out and wasters (FIG. 35).

Lowermost within the quarry pit were two discrete deposits: (1049) and (1072). (1049) was a small patch of redeposited natural clay and gravel formed soon after the cutting of the pit. Measuring 1.05 m by 0.9 m and 0.05 m thick, it consisted of a friable, mid-bluish-grey, clay sand and yielded a small group of seven sherds of Little London kiln pottery along with a 10 mm diameter, possible, but completely illegible, copper-alloy coin. (1072) was a firm, mottled

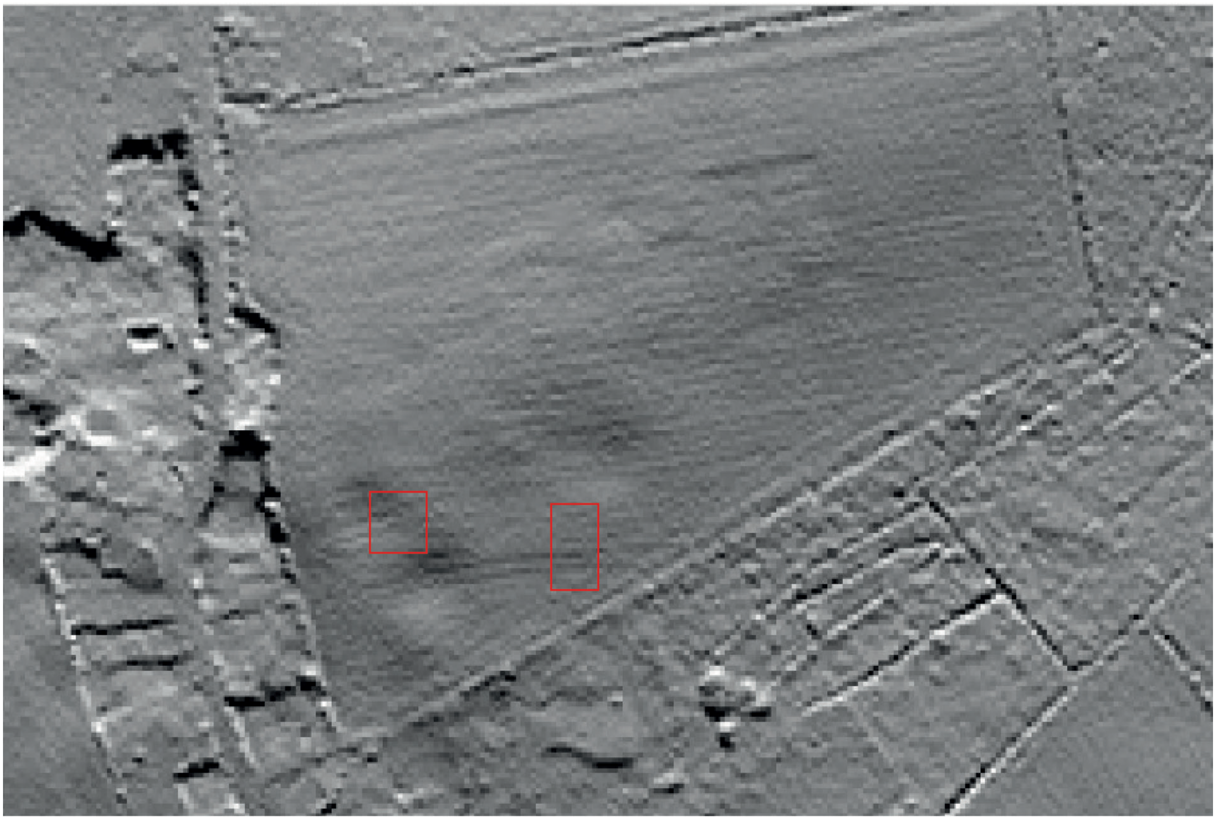

FIG. 34. Trench locations showing likely quarry pits within the field on hillshade model of Lidar DTM (© *Environment Agency/University of Reading*)

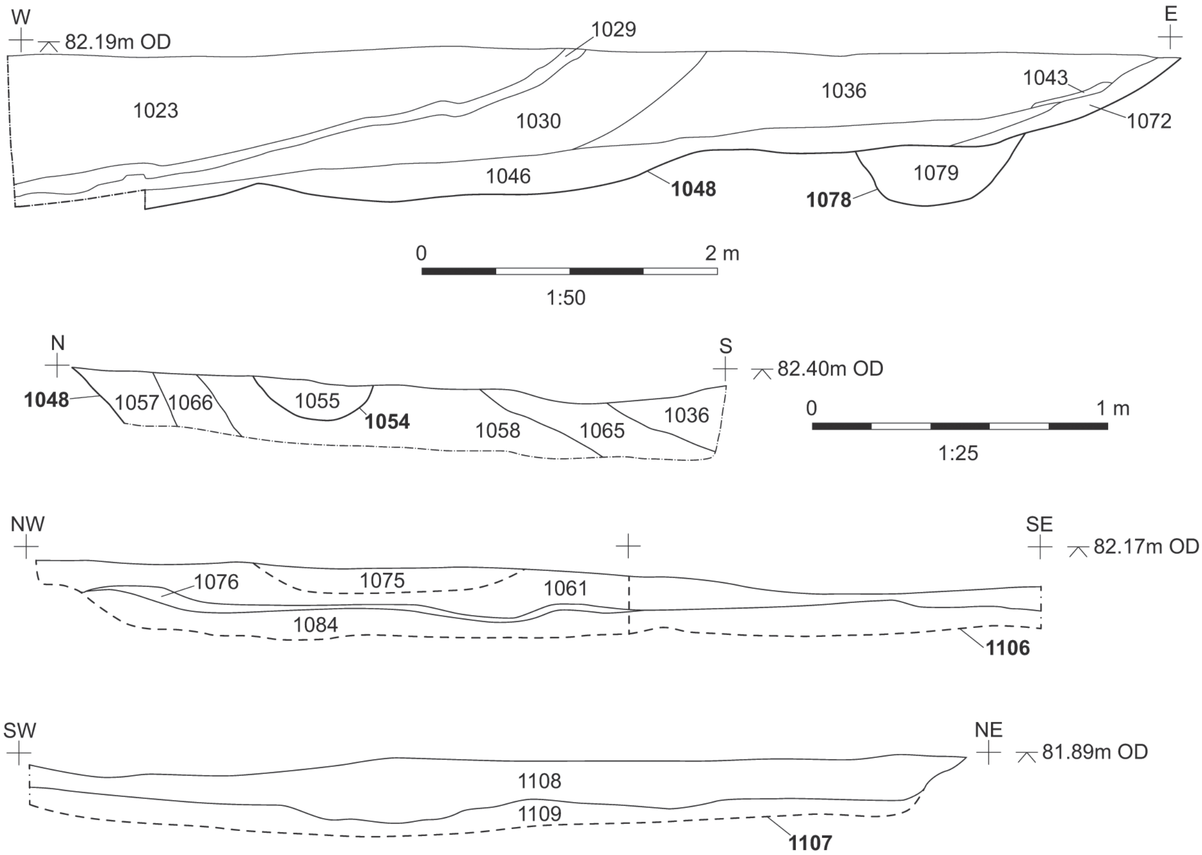


FIG. 35. Large section and section of smaller sondage through quarry pit [1048] and sections of possible puddling pits [1106] and [1107]

red and blackish-grey, sandy silt tipped in from the eastern edge of the pit. Measuring 3.2 m by 0.95 m and 0.15 m thick, it was a typical mixed dump of tile rubble merged with charcoal rake-out.

Both smaller deposits were then overlaid by a thick sandy layer (1046) that covered much of the base of the pit. Measuring 3.84 m by 2.2 m and 0.3 m thick, it consisted of a soft, light greenish-grey, silty sand. This deposit may be the result of the trampling of the sandy base of the pit by kiln workers entering the area to continue to extract better clay to the west. (1046) contained CBM with two antefixes, kiln furniture and a large assemblage of pottery, including Little London jars, flagons and the only example of a cheese press from the site (Machin, p. 102; Timby, p. 64). Another single-event dump was then deposited from the eastern side of the pit. (1043) was a loose, dark bluish-black, clay silt comprising around 80 per cent raked-out kiln-firing charcoal and measuring 1.44 m by 1.38 m and 0.02 m thick.

In the smaller section cut on the northern side of the pit the upper extent of a series of fills tipping into the pit could be seen (FIG. 35). A small part of each was excavated with finds recovered and recorded as follows.

(1057) was the earliest deposit and could be seen tipping in from the northern side of the pit. It measured 0.5 m by 1.9 m and was a friable, mid-purplish-red, silty clay containing a significant amount of scorched brick. Overlying (1057) was a charcoal-rich dump of kiln waste (1066). This measured 1.8 m by 0.18 m and consisted of a friable, mid-blackish-grey, silty clay. Sat above it was a thick layer of dumped brick and tile (1058) which was 1.1 m wide and could be seen arcing around the northern edge of the quarry pit for approximately 11 m. This was a firm, reddish-brown, silty clay and could have been formed either from the demolition and clearance of a structure, perhaps the first phase of Kiln 1, or from the waste from a kiln firing. Cut into this deposit was a small post-hole, [1054], which was probably part of a fence or lean-to associated with Kiln 1 (see above). Succeeding this was another heavy dump of charcoal, perhaps indicating the regeneration and reuse of one or more of the kilns; (1065) was a friable, blackish-grey, clay silt measuring 5.95 m by 0.2 m.

Common to both excavated sections was a substantial capping of rubble. (1036) measured

FIG. 36. Quarry pit [1048] looking north-west

8.5 m by 3.55 m and was 0.75 m thick. Consisting of a firm, mid-greyish-orange, clay silt, it was rich in brick and tile waste and, like (1058), may also have been the product of the demolition of a significant nearby structure or of waste from a kiln firing. Included within was a piece of thick-walled powdery oxidised ware: a probable saggar or kiln spacer (p. 77). Above it and similar in composition was (1030), dense with rubble and wasters, also suggestive of kiln waste or demolition of a nearby structure. Consisting of a firm, light orangish-brown, clay silt, it measured 4.8 m wide and 0.68 m thick and included a flat-rimmed hemispherical bowl with two grooves on the upper surface and a possibly deliberately-pierced base (Timby, p. 72). Sealing this was a thick layer of dumped burnt material, perhaps evidence of sustained use of the kilns again. Measuring 4.2 m by 3.3 m and 0.25 m thick, (1029) consisted of a friable, dark bluish-black, clay silt comprising 80–90 per cent raked-out charcoal (FIG. 37). A radiocarbon sample taken from within (1029) returned a date range of 52–130 cal A.D. (*Corylus avellana* charcoal 1915±19 BP, SUERC-90863). Uppermost within the large quarry-pit section was (1023), a 0.75 m thick, gradually accumulated layer including dumped CBM which measured 5.5 m by 4.05 m. Constituting a firm, light reddish-brown, clay silt, it was probably formed after the abandonment of the area and yielded a base sherd which had been trimmed into a disc shape (Timby, p. 77).

FIG. 37. (1029) Rake-out from kiln firing dumped into quarry pit [1048]. Looking south-east

## POSSIBLE PUDDLING PITS (FIGS 6, 35)

Two large, square clay deposits in the south-east corner of the trench initially suggested the presence of clay-floored buildings. Both were oriented upon the more general north-west–south-east alignment of the kilns but were revealed to be shallow, steep-sided pits. Potentially these may have been puddling pits, used for mixing the raw clay with water to achieve the right consistency but also to remove impurities or add tempering to strengthen before firing.

The larger of the two pits, the north-easterly of the pair, was [1106] which measured 3.65 m by 3.75 m and 0.24 m deep; it was divided into roughly-equal quadrants with opposite quarters excavated. Square in shape with slightly-rounded corners, the pit boasted straight, vertical sides and a flat base. Contained within were four fills, two of which were dominant, clay-rich deposits.

The lowermost fill (1084) was a firm, dark yellowish-grey clay containing both charcoal and gravel and measured 3.4 m by 2.83 m and 0.1 m in thickness. Its relationship to the underlying natural clay was extremely diffuse and it was likely the remnant of quarried clay being mixed within the pit. The overlying fill (1076) was a thin deposit of loose, light greyish-white, sandy silt. This was only seen in the north-western quadrant and measured 1.85 m wide and 0.03 m thick and seemed to mark a brief period of change of use of the pit. Above it was another substantial deposit of heavy clay (1061) which spread across the full width of the pit; it measured 3.65 m by 3.75 m and was 0.15 m thick. Similar in composition to (1084), but containing a higher percentage of charcoal. A separate deposit of charcoal, (1075), was then recorded as the uppermost fill. This measured 0.65 m by 0.53 m and 0.02 m thick and was probably a remnant of the overlying dirty ground surface that surrounded the kilns and working areas.

The second pit [1107] was approximately 1 m to the south-west respecting the same alignment. It was slightly smaller, measuring 3.55 m by 3.2 m and 0.3 m in depth, and contained just two fills which were excavated in half-section. The lowermost fill, (1109), was a compact, mid-yellowish-grey, silty clay that contained some gravel. It measured 3.55 m wide by 0.08 m thick and, like the previous example, the boundary between this fill and the base of the pit was very diffuse. Above this was (1108), a similar deposit measuring 3.55 m wide and 0.22 m thick. It was composed of a firm, dark yellowish-grey, silty clay which was very similar to (1075) as described above.

## SOUTHERN PALISADED ENCLOSURE (FIGS 6, 38–39)

Towards the south of Trench 1 was the shallow arc of a deep, straight-sided trench, 0.54 m wide and 0.67 m deep, which contained evidence of charred posts set to form a continuous palisade. It ran for approximately 15 m and, if extrapolated as a complete circle, would have had a diameter of roughly 35–45 m. The palisade trench cut through both the upper fills of the quarry pit and the trackway ditch [1024] and so is relatively late in the sequence. There was no evidence of structures within the — albeit very limited — internal space uncovered, but the palisade may have enclosed accommodation for the workforce of the pottery and tilery. Alternatively, with evidence of footprints in tiles left out to dry indicating that domesticated animals were being kept in the vicinity, the enclosure may have contained livestock.

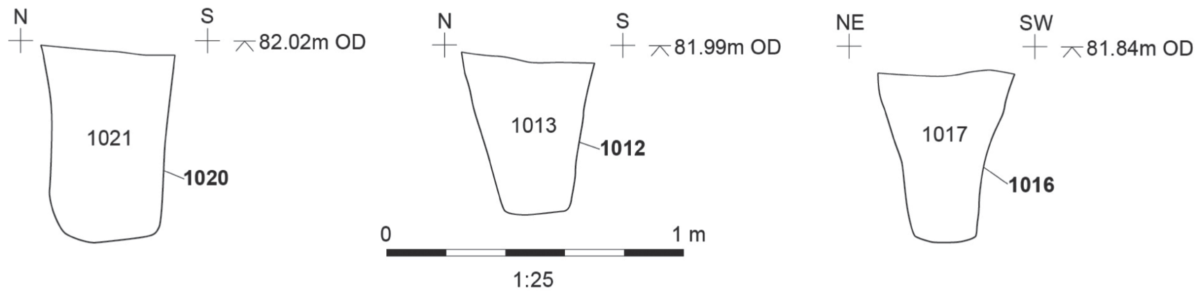


FIG. 38. Palisade trench: profiles

Three slots, [1020], [1012] and [1016], varying between 0.45 and 0.54 m wide and 0.59 and 0.67 m deep, were excavated across the palisade trench. Each was straight-sided with a flat base and contained fills (1021), (1013) and (1017) respectively. All fills consisted of a firm, mid-orangish-brown, silty clay containing some waste brick and tile and charcoal. Fill (1017) contained the remains of a charred post driven into the trench, the only post to be clearly identified in this trench (FIG. 39). Finds were limited to three sherds of pottery, including Little London kiln ware, and CBM.

FIG. 39. Charred post within palisade trench [1016]

## SUMMARY

The relationship of Trackway Ditch 1 with Kiln 1 indicates that it was already in existence before the construction of the kiln. While there are some sherds of Little London ware among a larger pottery assemblage from the primary silts at the base of Ditch 1 in the truncated (and possibly disturbed) section revealed by the excavation of the quarry, Little London ware and CBM are absent from the otherwise late Iron Age/earliest Roman pottery assemblage from the primary silts of the completely excavated section of Ditch 1, as they are from the small section excavated of the primary silts of Ditch 2. This suggests that there was occupation in the immediate area which pre-dated the start of either pottery- or brick-and-tile-making.

There were altogether only four abraded pottery sherds from Kiln 1 and a single sherd from Kiln 2 and, although the total volume of the four post-holes supporting the cover over Kiln 1 is small, it is probably significant that they contained no sherds of Little London pottery, while other post-holes beyond the kiln did contain sherds of this ware. A single sherd of Neronian samian was recovered from isolated post-hole [1089] adjacent to, but not necessarily structurally related to Kiln 1. Altogether the evidence suggests that brick-and-tile-making began ahead of the production of pottery, but probably only by a short interval, as Little London wares were found in the primary fill of the adjacent quarry pit. Judging by the scarcity of pottery finds in its fill, it is just possible that Kilns 1 and 2 were abandoned either before pottery-making began, or continued after it had ceased, the latter more likely (see Ch. 8). Otherwise pottery- and brick-

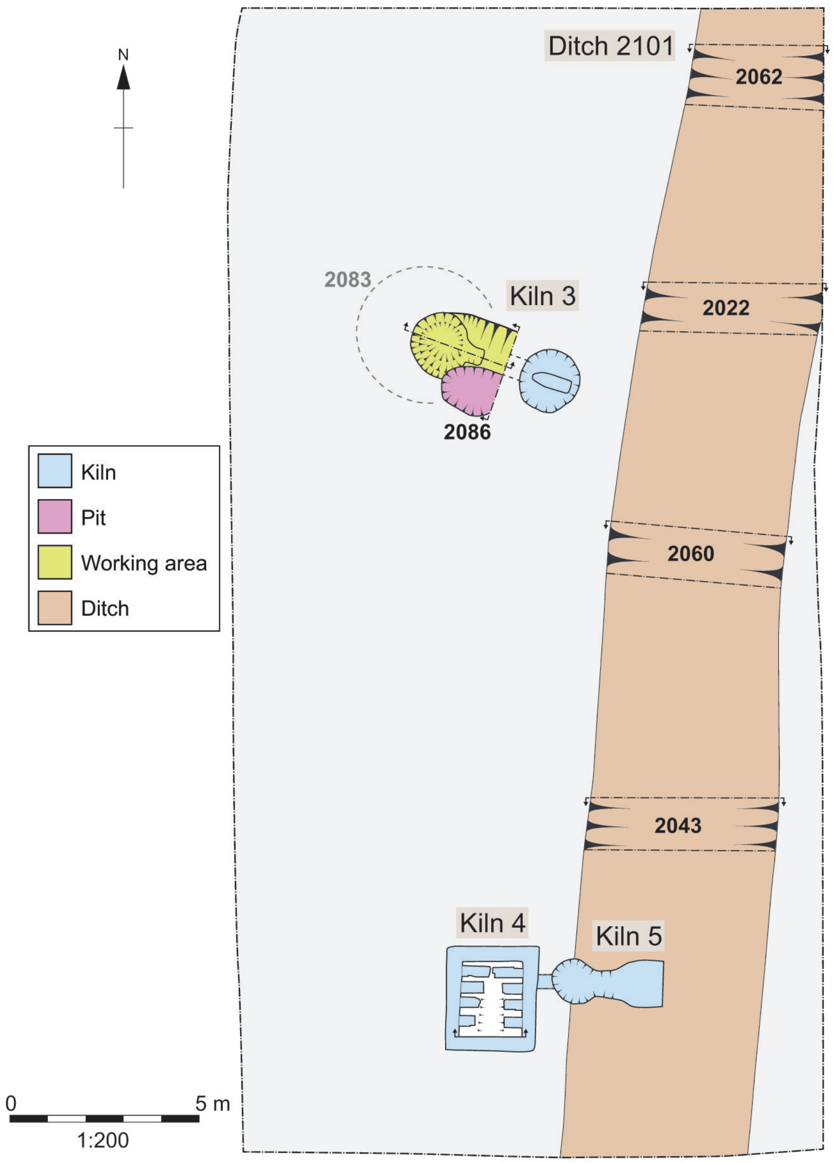


FIG. 40. Plan of Trench 2

and-tile-making, fired in different kilns, continued alongside each other. Even if early in the development of the production of both CBM and pottery at Little London, Kiln 1 was not necessarily the earliest, and we should recall the indications from the geophysics of the close proximity of adjacent kilns to the north and south (FIGS 2–3). Not only were the bricks which made up its structure fired elsewhere, discarded CBM was already available to be used to pack the post-holes which supported its superstructure. Equally production of brick and tile elsewhere across the site may not have ceased after the kiln was backfilled. Although the waste material which filled the kiln chamber could have derived from the levelling of an adjacent dump of kiln waste, it could equally well have been discard from the firing of one of the nearby kilns. The latest activity documented from Trench 1 was the creation of the palisaded enclosure revealed towards the southern limit of the excavation. It was cut into the upper deposits of the backfilled quarry pit and so could post-date brick-and-tile- and pottery-making, at least in this area of Little London.

## TRENCH 2

Trench 2 was located approximately 50 m to the east of Trench 1 and measured 15 m by 30 m. Like Trench 1, it was focused on two strong geophysics signals and a linear anomaly running north–south towards the large quarry pit at the top of the field (FIGS 40–41). Below the topsoil, the older ploughsoil had mixed with a gradually-formed deposit of hill-wash making the underlying horizon of natural geology difficult to determine. Obvious concentrations of brick and tile were apparent at the location of both potential structures but edges of other features were difficult to determine.

FIG. 41. Trench 2, looking south-west

## CIRCULAR POTTERY KILN (KILN 3) (FIGS 42–46)

Identified from the surface as a clear scorched, red circle, Kiln 3 (cut [2040]) was a circular, updraught structure which measured 1.66 m in diameter and was 0.88 m deep at its lowest point (FIGS 42–43). The edge of the firing area of the kiln had no architectural construction but was instead cut directly into the natural clay with a narrow flue/stokehole (1.92 m in width) entering into the western side and giving the appearance that it had been tunnelled through. There was no trace of a constructed arch. Through firing, the outer edges had baked solid thus stabilising the integrity of the kiln and the stokehole. Built into the chamber was a central tongue pedestal/plinth emerging from the eastern side and running for 0.98 m towards the stokehole; the latter was not excavated where it entered the kiln at which point it was 0.4 m wide. Constructed of seven courses of mixed box-flue tile and brick, the plinth, **2087**, measured 0.42 m high and 0.24 m wide and similarly had been scorched *in situ* under intense heat. The bricks and tiles were laid in semi-stretcher coursing held by a white mortar bond that had turned pink


FIG. 42. Kiln 3 looking north-west after the removal of *tegulae* **2050** from the central plinth

with firing. Around the edge of the circular chamber ran a small shelf approximately 0.22 m wide into which had been moulded a number of small recesses that probably held horizontal supports. Originally, prefabricated clay fire-bars may have been laid from the central plinth to the outer shelf to support the ceramics being fired, thus allowing the hot air to circulate freely below. However, it seems in the latest use of the kiln these supports had been replaced with reused *tegulae* roof tiles, **2050**, three of which remained fixed to the top of the plinth. The broken remains of several more were found at the base of the chamber mixed within a thin layer of pottery wasters.

The lowermost deposit within the kiln was (2051): a loose, blue sand measuring 1.22 m by 0.6 m and 0.04 m thick. This may have been a deliberate sand inclusion used as an insulator to protect the sides and base of the central plinth from the furnace heat which was evidenced by the high concentration of charcoal within the deposit. Overlying this was (2037) which consisted of a firm, mid-yellowish-blue, sandy clay measuring 1.2 m by 1.3 m and 0.22 m thick. Within this were a number of broken *tegulae*, once part of the upper firing floor **2050** which had collapsed into the base of the kiln. This marks the end of the use of the kiln, with the succeeding deposits

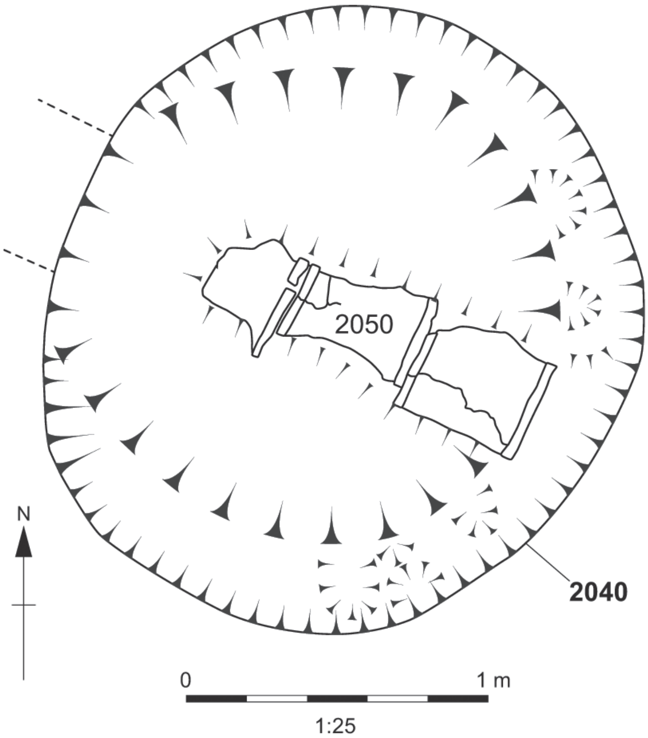


FIG. 43. Plan of Kiln 3

formed from a mixture of the collapse of the structure and backfill. (2051) and (2037) yielded a high number of white or pale pink/orange oxidised wares with examples of flat-rimmed bowls, jars, one flagon handle and a lid: very probably the type of pottery being fired in the kiln (Timby, p. 65). A radiocarbon sample taken of juvenile oak charcoal from within (2037) returned a date range of 27–208 cal A.D. (juvenile *quercus sp.* charcoal 1904±24 BP, SUERC-90860).

(2038) was a small lump of collapsed kiln structure that sat upon the remnant kiln floor, **2050**, surviving upon the central plinth. Consisting of a friable, mid-red, clay sand, it measured 0.32 m by 1.18 m and was 0.12 m thick and included a large percentage of the material that probably made up the original dome structure of the kiln: thin tiles and a scorched clay bond. Overlying this was (2018): a thick, light-grey clay measuring 1.7 m by 1.5 m and 0.35 m thick. This was one of the main deposits within the disused kiln and seems to represent a backfilling event, extraneous clay from elsewhere dumped here out of convenience. It contained one iron nail. The succeeding two fills, (2007) and (2006), were both later accumulations of slumped material filling the remnant hollow of the abandoned kiln. (2007) was a firm, mid-brownish-yellow, sandy clay which measured 1.8 m by 1.6 m and was 0.2 m thick. (2006) was similar in composition and size, the result of the accumulation of ploughsoil within the surviving depression. It contained a small fragment of colourless vessel glass.

Following the line of the flue running westwards from the kiln, a slot was dug revealing a sizeable working area that was not readily apparent from the surface (FIGS 44–46). Although not excavated to its full length, the flue ran from the kiln into a 3.5 m by 3 m area which sloped downwards towards the shaft of the flue (1.92 m wide) at a depth of over 1.1 m. The depth and bowl-shaped nature of the wider working area suggest it may have been set into an already existent hollow such as a clay-extraction pit, which may also have served as a well.

Cut number [2083] was assigned to the wider feature into which the flue and working area were set. Its full extent could not be established in plan due to the masking nature of the combined natural clay and ploughsoil but it seems likely that it was once a considerable open feature like that of the quarry pit seen in Trench 1. Within this cut, which was not bottomed, was a substantial fill of redeposited clay that was seen on all sides of the working area and stokehole: (2082). This was a firm, mid-orangish-brown clay which contained occasional inclusions of charcoal and waste tiles. It seems likely that this may have been the result of the upcast of surplus clay, deposited here from the construction of one or more earlier semi-subterranean kilns or structures in the area. Another, darker fill was also seen within the larger feature, pre-dating the construction of the kiln. (2080), a friable, mid-bluish-grey, clay sand, was at the base of the working area cut and measured 0.92 m across with an unknown depth.

The relationship between the cuts for the working area [2079] and the 'stokehole' [2084] is a little obscure at this point. Although it seems possible that they are both contemporary and dug at the same time, the shape of the rake-out deposits (2061), (2076) and (2077) leading along the stokehole is considerably wider than the flue opening that can be seen internally within the kiln. This perhaps hints at two phases of the kiln: first, a slim, circular working area [2079] firing heat through a longer, narrow, arched flue into the kiln which was then replaced by a more

FIG. 44. Working area and collapsed flue leading to circular pottery kiln (Kiln 3). Looking south-east

open working space [2084] almost adjacent to the firing chamber requiring virtually no flue.

The narrow working area [2079] was circular in shape with straight, vertical sides and a small shelf on one side projecting towards the kiln. It measured 1.68 m by 1.92 m and was excavated to a depth of 1.05 m with the earliest excavated context tipping towards the flue. Its dimensions suggest that it was a pit pre-dating Kiln 3. Depending on how much they subsided during the life of the kiln, some of the wasters from the lower fills could have originated from another kiln close by. Lowermost within the cut was (2078), a friable, dark grey, silty clay containing around 30 per cent charcoal. This measured 0.86 m wide by 0.4 m thick and was a typical mixed deposit representing a solid early period of activity. Negligible pottery was recovered from (2078) suggesting it was formed before there was much kiln waste lying around. The overlying deposit (2073) then represents a sequence of single firings, a grouped layer of thin layers of rake-out laminated between deposits of clay. This deposit represents continued clearing of the working area after each firing and contained a mixture of different soils which overall measured 1.46 m by 1.12 m and 0.22 m thick. A dark layer of burnt rake-out (2071) then tips into the working area. Measuring 1.28 m by 0.98 m and 0.14 m thick, it was a firm, dark grey, clay and probably represented a single firing episode that was then left *in situ*.

The cut of the stokehole, [2084], leading from [2079] towards the kiln, was seen to be

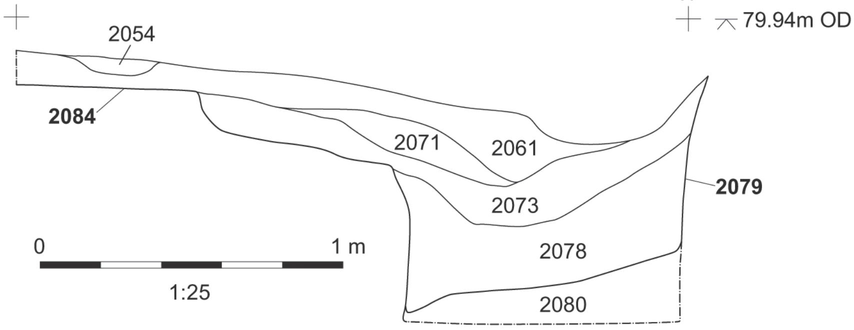


FIG. 45. North-facing section through the working area and stokehole leading to Kiln 3

generally linear, running east to west, with moderate concave sides and a flat base. Within it were a number of lenses of charcoal divided by clay resurfacings, each perhaps equating with a single firing and subsequent reuse. Although some effort was made to excavate each individual lens, a number of contexts in this area demonstrate several events, with layers (2077), (2076) and (2061) representing a number of firings, maintenance and reuse. (2077), (2076) and (2061) were each a friable, dark grey, sandy clay measuring up to 1.2 m wide and 0.1 m thick. (2061) ran 2.35 m to the west and overlay (2071). The upper lenses within (2061) represent the final use of the kiln, with the succeeding deposits formed during the abandonment of the structure. (2076) contained a small assemblage of 26 sherds of whiteware including one collared-flagon rim, whereas (2061) yielded a particularly large assemblage of nearly 800 sherds of pottery nearly all of which comprise kiln products (Timby, p. 65). Curved-wall platters were particularly prominent with a minimum of 43 vessels. Of note from this group of material is the only stamped mortarium (SF208) (Timby, p. 59, FIG. 56; Tomlin, p. 60). A radiocarbon sample taken from juvenile oak charcoal found within (2076) returned a date range of 5–125 cal A.D. (juvenile *quercus sp.* charcoal 1941±24 BP, SUERC-90862). This context also contained one iron nail.

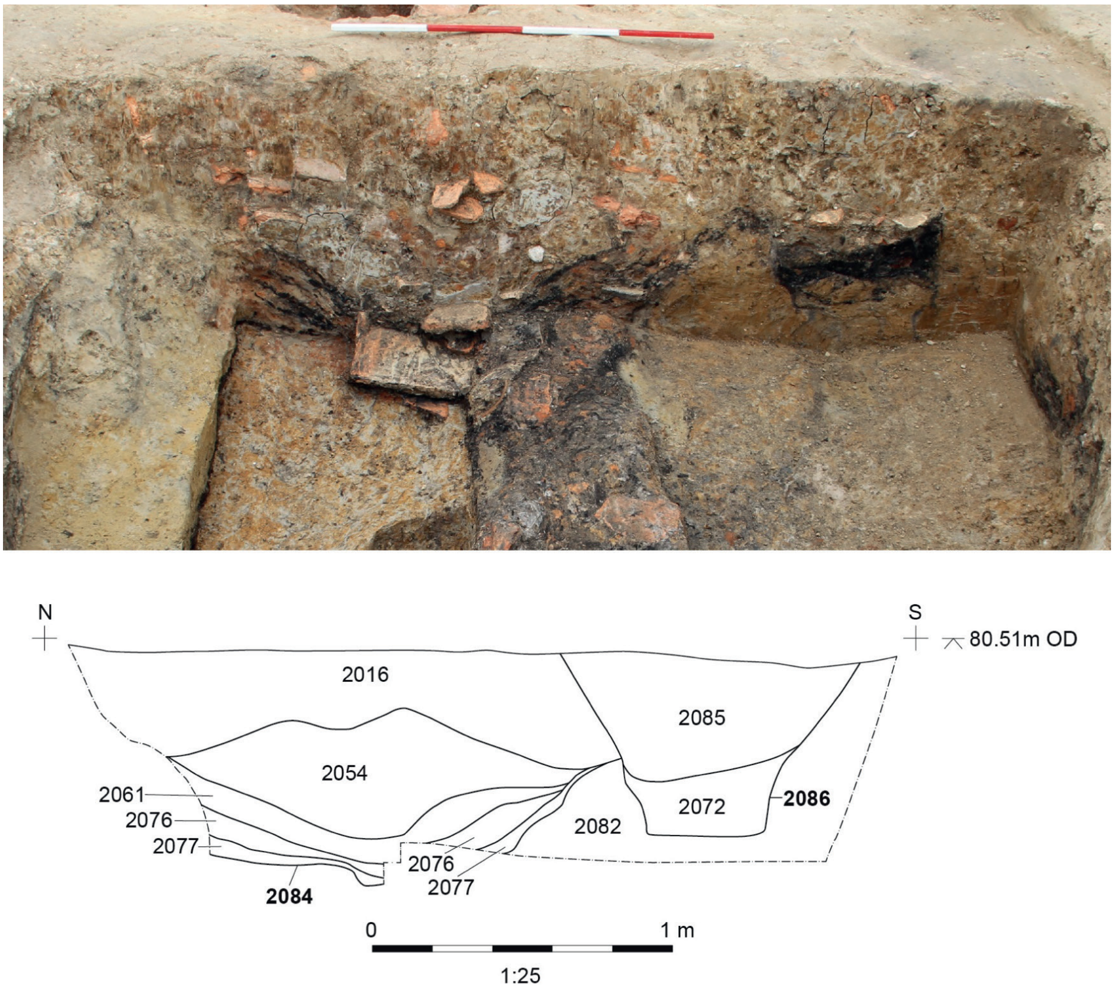


FIG. 46. West-facing section through the collapsed flue

The overlying deposit (2054) was formed through the collapse of the flue combined with the backfilling of clay into the area. Consisting of a firm, mid-grey clay measuring 4 m by 2.2 m and 0.44 m thick, it included lenses of redeposited London clay and tile wasters from nearby. Uppermost above the flue was (2016), a mixed backfill layer consisting of a friable, mid-brownish-grey, sandy clay. Seen as 1.82 m wide and 0.35 m thick, it was probably more extensive and the same event as the backfill within the kiln firing chamber. (2016) produced a further 109 sherds, including a sherd of Flavian South Gaulish samian and some pieces of probable kiln furniture in the form of saggars (Timby, p. 62), and a small fragment of a square bottle of colourless glass.

Slightly to the south was cut [2086], which was elliptical in shape and measured 1.4 m by 1.2 m and 0.6 m deep. [2086] appeared to post-date the backfilling of the kiln and working area, although its lower fill (2072) suggested it was related to kiln activity nearby, perhaps a rubbish pit for discarding rake-out and wasters as it contained 138 sherds of pottery and CBM (Timby, p. 65) (FIGS 40, 46). The pottery is unusual in composition with at least ten platters, including three stamped examples, and two dolia. The presence of platters from within (2072) suggests the backfill of pit [2086] came from the same source as that used to backfill the kiln. (2072) was a friable, black, sandy clay containing around 95 per cent dumped charcoal and measuring 1.4 m by 1.25 m and 0.26 m thick. Overlying this was a backfill deposit, (2085), which was similar in make-up to the uppermost layer seen within the kiln, flue and working areas. (2085) measured 1.4 m by 1.2 m and was 0.42 m thick.

## SOUTHERN KILN SEQUENCE — KILNS 4 AND 5 (FIGS 47–53)

Two small kilns in the south of Trench 2 illustrated three distinct phases of pottery production in this area. The earliest structure was a well-built rectangular kiln (4) with a stokehole and working area to the south, which eventually went out of use and fell into disrepair. A smaller, circular-chambered kiln (5) was then constructed approximately 1 m to the east, using the hollow of the collapsed Kiln 4 as the working area for firing the stokehole. This circular kiln was then redeveloped in a secondary phase with the stokehole turned to the opposite side utilising the slope into the north–south ditch as the working area.

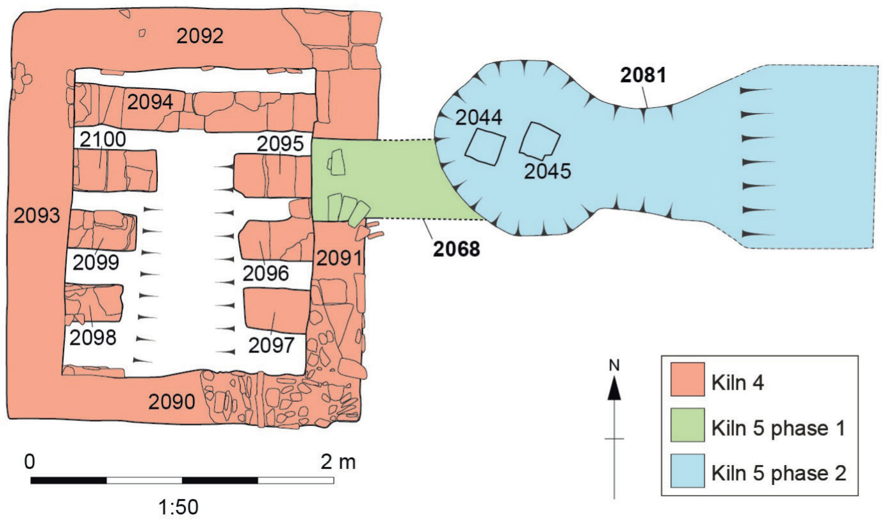


FIG. 47. Plan of pottery Kilns 4 and 5 in the south of Trench 2

## RECTANGULAR POTTERY KILN 4 (FIGS 47–51)

The earliest kiln (4) was a single-flued, updraught kiln, rectangular in shape and constructed of well-made coursed bricks and reused *tegulae*. The outer walls were up to 0.4 m thick, giving maximum dimensions of the structure of 2.38 m by 2.74 m. It was cut into the natural clay to a depth of 1.2 m. Around one third of the stokehole arch survived on the southern wall and four pairs of internal cross-walls formed arches to support the floor over the firing chamber. Within a shallow hollow dug into the base of the kiln was a deposit of charcoal and ash mixed with a scattering of broken pottery, an assemblage once again dominated by flagons and other pale wares (Timby, p. 67). As the kiln fell into disrepair or was demolished, the chamber was almost entirely filled with the remains of the collapsed walls and superstructure.

The four walls of the kiln, **2090–2093**, were all integrated as one structure, laid in a stretcher

FIG. 48. The southern pottery kilns, Kiln 4 (left) and Kiln 5 (right), looking north

course with a sandy lime-mortar bond. The bricks were generally around 0.38 m by 0.28 m with a thickness of 0.04 m, but with some having been cut down to fit the dimensions of the structure. The largest of the *tegulae* measured up to 0.44 m by 0.35 m with a thickness of 0.07 m. The back wall of the kiln, **2092**, survived to a height of fourteen courses (1.2 m) of brick with increased robbing towards the south nearer the stokehole leaving just seven.

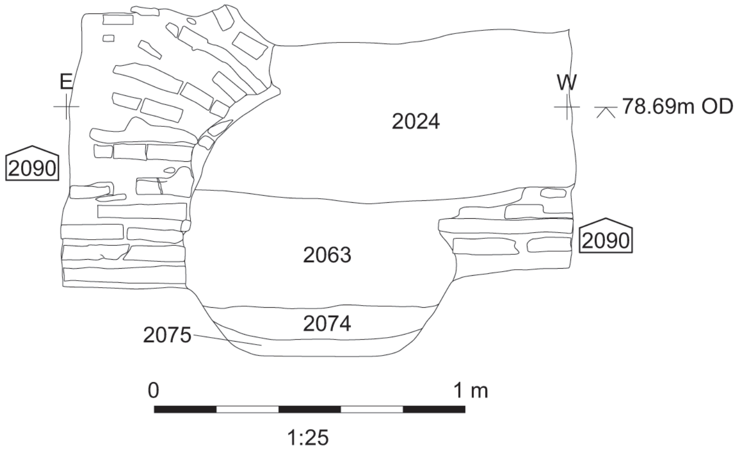


FIG. 49. Surviving stokehole arch in Kiln 4

Approximately a third of the stokehole archway survived within southern wall, **2090**, standing to a height of 0.9 m (FIG. 49). The construction method was more haphazard than that of the adjoining lower walls with a less co-ordinated arrangement of lower-quality bricks and a higher structural emphasis on the mortar bond.

Within the firing chamber survived the springers for four cross-walls which would have originally supported the floor that held the pottery vessels. Three of the cross-walls remained as six small stubs, **2095–2100**, emanating from the side walls, whereas the fourth, **2094** at the back of the kiln, stretched almost fully across the chamber, and demonstrated how the corbelling of the bricks would have supported the firing surface. Although the cross-walls were not keyed into the outer kiln walls, they were constructed with bricks similar to those used in the outer walls and were clearly of the same construction phase. **2094** at the back of the kiln survived to a height of ten courses; robbing and collapse caused the general increase in structural decay towards the south. **2098** in the south-west corner survived to a height of only four courses and, along with **2099**, displayed evidence of the bricks fusing together under the heat of firing.

FIG. 50. Ashy deposit (2075) at the base of the firing chamber of Kiln 4. Looking south towards the stokehole

FIG. 51. Looking north-east into Kiln 4, showing corbelling of the brickwork on cross-wall **2094**. The Phase 1 flue of Kiln 5 can be seen above the east wall **2091** of Kiln 4

At the base of the kiln was a small hollow running from the stokehole arch to the back of the firing chamber which contained a deposit of blue sand (2075). Measuring 1.6 m by 0.64 m with a thickness of 0.06 m, the layer was rich in charcoal and contained numerous large pieces of charred wood from the kiln firings. A radiocarbon sample taken from a portion of oak charcoal returned a date range of 39 cal B.C.–82 cal A.D. (juvenile *quercus sp.* charcoal 1964±24 BP, SUERC-90861). The lack of pottery from this layer suggests that it represented a period when the kiln was regularly maintained, with any broken wasters removed after each firing. Above this was (2074): a soft, light bluish-grey, silty sand which measured 0.6 m by 0.76 m and 0.12 m thick. It produced 162 sherds of pottery which were a mixture of white, grey and under-fired whiteware sherds with examples of flagons, jars and lids in a variety of firing colours (Timby, p. 67). This layer shows that the kiln was still being used but without being cleared out of wasters. The inclusion of degraded brick suggests the superstructure was beginning to disintegrate when this context was forming. The overlying deposit (2063) then marks a shift towards the complete abandonment of the structure. This was a firm, light-red, sandy clay measuring 2.4 m by 1.58 m with a thickness of 0.35 m. Among collapsed kiln material, a large cache of 268 pottery sherds, all from jars (Timby, p. 67), from this layer does hint at some continued firing of the kiln. Subsequently a 0.64 m thick layer of collapsed kiln structure, including possible superstructure (2024), completely sealed the remains of the kiln.

An exploratory slot was dug into the suspected working area to the south of pottery Kiln 4. Measuring 1.4 m long and 0.8 m wide, the slot reached an arbitrary depth of 0.96 m and revealed three distinct deposits. The lowermost, (2066), was a typical deposit of rake-out, 0.32 m thick and consisting of a charcoal-rich, firm, greyish-black clay. Above this sat (2065) which was up to 0.55 m thick. This was a compact, mid-orange, sandy clay which had formed mostly from the collapsed masonry that made up the stokehole arch. Uppermost was (2064), a mixed deposit combining further kiln collapse, deliberate backfill and disturbance by later agriculture. (2064) was a compact, yellowish-brown, silty clay up to 0.38 m thick (Timby, p. 67).

FIG. 52. The Phase 1 flue from Kiln 5 linking with the working area in Kiln 4 to the west

## CIRCULAR POTTERY KILN 5, PHASE 1 (FIG. 52)

Before the complete abandonment of the firing chamber of Kiln 4, the space was used as the working area for a newly-built kiln (Kiln 5) to the east. The exact form of this new kiln is unknown, but it seems most likely that it was very similar to the circular structure of the second phase of Kiln 5. All that survived of Phase 1 was a short stretch of the flue [2068] which ran east to west from the remains of the circular firing chamber to the working area in the abandoned hollow of Kiln 4. The flue measured 1.1 m long by 0.64 m and 0.15 m deep and can be seen in profile in the side of the firing chamber.

A 0.03 m-thick layer of rake-out (2069) sat at the base of the flue, comprising 90 per cent ash and charcoal within a loose, silty clay matrix. It produced one tiny colourless glass bead (Crummy, p. 179). This deposit spread into the working area within the hollow of abandoned Kiln 4 as (2017). Formed from trampled rake-out, this layer measured 1.58 m by 1.26 m and was up to 0.1 m thick. The flue was then covered by collapsed structural material (2070), a firm, mid-orangish-grey clay layer containing a number of tiles that supported the stokehole. This measured 1.1 m by 0.64 m and 0.2 m thick and was similar in make-up to the later abandonment layers in Kiln 4.

FIG. 53. Kiln 5 Phase 2. Looking east from the firing chamber down the stokehole towards the ditch

## CIRCULAR POTTERY KILN 5, PHASE 2 (FIG. 53)

The second phase of Kiln 5 involved the switching of the orientation of the flue so that it ran eastwards, sloping into the hollow of the north–south ditch that flanked the eastern edge of Trench 2. The chamber of the kiln was also redeveloped with a new lining, and presumably therefore a new dome. Unlike the other nearby examples, Kiln 5 produced very little pottery with just 11 sherds one of which was post-medieval in date (Timby, p. 69). Overall, the kiln chamber was 1.16 m in diameter and 0.52 m deep, with the flue extending approximately 1.7 m to the east before sloping away into the ditch. A rudimentary lining of clay mortar (2052) up to 0.1 m thick was applied to the chamber and stokehole and had hardened and darkened through the firing of the kiln.

Within the centre were two stacks of *pilae*, **2044** and **2045**, presumably used in a similar fashion as the tongue plinth in pottery Kiln 3, to support a surface for the vessels during firing. Each stack consisted of a series of *bessales* tiles measuring 0.2 m square and 0.05 m thick fixed together with a clay-based mortar. **2044** and **2045** consisted of eight courses and seven courses of *bessales* respectively, with the basal courses fused together due to the heat of the firings. The top of stack **2044** was scorched black suggesting it was at the level of the firing floor and exposed to the heat of the chamber.

Lowermost within the kiln was a small layer of rake-out material (2058) within the stokehole. Consisting of a hard, bright orangish-red, silty clay, it measured 0.38 m by 0.39 m and 0.02 m thick and probably represented the early uses of the kiln when it was well maintained. Above it and central to the chamber was a hard burnt layer (2053) which was spread around the supporting stacks. Potentially an attempt at re-lining the kiln after a series of uses, it consisted of a hard, dark grey clay, scorched and vitrified in many places and rich in charcoal. This layer measured 1.12 m by 1.96 m and was 0.1 m thick. Above this was (2035): a friable, mid-orange, silty clay which represented the last uses of the kiln before it fell into disrepair. Measuring 1.14 m by 1.05 m and 0.21 m thick, it contained a great deal of collapsed kiln structure, including a series of thin curved tiles (Machin, p. 96). Once the firing process was complete, the roof could be broken down to this level to retrieve the finished vessels and then built up again for the next use. Overlying (2035) was a thick layer of rubble derived from the collapse of the kiln superstructure and the continued dereliction of the area as a whole. Filling the firing chamber and 1.58 m by 1.18 m and 0.25 m thick, it included a large number of broken tiles possibly resulting from the dumping of waste from other kilns nearby.

A disturbed layer of rubble (2005) then covered the whole area across both kilns and working areas. Formed of a mixed, mid-orangish brown, silty clay it was strewn with brick and tile waste that had been further disturbed by later ploughing. (2005) was 4.96 m by 2.82 m and 0.28 m thick.

Towards the east were two ditch fills that sat within the mouth of the stokehole as it opened into the ditch. The shape of the stokehole shows that the ditch had already silted up or been backfilled quite substantially at this point but still offered enough of a hollow to act as a working area for the kiln. Both deposits were typical of the later ditch fills (see below) and appear to post-date the abandonment of the kiln. The lower of these two deposits, (2056), was a hard, mid-greyish-brown, silty clay that was 0.20 m thick, whereas the upper layer, (2055), was a friable, light yellowish-grey, sandy clay measuring 0.26 m in depth.

## NORTH–SOUTH DITCH 2101 (FIGS 54–55)

The substantial north–south ditch 2101 revealed along the eastern edge of Trench 2 appeared much less obvious on the surface than had been indicated on the geophysics scan. The edges were extremely diffuse and masked by ploughing and colluvial wash. Only a scattering of CBM in the upper deposit indicated any kind of feature, initially thought to be a shallow pathway. Four slots each 2 m wide were placed along the length of this faint impression revealing a ditch averaging over 4.5 m wide and 1.4 m deep. Generally V-shaped in profile with a narrow, flat base, the ditch contained few finds near the base, suggesting that it was constructed before intense tile- and pottery-making activity began in the vicinity. As in Trench 1, it seems the pottery kilns had been deliberately located to exploit a boundary and used the partly-filled ditch to deposit waster material. The positioning of the kilns therefore seems to preclude a bank on the west side of the ditch. Thus, although there was no trace of the accompanying bank within the excavated area, it presumably flanked the ditch on its eastern side. During the use of the nearby kilns, the ditch was filled with large amounts of waste pottery with nearly 3,000 sherds found within the four slots dug into it (Timby, p. 69).

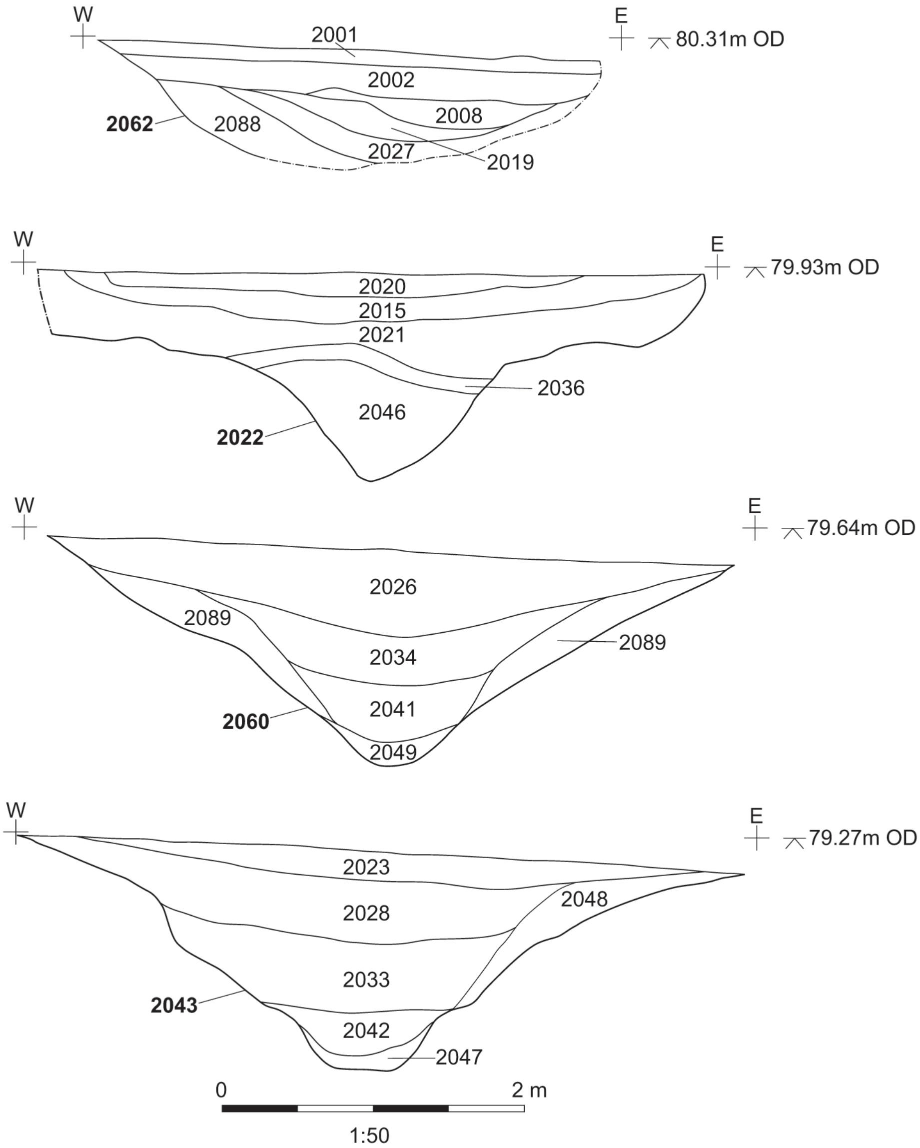


FIG. 54. North–south Ditch 2101, profiles

[2062]

The northernmost slot through the ditch was the most fruitful in terms of finds with over 2,000 pottery sherds retrieved (Timby, p. 70). Clearly a dumping ground for pottery that did not survive firing, it seems likely that much of this material came from nearby Kiln 3, but the ditch may also have been a midden for more general waste. The presence of household ceramics in fabrics other than those made at Little London, as well as samian ware, glass and a piece of tazza, also hints at nearby occupation. The volume of finds recovered from this area of the ditch meant that time did not allow it to be fully excavated and it was abandoned at around a depth of 0.8 m and a width of 3.3 m.

Seen lowermost within the ditch slot was (2088) against the western edge. This was a firm, light yellowish-grey clay that measured 1.4 m wide and 0.32 m thick. Formed of redeposited natural clay which had eroded from the sides of the ditch, it yielded no finds. Overlying this was (2027) which was a firm, mid-whitish grey clay, potentially from a demolished structure. This deposit measured 2.4 m wide and 0.18 m deep and may have been the result of sustained dumping from a nearby kiln mixed with the discarded remains of the kiln itself after renovation. The pottery from (2027) is exceptional in that it consisted almost entirely of kiln products with multiple examples of flagons, mortaria and lids with a few flat-rimmed bowls, a chimney

FIG. 55. Slot [2060] looking north-west

piece and the only tazza from the site (Timby, p. 70). It also produced one iron nail. Sat above was (2019): a firm, dark grey, sandy clay which was similarly dominated by kiln wares. (2019) measured 1.85 m wide by 0.24 m thick and was rich in charcoal rake-out as well as containing CBM and iron nails. Sat above this was (2008): a firm, mid-greyish-brown, sandy clay which measured 1.62 m wide and 0.18 m thick. This was the most abundant fill in terms of pottery with 801 sherds which included a high proportion of Alice Holt wares, and a few sherds of samian of which the latest sherds were an early-to-mid Flavian Drag. 37 and a Drag. 29, dated *c.* A.D. 60–85, of South Gaulish ware and a sherd of Les Martres de Veyre ware, probably of Trajanic date (Bird, p. 63). This group also contained small fragments of colourless glass, including a square bottle, and one iron nail. The tenor of the group from (2008) is slightly later than the other ditch assemblages and it may represent a slightly later re-cut into the top of the ditch or simply later backfilling. Overlying (2008) was a layer of intrusive ploughsoil (2002) and a cleaning layer (2001).

[2022]

Ditch cut [2022] was approximately 5 m further to the south and measured 4.62 m wide and 1.42 m deep. In this instance the sides of the ditch were more convex in shape, sloping down to a pointed base. Just 62 pottery sherds were recovered from within the slot, surprisingly few relative to [2062] and given its proximity to Kiln 3 (Timby, p. 69).

The lowermost fill, (2046), was a friable, light brownish-grey, sandy clay which measured 1.42 m wide and 0.6 m thick. This was sealed by (2036), a friable, mid-purple-grey, clay sand which measured 1.78 m wide and 0.12 m thick. Both of these basal fills contained no artefacts and the slightly heaped nature of their deposition suggests they may have been the result of deliberate backfilling rather than a gradual natural accumulation. Stratified above was (2021): a friable, light brownish-grey, sandy clay measuring 3.62 m wide and 0.32 m thick. This covered much of the upper extent of the ditch and contained the first finds, a few sherds of kiln wares.

Overlying was (2015) which measured 4.2 m wide and 0.18 m thick and yielded the bulk of the pottery, further kiln wares including a collared-rim flagon and lid knobs (Timby, p. 69). (2015) was a friable, mid-blackish-grey, sandy clay containing one iron nail which was then overlaid by a mixed layer of accumulated sandy clay. (2020) measured 3.1 m wide and 0.15 m thick and was formed by the silting-up of the hollow of the ditch and disturbed by ploughing.

[2060]

Slot [2060], which was a further 5–6 m to the south, contained just four fills with some edge collapse. The sides of the ditch here were slightly convex and sloped gently into a rounded base. Attached to either side was (2089): a firm, mid-brownish-yellow layer of eroded clay measuring 1.5 m wide and 0.25 m thick. Probably contemporary with this was fill (2049) which sat at the base of the ditch and measured 0.86 m wide and 0.18 m thick. It contained just 15 sherds of local handmade coarse wares including the knob from a Silchester ware lid and one tiny opaque black glass bead (Crummy, p. 179). Stratified above was (2041) which was a firm, mid-grey clay measuring 1.36 m wide and 0.36 m thick. This horizon yielded a large deposit of 254 sherds of pottery, including kiln waste, amongst which were two sherds of South Gaulish samian dated respectively to the Neronian-Flavian and Neronian-early Flavian periods (Bird, p. 63). Further finds came from level (2034), a firm, mid-brown-yellow clay which measured 2.6 m wide and 0.3 m thick and contained a further 146 sherds of pottery, CBM and a fragment of whetstone. The uppermost fill was (2026), a mid-brown-grey, sandy clay measuring 4.54 m wide and 0.6 m thick. This was a general silting layer that still yielded a smaller quantity of pottery and additional CBM.

[2043]

Furthest south in Trench 2, cut [2043] was 4.8 m wide and 1.46 m deep and boasted slightly irregular, convex sides and a flat base. Significantly, flint-tempered Silchester ware accounted for nearly 70 per cent of pottery from this slot with kiln products contributing just 10 per cent. As with the previous examples, there was a layer of redeposited natural clay eroded from the sides, (2048). This consisted of a firm, dark orangish-grey, sandy clay upon the eastern side of the ditch and measured 1.9 m wide and 0.3 m thick. Basal fill (2047) was similar in its formation, a typical primary deposit produced from redeposited natural clay during the initial construction of the ditch. It consisted of a friable, mottled greyish-orange, sandy clay and measured 0.9 m wide and 0.16 m thick. Overlying was (2042): a friable, mid-grey, sandy clay which measured 1.3 m wide and 0.3 m thick. This contained the first artefacts within this slot, a number of pottery sherds dominated by Silchester ware but also including a single piece of kiln ware (Timby, p. 70). The succeeding fill (2033) was a friable, light-grey, sandy clay measuring 2.35 m wide and 0.46 m thick. This yielded some relief-patterned tile, iron nails and the largest pottery assemblage from the slot: 216 sherds, of which only 11 per cent were products from the kilns. Overlying this was (2028): a firm, dark grey, sandy clay which measured 3.7 m wide and 0.42 m thick and contained a smaller, yet similar array of finds including an iron nail and part of an iron knife (Crummy, p. 179). The uppermost horizon (2023) was consistent with that seen in the preceding slots: a later silting layer mixed with ploughed-in subsoil. Measuring 4.1 m wide and 0.18 m thick, it consisted of a firm, mid-yellowish-grey, silty clay with a few inclusions of pottery and CBM.

## SUMMARY

Although the north–south ditch and the kilns are discrete features, it is possible to propose a chronological development of activity in Trench 2 from a combination of the relationships local to each feature or group of features and the associated dating evidence. The earliest kiln is likely to be Kiln 4 whose design mirrors that of the larger brick Kiln 1 and it is stratigraphically earlier than the circular Kiln 5. Its construction was predicated on the availability of bricks to make it and this adds further weight to the evidence from Trench 1 that brick and tile production preceded, if only by a short interval, the making of pottery. Like Kiln 5, Kiln 3 is circular and could, therefore, be contemporary with it. It is certainly later than the deep feature [2079] which, partly-filled, was used as its stokehole. Other than the radiocarbon dates, the waster pottery and CBM, the only independent dating evidence from the kilns is a single sherd of a Flavian South Gaulish Drag. 35 giving a *terminus post quem* for the filling of the stokehole of Kiln 3.

The earliest feature of all in Trench 2 is likely to be the north–south ditch 2101 whose basal fills either lacked any datable finds at all, except the probable post-conquest, tiny black glass bead, or included small quantities of local, non-kiln wares. This, and the absence of the types of pottery present in the primary fills of the trackway ditches in Trench 1, would suggest it is a post-conquest feature. The geophysics gives no indication of kiln structures to the east of the ditch and so it is likely that it had been created as a boundary before any pottery kiln was established.

Other than kiln wares the earliest datable material from the ditch are two sherds of South Gaulish samian of Neronian-Flavian and Neronian-to-early Flavian date from (2041), which appears to be the primary fill of a localised re-cut of the ditch in slot [2060]. Otherwise dumps of both waste pottery and other non-kiln wares are confined to the uppermost deposits of the ditch, most notably in the northernmost slot [2062], where the latest samian from (2008) included a Drag. 29, *c.* A.D. 60–85, a Drag. 37 of early-to-mid-Flavian date and a Les Martres de Veyre Drag. 36 of probable Trajanic date.

The probable Trajanic sherd is the latest closely datable pottery from the entire excavation and, along with three sherds of a second-century Dorset BB1 flat-rimmed dish from the initial cleaning of Trench 2, indicates some continuing occupation to the north of Trench 2 into the early second century. The abundance of wasters as well as of other, non-kiln, domestic pottery in the northernmost slot of the north–south ditch reinforces the possibility of both nearby settlement and a further kiln or kilns to the north of Trench 2. Given the tendency for rubbish to accumulate in ditch terminals, it is also possible that the northernmost slot is close to an entrance-way. The absence of Flavian-Trajanic forms among the waste pottery suggests that pottery production, like that of brick and tile, was confined to the Neronian to early Flavian period.

# CHAPTER 4

# THE POTTERY

*By Jane Timby*
*with a report on the samian by Joanna Bird and on the mortarium stamp by Roger Tomlin*

## INTRODUCTION AND METHODOLOGY

The excavation resulted in the recovery of 6,118 sherds of pottery weighing 86.2 kg and with 76.39 estimated vessel equivalents (EVE). Of this, some 635 sherds, 8.9 kg, came from Trench 1 and 5,497 sherds, 77.45 kg, from Trench 2. Most of the pottery dates to the early Roman period accompanied by a few intrusive sherds of post-medieval date. As this is a pottery production site, unsurprisingly a significant proportion of the pottery (73.5 per cent count, 69.4 per cent weight) comprises kiln waste. The assemblage was recorded using recommendations outlined in Barclay *et al.* 2016. To this end it was examined macroscopically and sorted into fabrics based on the inclusions present, the frequency and grade of the inclusions and the firing colour. Wares already documented at Silchester follow the same coding (cf. Timby 2018) or, where relevant, follow the codes used in the National Roman Fabric Reference Collection (Tomber and Dore 1998). The kiln products were divided broadly according to firing colour, texture and/or surface finish. Very small, shattered fragments were not classified and are excluded from the percentages. The sorted fabrics were quantified by sherd count and weight by recorded context. Rims were additionally coded to form and measured for the diameter and percentage present for the estimation of rim equivalence (EVE) (cf. Orton *et al.* 1993). A type series has been created specifically for the kiln products. The resulting data were entered onto an MS Excel spreadsheet a copy of which is deposited with the archive.

The condition of the material is variable with a mixture of good, relatively unabraded, sherds and more fragmented wares giving an overall average sherd weight of 14 g. There is no perceptible compositional difference between the assemblages recovered from the two trenches, although a greater amount came from Trench 2. Surface preservation is mixed and, as much of this is kiln waste, some sherds were too burnt to classify.

## DESCRIPTION OF KILN FABRICS AND ASSOCIATED FORMS (Table 1)

The kiln wares have been divided up into nine fabric groups (K1–K9) on the basis of firing colour and surface finish. In many cases this is not necessarily the intended colour as many sherds are under- or over-fired. The fabric used is essentially the same composition throughout, although with two variations in terms of the grade of the quartz-sand inclusions present producing finer and slightly sandier variants. In some sherds iron inclusions form a more prominent component in the clay used. Whilst most sherds are plain with no surface treatment others have been slipped. The sherds were sorted macroscopically and examined under a binocular microscope (x20).

**K1**: White-fired wares. A moderately hard fired ware with a sandy texture. The core can vary from white through to pink overlapping with fabric K7. The matrix contains a common frequency of well-sorted, fine-sub-angular quartz < 0.3 mm. Some quartz grains are iron-stained pink; others are white or clear opaque. A sparse frequency of rounded, iron-rich orange-red grains up to 1 mm are also scattered through the fabric. All the mortaria, with one exception, have angular, black, grey and white flint trituration grits, generally ranging from 2 to 5 mm in

TABLE 1. QUANTIFIED SUMMARY OF ALL THE ROMAN POTTERY FROM LITTLE LONDON

| | Code | Description | No. | No. % | Wt | Wt % | Eve | Eve% |
|---|---|---|---|---|---|---|---|---|
| IMPORTS | LGF SA | South Gaulish samian | 12 | 0.2 | 163 | 0.2 | 0.28 | 0.4 |
| | CNG TN | Central Gaulish *terra nigra* | 2 | 0.0 | 56 | 0.1 | 0.3 | 0.4 |
| | GAB TN | Gallo-Belgic *terra nigra* | 1 | 0.0 | 10 | 0.0 | 0 | 0.0 |
| | GAB TR1A | Gallo-Belgic *terra rubra* | 8 | 0.1 | 9 | 0.0 | 0 | 0.0 |
| | GYFMIC | fine grey micaceous ware | 3 | 0.0 | 38 | 0.0 | 0.1 | 0.1 |
| Amphora | BAT AM | Baetican amphora | 14 | 0.2 | 1290 | 1.5 | 0 | 0.0 |
| | GAL AM | Gallic amphora Dr 2-4 | 6 | 0.1 | 137 | 0.2 | 0 | 0.0 |
| REGIONAL | DOR BB1 | Dorset black burnished ware | 3 | 0.0 | 31 | 0.0 | 0.12 | 0.2 |
| LOCAL | ALH RE | Alice Holt-type reduced wares | 684 | 11.2 | 6033 | 7.0 | 7.83 | 10.3 |
| | SIL F1 | Silchester flint-tempered ware | 555 | 9.1 | 12790 | 14.8 | 4.97 | 6.5 |
| | FL2FE | finer flint-tempered, iron-rich | 1 | 0.0 | 77 | 0.1 | 0 | 0.0 |
| | GR1-4 | grog-tempered | 52 | 0.9 | 418 | 0.5 | 0.4 | 0.5 |
| | GRSJ | grog-tempered storage jar | 172 | 2.8 | 4342 | 5.0 | 0.41 | 0.5 |
| | GRSA | sandy with grog | 3 | 0.0 | 11 | 0.0 | 0 | 0.0 |
| | GRSAOR | sandy with grog and organic | 2 | 0.0 | 58 | 0.1 | 0.2 | 0.3 |
| | SAFEFL | sandy with iron and flint | 39 | 0.6 | 442 | 0.5 | 0.44 | 0.6 |
| UNKNOWN | BWSY | black sandy ware | 36 | 0.6 | 246 | 0.3 | 0.28 | 0.4 |
| | CA | calcareous temper | 1 | 0.0 | 10 | 0.0 | 0 | 0.0 |
| | GYSY | misc. grey sandy wares | 25 | 0.4 | 176 | 0.2 | 0 | 0.0 |
| | MISC | miscellaneous sandy | 5 | 0.1 | 46 | 0.1 | 0.03 | 0.0 |
| Kiln wares | K1 | white-fired | 1884 | 30.8 | 25145 | 29.2 | 25.63 | 33.6 |
| | K2 | grey slightly sandy | 157 | 2.6 | 2134 | 2.5 | 1.88 | 2.5 |
| | K3 | fine oxidised ware | 52 | 0.9 | 968 | 1.1 | 1.59 | 2.1 |
| | K4 | fine grey ware, iron-rich | 29 | 0.5 | 333 | 0.4 | 1.84 | 2.4 |
| | K5 | grey-slipped | 85 | 1.4 | 1244 | 1.4 | 3.08 | 4.0 |
| | K6 | fine grey ware | 48 | 0.8 | 699 | 0.8 | 1.94 | 2.5 |
| | K7 | pink-orange (under-fired K1) | 1558 | 25.5 | 14191 | 16.5 | 13.72 | 18.0 |
| | K8 | oxidised | 581 | 9.5 | 8075 | 9.4 | 8 | 10.5 |
| | K9 | white ware with colour-coat | 22 | 0.4 | 874 | 1.0 | 0.67 | 0.9 |
| | K00 | burnt sherds | 31 | 0.5 | 293 | 0.3 | 0.61 | 0.8 |
| | MORT1 | white ware mortaria | 41 | 0.7 | 4982 | 5.8 | 1.61 | 2.1 |
| | MORT2 | white ware mortaria | 2 | 0.0 | 505 | 0.6 | 0.15 | 0.2 |
| | MORT3 | as K7 | 3 | 0.0 | 342 | 0.4 | 0.31 | 0.4 |
| **TOTAL** | | | 6117 | 100.0 | 86167 | 100.0 | 76.39 | 100.0 |

size. One vessel, the only stamped example (FIG. 59.22), appears to have internal surface slurry but no grits. Fabric K1 accounts for 42.8 per cent by count and 51.2 per cent by weight of the kiln wares. It was used primarily for flagons (types FL1a–c, FL3 and FL5); bowls (BL1, BL2); jars (J2, J3, J5); lids (L1) and mortaria (M1–5). There is also a single beaker (BK2).

Superficially and texturally the fabric is very similar to Verulamium white ware and indeed would have been classified as Verulamium-type ware when encountered in previous assemblages from Silchester. At x20 magnification wasters from the Brockley Hill kilns show marginally coarser sand particles which appear to be composed of two grades, a finer and a slightly coarser;

the latter with rounded grains up to 0.5 mm in size. In general terms the quartz in the Brockley Hill sherds appears less iron-stained from the samples examined.

**K2**: Grey sandy ware. Texturally as K1 but fired grey. A moderately uncommon variant accounting for 3.5–3.6 per cent (by count and weight) of the kiln wares. Vessels include one flagon (FL2), a beaker (BK3), jars (J3, J6), several platters (PL1) and lids (L1).

**K3**: A fine oxidised ware, mid to dark orange in colour. The matrix contains a sparse to moderate scatter of mainly rounded, orange-brown iron up to 1 mm across and very rare (accidental?) flint. The quartz sand is very fine and not visible at x20 magnification. This ware contributes a very minor amount, 1.2/1.3 per cent by count/weight to the overall assemblage. Vessels mainly comprise platters (PL1), with single examples of a flanged bowl (BL1) and a two-handled flagon (FL4).

**K4**: A fine, grey ware with frequent iron specks representing a reduced version of K3. Black iron streaking is more prominent on the vessels surfaces. The matrix contains a moderate scatter of angular to rounded, black and red-brown iron mainly 0.5–1 mm in size and finer. As with K3 there is no quartz sand visible at x20 magnification. K4 is a minor fabric accounting for just 0.6 per cent (by count and weight) overall. Forms are almost exclusively restricted to curved wall platters (PL1) with a single shallow bowl (BL6).

**K5**: Grey-slipped, sandy ware. As K3/K4 but with a pale grey, semi-matt slip on the vessel surfaces, generally poorly adhered. This ware contributes 1.9 per cent by count, 2.1 per cent by weight, with most of the examples coming from working area [2079] below Kiln 3 [2040]. Vessels are almost exclusively restricted to curved-wall platters (PL1, PL3).

**K6**: Hard fired, very fine, blue-grey ware. This appears to be an over-fired version of K4. The fabric has a slightly crystalline, cindery texture with inclusions of angular to sub-angular black iron. It features in similar proportion to the other grey wares at 1.1 per cent (count) and 1.2 per cent (weight) and only occurs as curved-wall platters (PL1).

**K7**: A softer, oxidised/pink ware which is most likely an under-fired version of K1. The more friable nature is reflected in the figures as it makes up 35.7 per cent count of the kiln wares but only 24.3 per cent by weight. Vessels are dominated by flagons (FL1a, FL3, FL5) and jars (J3, J6) accompanied by bowls (BL1, BL5), beakers (BK3), lids (L1) and single examples of a dish/saggar (D1) and platter (PL1).

**K8**: An oxidised, sandy version of K1/K2. This ware contributes 12.9 per cent of the assemblage by count, 13.5 per cent by weight. It appears in a range of forms including flagons (FL1a–b, FL5), jars (J3, J6), lids (L1, L2) and single examples of a platter (PL1), dish/saggar (D1), a possible strainer (S1) (FIG. 61.71) and a cheese press (CP1). The lids feature several knobs.

**K9**: Orange-slipped, white ware. A small number of white ware sherds (K1) have a matt orange-red or brownish-red surface which seems to be from a surface slip. It forms a very minor amount, 0.5 per cent count, 1.5 per cent weight, of the overall assemblage. There is only a single rim present, from a flagon (FL3).

## FORM TYPE SERIES (Table 2)

A total of 41 types have been defined from the discarded kiln products many of which are represented by single examples. Complete profiles were extremely rare, so the typology is largely based on rim fragments. The competency of the potters is variable, reflected in bases that are either extremely thick and heavy or so thin that they have split. Overall flagons make up over half the discarded assemblage (51.8 per cent) by EVE followed by almost equal quantities (11–14 per cent) of bowls, platters and jars. All other forms account for 4 per cent or less.

TABLE 2. INCIDENCE OF FORMS PRODUCED AT LITTLE LONDON BY ESTIMATED (RIM) EQUIVALENCE (EVE)

| **Forms** | **Type (Kiln wares)** | **Type No.** | **EVE** | **EVE %** | **Fig. No.** |
|---|---|---|---|---|---|
| Flagon | collared rim | FL1a | 19.91 | 32.7 | 11, 13–14, 52–4 |
| | rectangular collared rim | FLb | 4.44 | 7.3 | 2 |
| | square collared rim * | FLc | 1.00 | 1.6 | 50 |
| | expanded squared rim * | FL2 | 0.22 | 0.4 | 38 |
| | disc-mouthed | FL3 | 3.52 | 5.8 | 4–5, 39, 56 |
| | double-handled, triangular rim* | FL4 | 0.53 | 0.9 | 12 |
| | ring-necked | FL5 | 1.33 | 2.2 | 57–8 |
| | flared with beaded rim* | FL6 | 0.27 | 0.4 | 55 |
| | funnel-mouthed* | FL7 | 0.00 | 0.0 | 51 |
| | miscellaneous other | FL | 0.27 | 0.4 | |
| Bowl | flanged rim deep bowl | BL1 | 6.06 | 10.0 | 15–16, 59 |
| | flat beaded rim hemispherical* | BL2 | 0.15 | 0.2 | 7 |
| | grooved flat rim hemispherical* | BL3 | 0.10 | 0.2 | 60 |
| | short flat rim straight-walled | BL4 | 0.11 | 0.2 | 61 |
| | shallow flat rim* | BL5 | 0.08 | 0.1 | 17 |
| | flanged beaded rim* | BL6 | 0.03 | 0.0 | 18 |
| | flanged bowl* | BL7 | 0.15 | 0.2 | 10 |
| | tripod bowl* | BL8 | 0.00 | 0.0 | 35 |
| | miscellaneous other | BLmisc | 0.15 | 0.2 | |
| Dish | curved wall dish | D1 | 0.53 | 0.9 | 84 |
| Platter | curved wall with foot-ring | PL1 | 8.00 | 13.2 | 3, 27–8, 41 |
| | curved with lid-seating* | PL2 | 0.07 | 0.1 | 62 |
| | beaded rim curved wall* | PL3 | 0.29 | 0.5 | 29 |
| Beaker | short everted rim | BK1 | 0.27 | 0.4 | 40 |
| | sharply everted with offset* | BK2 | 0.15 | 0.2 | 19 |
| | sharply everted globular | BK3 | 0.16 | 0.3 | 20–1, 63 |
| Jar | everted, hooked rim* | J1 | 0.35 | 0.6 | 8 |
| | dolium-type flat rim | J2 | 0.24 | 0.4 | 30–1 |
| | expanded rim neckless jar | J3 | 5.19 | 8.5 | 42–4, 46–7, 72 |
| | necked jar/bowl with rolled rim | J4 | 0.15 | 0.2 | 73–4 |
| | triangular cordoned rim* | J5 | 0.12 | 0.2 | 32 |
| | necked, cordoned jar | J6 | 1.18 | 1.9 | 75 |
| | necked with carinated shoulder | J7 | 0.30 | 0.5 | 33–4 |
| | grooved outer rim face * | J8 | 0.35 | 0.6 | 45 |
| Lid | plain rim | L1 | 2.16 | 3.6 | 26, 48–9, 68, 70 |
| | flat, perforated* | L2 | 0.05 | 0.1 | 69 |
| Mortarium | hooked flange, low bead | M1 | 0.81 | 1.3 | 9, 22–3 |
| | hooked flange, low bead | M2 | 1.00 | 1.6 | 24, 65–6 |
| | hooked flange, level bead* | M3 | 0.12 | 0.2 | 64 |
| | double-beaded, flat flange* | M4 | 0.25 | 0.4 | 67 |
| | double-beaded, rolled tip flange* | M5 | 0.23 | 0.4 | 25 |
| | miscellaneous – incomplete | M | 0.05 | 0.1 | |
| Cheese press | | CP1 | 0.45 | 0.7 | 6 |
| Tazza | tazza* | TZ1 | 0.03 | 0.0 | 76 |
| **TOTAL** | | | 60.82 | 100.0 | |
| | * = single example only | | | | |

**Flagons**

**FL1a**: Collared-rim flagon (Hofheim type) (FIGS 58.11, 13–14; 60.52–54). As *Camulodunum* (Cam.) 140. Single-handled flagon with a cylindrical neck and out-curved triangular lip undercut on the exterior. Rim diameters range between 50 mm and 80 mm. The form can be traced back to the later Augustan military sites in the Rhineland. In Britain the form is common in the Claudio-Neronian period and is the main flagon type found on many of the early military sites, for example, Colchester, Usk, Kingsholm, Longthorpe and Wroxeter. Production of the form ceased in the early Flavian period. It is also associated with presumed civilian kilns at Duxford (Anderson and Woolhouse 2016), Eccles (Detsicas 1977) and Canterbury (Jenkins 1956; 1960).

**FL1b**: Collared-rim flagon with a more rectangular rim with a slightly concave inner face and undercut on the exterior (FIG. 58.2). A similar variant is also found at Bricket Wood (Saunders and Havercroft 1977, fig. 5.8–12).

**FL1c**: Square-collared rim (FIG. 60.50). A single example in fabric K1 was recovered from Ditch 2101 slot [2060].

**FL2**: Heavy mouthed flagon with a squared rim expanded on the interior (FIG. 60.38). A single example in fabric K2 from Kiln 4 (2031).

**FL3**: Disc-mouthed flagon (FIGS 58.4–5; 60.39, 56). Single-handled flagon ranging in diameter from 26 to 56 mm. The form falls within Cam. types 149–151 and was made at a number of other centres including Bricket Wood and Brockley Hill (Davies *et al.* 1994, fig. 35.162–3; Marsh and Tyers 1978, type ID), although never seems to have been particularly popular. The flagon has continental origins and was found at Novaesium (Filtzinger 1972, form 16) and Hofheim (Ritterling 1913, form 55).

**FL4**: Double-handled flagon with a short triangular rim and a conical neck as Cam. type 167 (FIG. 58.12). Only a single example is present. A similar form was made at Bricket Wood (Saunders and Havercroft 1977, fig. 5.30; Marsh and Tyers 1978, type IE).

**FL5**: Ring-necked flagon (FIG. 60.57–58). A single-handled flagon with a ringed neck, limited to six examples, all from Ditch 2101 slot [2062]. The form can be traced back to Augustan-Tiberian sites on the Continent and is one of the main types to be found in the South-West from the Neronian period with examples documented from Exeter (Bidwell 2021), Lake Farm (Darling 1986), Tiverton (Maxfield 1991) and the Corfe Mullen kiln (Calkin 1935) amongst others. The South-West examples often have a more cupped profile with four or more rings. In the South-East the form becomes well documented from the early Flavian period onwards, essentially replacing the collared-rim form. Examples were found in the immediately pre-Boudican levels at Verulamium dated A.D. 55–60 (Saunders and Havercroft 1977, 125). The earlier forms have several evenly shaped rings which generally decrease in number with time whilst the upper ring expands. This form of flagon can be widely paralleled and was made at Brockley Hill and Bricket Wood (ibid., fig. 5.34–54), as well as at the early Roman establishments at Gloucester and Colchester (kiln 23) (Hull 1963, fig. 84).

**FL6**: Slightly beaded, flared rim. A single example was recovered from Ditch 2101 slot [2062] (FIG. 60.55). Possibly related to Southwark form IH2, a Verulamium area product (Marsh 1983, fig. 233).

**FL7**: A double-handled, large flagon missing the upper rim (FIG. 60.51). A carination at the handle attachment suggests it may be a funnel-mouth flagon allied to Cam. type 169/170, another type with continental parallels. The form was made at Bricket Wood (Saunders and Havercroft 1977, 122; fig. 5.25–27) and Eccles (Detsicas 1977, fig. 3.4).

**Handles**: In total 92 detached handle fragments were recovered. Apart from a single round-sectioned example, these are all strap handles from flagons with two-, three- and four-ribbed forms. Of the classifiable pieces 70.5 per cent are three-ribbed followed by two-ribbed at 18.2 per cent and just four examples of four-ribbed.

**Bases**: Most of the flagons appear to have foot-ring bases although a few are flat.

### Bowls

**BL1**: Deep, flanged rim, hemispherical bowl (FIGS 58.15–16; 60.59). The flat down-turned rim generally has two grooves on the inner and outer margins. The angle can vary from almost horizontal to well inclined; there is also some variability in the width of the rim. Vessels are mainly produced in fabrics K1 and K8. As with the flagons, the form has continental military origins and in Britain appears on early military sites such as Usk (Greene 1973, fig. 1.10), Longthorpe (Dannell and Wild 1987, fig. 41. 58b) and Kingsholm (Darling 1985, fig. 25.41–42). The form was made at Colchester (Hull 1963, kiln 23), Brockley Hill and Bricket Wood (Saunders and Havercroft 1977, fig. 8).

**BL2**: Deep, hemispherical bowl with a flat flange and small bead rim (FIG. 58.7). A single example in fabric K7.

**BL3**: Flat-rim, deep, hemispherical bowl. The rim has a single groove on the upper surface. A single example from Ditch 2101 slot [2060] in fabric K1 (FIG. 61.60).

**BL4**: Short, flat-rim bowl probably with one or two grooves. Two poorly preserved examples both in oxidised ware (FIG. 61.61).

**BL5**: Shallow bowl with a hemispherical body and a flat, double-grooved rim. A single example fired orange (fabric K8) (FIG. 58.17).

**BL6**: Shallow, hemispherical bowl displaying a beaded, flanged rim. A single example in fine oxidised ware was recovered from working area [2079] (FIG. 58.18).

**BL7**: Fragment of a double-grooved, flanged-rim bowl. Represented by a single example made in fine grey ware (K4) (FIG. 58.10).

**BL8**: Tripod bowl. A single pod recovered from the flue area of Kiln 3 [2040] suggests that tripod bowls were possibly made unless this piece performed some other function (FIG. 59.35).

### Dish?

**D1:** Simple curved-wall vessel with a flat top to the rim and a flat base. There are just five examples, three of which are heavily burnt. The slightly crude form might suggest these vessels were made to be used as kiln furniture (FIG. 62.84).

### Beakers

**BK1**: Short everted rim beaker. The rim is slightly bevelled on the interior. A single example fired white (FIG. 60.40).

**BK2**: Sharply everted, thickened rim beaker with a small offset below the rim (FIG. 59.19).

**BK3**: Sharply everted rim, globular beaker (FIGS 59.20, 21; 61.63). Broadly similar forms were made at Colchester (Hull 1963, fig. 84.11) but with roughcast decoration.

### Mortaria

In total 13 rims of mortaria are present all of which comprise the flanged type as opposed to the earlier wall-sided vessels. There is diversity in form perhaps pointing to a phase of experimentation at this time in mortaria production also seen at other contemporary kiln sites such as Eccles (Hartley 1977a, 28).

**M1**: Dropped hooked flange with a low bead (FIGS 58.9; 59.22–23). This group includes the only stamped mortarium from the site (FIG. 59.22) (see below). Unlike all the other vessels grouped here, this one does not appear to have any specific trituration grits but has a finely sorted cream slurry containing well-sorted quartz, fine pellets of clay or grog and iron. Whether further grits were intended to be added is not known. The vessel has concentric grooving on the flange and interior. The other vessels have fine flint-trituration grits composed of white, grey and black angular fragments. The bead on one example (FIG. 58.9) is quite high, approximating Cam. type 195A (Hawkes and Hull 1947, 256) noted as appearing in the Neronian period. This bears close comparison with some of the Northern Gaulish examples, notably Gillam (1970) type 238 (cf. Hartley 1977b, fig. 2.1).

**M2**: Dropped hooked flange with a low bead and hemispherical body (FIGS 59.24; 61.65–66). Fabric: K7.

**M3**: Dropped hooked flange with a small bead level with the top of the flange (FIG. 61.64). A broadly similar form is illustrated from Colchester (Hull 1963, fig. 68.19).

**M4**: Double-beaded with a short, almost flat flange (FIG. 61.67).

**M5**: Double-beaded with a short flange with a rolled tip (FIG. 59.25). Flint trituration grits.

### Lids

**L1**: Simple lids with plain rims with domed or flatter profiles ranging in diameter from 120 mm through to 360 mm (FIGS 59.26; 60.48–49; 61.68, 70). Most were probably designed to go with the flanged-rim bowls type BL1. One example has a single perforation. Most lids are in white or oxidised fabrics with a few grey ware examples. Six detached lid knobs are present and are all of solid construction. These all feature in oxidised fabrics. Lids of similar simple form were made at the Verulamium and Eccles kilns amongst others.

**L2**: One example of a small, flat lid with at least two surface grooves and a single perforation (FIG. 61.69).

### Strainer

**S1**: A single example of a possible strainer represented by a flat base-sherd with multiple perforations (FIG. 61.71). The other possibility is that this is a detached lid knob with multiple perforations.

### Platters

**PL1**: Curved-wall platter copying Cam. type 16. The vessels are furnished with a shallow foot-ring with a distinctive finger groove outside the foot, a trademark of the potter. At least seven, possibly eight, vessels carry a central, poorly impressed, potter's name stamp (see below). The diameters range from 140 mm through to 300 mm, with the highest frequency in the 180–200 mm range. The vessels occur in fine grey fired ware (K2, K4), oxidised ware (K8) and grey-slipped ware (K5) (FIGS 58.3; 59.27–28; 60.41). The form appears to be a direct copy of the Gallo-Belgic form usually found in *terra nigra* and dating to the latest phase of the industry in the period *c.* A.D. 40–70/75. In addition to the rims a large number of base-sherds with foot-rings were recovered.

**PL2**: Curved-wall platter with an internal off-set/lid-seating in grey sandy ware K2 (FIG. 61.62).

**PL3**: Curved-wall platter with a beaded rim and a shallow foot-ring. The base has a compass-incised, double-line circle in the centre surrounding a potter's stamp (see below). This form is represented by a single example in oxidised ware (FIG. 59.29).

### Cheese press

**CP**: A single example of a perforated cheese press came from quarry pit [1048] (FIG. 58.6). The form is one with military origins which occurs in the late Augustan-Claudian levels at Novaesium (Filtzinger 1972, taf. 47.7). Similar vessels were made at Eccles (Detsicas 1977, fig. 3.4.97); less commonly at Brockley Hill (Seeley and Thorogood 1994) and at the military sites at Usk (Greene 1993, type 28) and Longthorpe (Dannell and Wild 1987, 151).

### Jars

**J1**: Everted, slightly hooked rim jar with a slight shoulder carination. A single example recovered from Trench 1 (FIG. 58.8).

**J2**: Flat rim dolium-type jar. An unusual form with just two examples in fabric K1 (FIG. 59.30–31). For discussion see below.

**J3**: Neckless, globular-bodied jar with an expanded rolled, or slightly squared, rim (FIGS 60.42–44, 46–47; 61.72).

**J4**: Necked jar/bowl with a rounded, slightly beaded rim (FIG. 61.73–74).

**J5**: Triangular-rimmed jar with a narrow external cordon. Another white-fired singleton recovered from Kiln 3 [2040] (FIG. 59.32).

**J6**: Necked, cordoned jar (FIG. 61.75).

**J7**: Necked jar with a high, angular carinated shoulder and a small beaded rim (FIG. 59.33–34). This form can be directly paralleled with similar vessels from the kiln site in Field 410, Brockley Hill (Castle 1973a, fig. 2.4–5). Tyers (1998, 296) considers that these distinctive jars might be related to a similar style of jar made in the area of Lyon and to its east.

**J8**: Jar with a grooved outer rim (FIG. 60.45).

**Bases**: The jars generally have flat bases many of which show concentric marks on the underside where the vessel has been removed from the wheel using a wire.

### Tazza

**TZ1**: A single example of an oxidised tazza with a carinated profile decorated with finger frilling on the lip and carination (FIG. 61.76). Tazze feature amongst the products of the Verulamium kilns at Bricket Wood (Saunders and Havercroft 1977, fig. 11.203) and Brockley Hill (Tyers 1983, 11).

## POTTERS' STAMPS

1. FIGS 56; 59.22. Mortarium type M1. Deposit (2061), [2084/2079]. Fabric K1 variant. Impressed stamp to right of spout; other side missing. The stamp is set within an ansate-shaped frame with the first and last letters located within the ansates. Reading slightly faint over the flange making some letters difficult to decipher (Tomlin, below). The vessel has scoring on the flange and lower interior but not immediately adjacent to the spout. The interior appears to have a thin wash of slurry but no very clear trituration grits. The fabric is slightly coarser than the other mortaria but falls into the expected spectrum of wares from the kilns.

Other occurrences of ansate-shaped stamps have been noted at Colchester as part of the overall frame and with a rectangular surround. This includes the Verulamium potter Secundus dated A.D. 60–90 (Hartley 1999, S17; S19) and the Sexti Valerii group of potters thought to be working at Colchester in the same period (ibid., 201, fig. 4.26.84 and 105–9). Finds from this group elsewhere seem to imply production before the Boudican destruction. Hartley (ibid., 201) suggests that this group of potters, linked by the same *praenomen* and *nomen*, were freedmen who customarily took the *praenomen* and *nomen* of their former owner. The potter A. Terentius Ripanus, probably based in Gloucester, also used an ansate panel for his stamps (Birley 1949,


FIG. 56. The mortarium stamp

fig. 2.3), in this case with a herringbone border on the top and bottom. An example of this stamp came from the College of Art pottery kilns, Gloucester (Rawes 1972, fig. 8. *M*10). The mortaria produced by this potter have a bead lower than the flange thus resembling the Little London M1 type. Hartley (1972, 50) suggests a date of A.D. 60–90 would fit the work of A. Terentius Ripanus whose products have been documented at Alcester, Castleford, Caerleon and Wroxeter. Other examples of ansate-framed stamps include a mortarium from the Apple Tree Farm military kiln site, Heworth, York, in Eboracum oxidised ware which is dated to the early second century (Wilson and Price 2002, fig. 7.82). None of the examples of ansate stamps cited have a letter placed within the ends of the frame which currently seems unique to the Little London die.

The only direct parallel for the Little London vessel at present comes from a find made in excavations at Thames Valley Park to the east of Reading (Smith and Barnes 1997). The vessel, thought at the time to be a product from the Verulamium region, came from an enclosure ditch (Mepham 1997, fig. 37.20). It shows one surviving, poorly impressed stamp to the right of the spout interpreted as RICAII which appears to be from the same die as the Little London stamp. In total 34 sherds of Verulamium mortaria are noted as present from this site (ibid., table 13) which may well be further examples of Little London vessels.

### **The mortarium stamp** *By R.S.O. Tomlin*

Ansate stamp, 51 by 13 mm, impressed across the flange at right-angles to it. Only four letters have registered well: the small capitals in the two *ansae*, A (left) and O (right); the first letter within the rectangular panel, which is R; and mid-way, the letter A. Between R and A, there are two letters, both quite faint: I (or possibly a narrow E) and C (or possibly G). A is followed by two verticals, both even more faint: H, II and EI are possibilities, but it rather looks as if the first 'I' extends right at the foot, suggesting LI. With these reservations, the following reading is proposed: A RICALI O

As Timby has already noted, ansate mortarium stamps are uncommon; and the only previous instance of this stamp is Mepham 1997, 62, no. 20 (said to be 'stamped RICAII on rim'), which can be read from fig. 37.20 as [.] RICAII O. There is no other ansate stamp with a letter in each *ansa*. Such a design-element was rare, to judge by legionary 'centurial' stones in Britain: these are quite often ansate, but only two have letters in the *ansae*, *RIB* 1389 and 2137, presumably the initials of centurions.

The meaning of the Little London stamp may only be conjectured. Hartley (1999, 201) has rightly suggested that the Sextus Valerius group of stamps at Colchester record different freedmen of the same master, who all took their patron's *praenomen* and *nomen* but retained their own (slave) name as a *cognomen*. By analogy with this group, the Little London stamp would be that of an A(ulus) O(...) Ricalus, who used the form *A(uli) Ricali O(...)*: his *praenomen*, *cognomen*, *nomen* in the genitive case. His most likely *nomen* would then be *O(ctavius)* or *O(ppius)*.

His *cognomen* is more difficult. *Ricalus* is unattested, but the unique name *Uricalus* is found at Bath (*Tab. Sulis* 94.1, where it is compared with *Calus*, which is attested). It is possible, though, that the potter's name was really *Regalis*. As already noted, E and G are just possible, although I and C look much more likely; but confusion may occur between unstressed <*e*> and <*i*> and between <*c*> and <*g*>. *Regalis*, although a Latin *cognomen*, was popular in Celtic-speaking provinces because it 'embodied' the Celtic name-element found in, for example, the titles of Mars Riga (*RIB* 711) and Mars Rigonemetis (*RIB* III, 3180). *Regalis* is indeed the name of a Colchester mortarium potter (Hartley 1999, S70), but although the end of the Little London name can be read as LI (genitive), there is no S: –LIS or even –IS cannot be read.

*Addendum*

There is a hint of a rightward stroke at the top and bottom of 'I'; and perhaps even at the middle; and likewise a short vertical stroke making 'C' into 'G'. (But the two latter traces are very slight, and may only be over-interpretation of the low, granular surface.) Nonetheless, A REGALI O, *Regali(s)* between *A* and *O*, seems a likely reading.

2. FIGS 57; 59.29. Platter forms PL1, PL3. At least seven, possibly eight, platters are stamped with what appears to be the same die. In two cases just the edge of the impression is visible. The stamps are in all cases extremely poorly defined and partly clogged with clay. In two vessels only the edge of the cartouche is visible and one is too worn to detect any letters, showing just the rectangular surround. It is difficult to tell if the letters are legible or illiterate as some appear to be, and the surrounding rectangular frame is poorly defined. In all cases the stamps are centrally placed on platter bases and in at least one case surrounded by an incised circle. Both forms PL1 and PL3 were stamped, with three or four examples occurring in grey-slipped ware (fabric K5), two in fine oxidised ware (K3) and two in fine grey ware (K2). Five vessels came from working area [2079], two from the backfill of Kiln 3 [2040] and one from Ditch 2101 slot [2060]. No other examples of this potter's work have been identified from Silchester or the surrounding area to date.

## GRAFFITI

Two examples of pre-firing graffiti and three examples of post-firing graffiti were identified. The base of a mortarium from Kiln 4 (2031) had a cross on the underside made before firing (FIG. 62.85). A body sherd from Ditch 2101 slot [2062] showed the edge of a graffito at the break similarly made before firing (FIG. 62.87).

Of the three examples with post-firing graffiti, two are body sherds of kiln ware (FIG. 62.88–89) and one is a grey sandy ware with the graffito on the underside of the base (FIG. 62.86), all from Ditch 2101 slots [2060/2062].

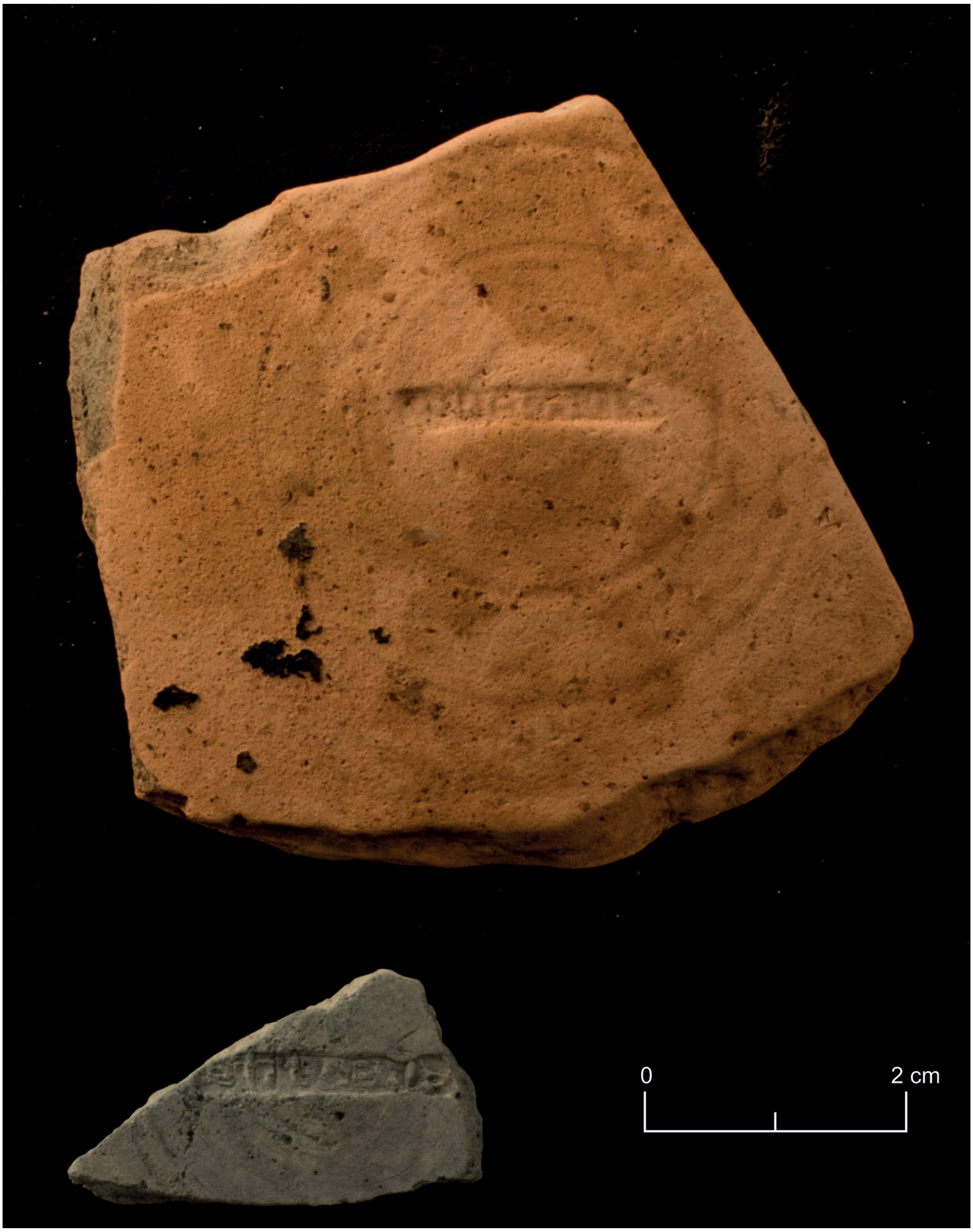


FIG. 57. Potters' stamps on platter forms PL1 and PL3

## KILN FURNITURE

At least six, very thick walled, curved sherds in kiln ware may come from saggars or some other form of kiln furniture. Only one of these, recovered from quarry pit [1048], has a rim (FIG. 62.83). The five other sherds came from the backfills of Kiln 3 [2040], mainly in fabric K7, but with one totally burnt piece. Other sherds/vessels which perhaps should be seen as potential kiln furniture are the dishes (D1) (FIG. 62.84) which are quite crudely made. There are six examples of these, three completely burnt, two in fabric K7 and one in fabric K8. Five were recovered from the upper fill of Ditch 2101 slot [2062] and one from Kiln 3 [2040].

## NON-KILN WARES

### THE SAMIAN *By Joanna Bird*

**Trench 1**

*Post-hole [1089] (1088)*
Plain bowl, probably Ritt. 12 rather than Curle 11, La Graufesenque, Neronian.

**Trench 2**

*Ditch section [2060] (2041)*
Drag. 29 or 37 probably, La Graufesenque. There are faint traces of what is probably moulded decoration, but nothing identifiable. Neronian to Flavian.
Drag. 27, La Graufesenque, Neronian to early Flavian.

*Ditch section [2062] (2008)*
Drag. 29 rim, La Graufesenque. Only fragments of the upper zone decoration survive. *c.* A.D. 60–85.
Drag. 29, La Graufesenque; probably a different vessel from the rim sherd. Traces of a possible mould signature are present below the decoration, of which only a fragment survives. *c.* A.D. 55–75.
Drag. 37 base (two sherds), La Graufesenque, early to mid-Flavian.
Drag. 27, La Graufesenque, Neronian to early Flavian.
Drag. 15/17 or 18, La Graufesenque, Neronian to Flavian.
Foot-ring, La Graufesenque, second half of first century.
Drag. 36, Les Martres-de-Veyre, probably Trajanic.

*Kiln 3 [2040] stokehole (2016)*
Drag. 35, La Graufesenque, Flavian.

### OTHER WARES (Table 1)

Non-kiln wares make up 26.5 per cent of the assemblage by count, 30.6 per cent by weight. These comprise a mixture of imported wares and local first-century A.D. coarse wares with three second-century sherds from a Dorset black burnished ware flat-rim dish from cleaning over Trench 2. A significant proportion of the non-kiln wares, 71 per cent, were recovered from the large Ditch 2101 slots [2022/2043/2060/2062] with a further 15 per cent distributed across other Trench 2 contexts and 14 per cent from Trench 1. Imported wares include a Cam. 2 platter and Cam. type 52 dish both in Central Gaulish *terra nigra* (CNG TN) (FIG. 59.36), a carinated beaker Cam. 120 in Gallo-Belgic *terra nigra* (GAB TN) and nine sherds from a pedestal beaker in *terra rubra* (GAB TR1 A). A decorated bowl in micaceous grey ware (FIG. 61.79) from the upper fill of Ditch 2101 slot [2062], may also be a continental import. Amphorae include 14 sherds of Baetican type and a much worn handle from a Dressel 2-4, probably in a Lyon/Rhône Valley fabric.

The remaining non-kiln assemblage comprises coarse wares overwhelmingly dominated by products of the Alice Holt kilns which contribute 11.2 per cent to the overall assemblage. These include everted, bevelled and beaded rim jars, neckless jars, necked, cordoned jars/bowls (FIG. 61.80), 'Atrebatic'-type bowls and dishes (FIGS 59.37; 61.81–82), a lid, a beaker and a flask. Coarse flint-tempered Silchester wares account for a further 9.1 per cent (count) of the total assemblage and mainly comprise large jars and lids, including a fine example with a solid knob (FIG. 61.77). The remaining coarse ware assemblage consists of a range of grog-tempered wares, including a storage jar and a necked, cordoned jar (FIG. 61.78), and an iron-rich sandy ware with flint (SAFEFL). This ware is not one instantly recognisable from the Silchester assemblages but has been found on sites in the hinterland. Featured sherds include beaded rim jars and a lid. Most of the sherds come from Ditches [1181] and 2101 slots [2022/2062] and working area

[2079]. Six sherds from one handmade vessel were in the primary fill (2029) of Ditch 2101 slots [2022/2062].

## MODIFIED SHERDS

A few of the bases of the kiln products had been holed and in most cases this could be accidental due to poor throwing where the bases had become too thin, or may have been a deliberate act by the potter when discarding failures. Vessels which appear to be deliberately holed include a flagon base with a foot-ring from Ditch 2101 slot [2062], a bowl (BL1) from quarry pit [1048] and possibly a vessel with four holes also from Ditch 2101 slot [2062].

A sherd from an oxidised, grog-tempered storage jar from Ditch 2101 slot [2062] (2008) appears to have an iron object piercing the wall. The item is extremely corroded but could possibly be the remains of an iron strap or repair rivet. Two base-sherds from quarry pit [1048] and Ditch 2101 slot [2060] may have been trimmed to form two circular disks or stoppers (FIG. 62.90–91). The one from quarry pit [1048] is quite abraded.

## DISTRIBUTION OF POTTERY

### TRENCH 1

Trackway ditch [1086] produced a total of 164 sherds weighing 2100 g and with 0.95 EVEs. No pottery was recovered from the lower fills with the first group of material coming from deposit (1062) with 85 sherds. None of these wares are kiln products, with sherds of Silchester ware, Alice Holt ware (FIG. 58.1), one calcareous-tempered ware and ten sherds of amphorae comprising Baetican and Gallic sherds. The latter features a very worn and abraded Dressel 2-4 type handle and is probably in a Lyon fabric. A further group of 26 sherds of pottery came from layer (1056), all of which are kiln fabrics including a collared-rim flagon (FIG. 58.2) suggesting that the trackway ditch had been dug and partially backfilled before the kilns were in operation. Sealing horizon (1041) with just five sherds included a mixture of kiln ware amongst which is a platter (FIG. 58.3), Baetican amphora and Alice Holt ware, whilst layer (1040) produced 48 sherds also of mixed type with kiln ware, Silchester ware, grog-tempered storage jar and a black sandy ware.

Ditch [1024] produced pottery from three levels including the primary fill (1137). In total 82 sherds weighing 678 g and with 0.44 EVEs were present. Primary fill (1137) produced 11 sherds comprising a Gallo-Belgic *terra nigra* beaker Cam. type 120 and nine fragmentary sherds from a *terra rubra* (TR1A) pedestal beaker and a grog-tempered ware jar. This group could be immediately pre- or post-conquest in date. Layers (1134/1133/1136) forming the main ditch fills were aceramic with the remaining pottery coming from the uppermost layers. Deposit (1120) contained just seven sherds, which feature kiln ware and Silchester ware, whilst fill (1112) yielded a larger assemblage of 61 sherds consisting of kiln ware, Silchester ware, Alice Holt wares and a beaded-rim jar in an iron-rich sandy fabric.

The section through quarry pit [1048] encountered a further section of ditch (1025) (ditch [1078]) with a single fill (1079) containing 31 sherds of pottery most of which come from a Silchester ware lid and a copy of a Cam. type 2 platter in grog-tempered ware (GR4). There are also five sherds of kiln ware which may be contamination from the quarry fill.

Quarry pit [1048] contained a moderately large assemblage of 274 sherds weighing 4805 g and with 4.43 EVEs. The bulk of the material is kiln waste, 75 per cent by count, with the remaining sherds mainly of Silchester ware and Alice Holt reduced ware. The kiln wares include two examples of disc-mouthed flagons (FL3) (FIG. 58.4–5), the only cheese press from the site (FIG. 58.6), a jar (type J1) (FIG. 58.8), at least two mortaria (FIG. 58.9) and four flat-rimmed bowls (BL1–2) (FIG. 58.7). One of the mortaria is worn from use and one base appears to have been deliberately holed. The group also includes a possible saggar (FIG. 62.83).

No pottery was recovered from the square pits [1106] and [1107] but very small groups of pottery came from the various other features on the site including post-holes [1014], [1045],

[1089], [1038], [1063]; gullies [1016], [1020]; and drain [1024]. With the exception of post-holes [1038] and [1089], all these features produced sherds of kiln ware indicating contemporaneity with the production period. Post-hole [1089] produced a single sherd of Neronian samian whilst post-hole [1038] had one sherd of Silchester ware.

Aside from drain [1024], the tile kiln produced very little pottery with just four abraded sherds of kiln ware from the upper fills. Kiln 2 was similarly devoid of pottery with a single sherd of grog-tempered ware from rubble (1060).

## TRENCH 2

### **Kiln 3 [2040] and associated features** (Tables 3 and 5)

Pottery from the various deposits associated with Kiln 3 [2040] amounted to some 1,799 sherds weighing just under 24 kg (Table 3). A further 138 sherds, 1.9 kg, came from later pit [2086]. The assemblage has been split into four groups: pottery from the rake-out in the stokehole area mixed with material from the upper levels of working area [2079]; pottery from within the kiln structure; material from the upper levels and demolition deposits; and finally pottery from cut [2086].

None of the pottery recovered from Kiln 3 [2040] could directly be related to the use of the kiln but was recovered from abandonment deposits within and above the kiln structure. Layers (2006), (2037–8), (2051) and (2076) collectively yielded a modest group of 201 sherds weighing 1.9 kg and with 1.21 EVEs. Forms include flagon, flat-rimmed bowls, jars and lids but no platters. A larger amount of pottery, some 1,013 sherds weighing 14.0 kg and with 14.07 EVEs, was recovered from layers overlying the kiln (2007, 2016, 2018, 2054, 2061). This contained the greatest number of non-kiln wares, although still only 8 per cent of the total. Of note amongst these is a single sherd of South Gaulish samian dish Drag. 35 dated to the Flavian period, a sherd of Baetican amphora and two Central Gaulish micaceous *terra nigra* vessels (Cam. 2 platter and Cam. 52 bowl (FIG. 59.36)), potentially of pre-conquest date. The remaining wares comprise grog-tempered ware, Silchester ware, Alice Holt reduced wares, including a 'Surrey-type' bowl (FIG. 59.37), and various reduced sandy wares. The kiln wares from these upper fills are dominated by white-fired ware (K1) and under-fired ware (K7) which together account for 73.9 per cent by sherd count followed by oxidised wares (K8) at 7.6 per cent. Each of the other wares accounts for less than 3 per cent of the assemblage. Forms include flagons (FIG. 58.11–12); bowls, including a single pod or leg (FIGS 58.15; 59.35); beakers (FIGS 58.10–18; 59.19–21); mortaria (FIG. 59.22–25); lids; platters and jars (FIG. 59.32). In terms of forms, collared-rim flagons (FL1) dominate (28.8 per cent EVE) followed by curved-wall platters (28.7 per cent), flat-rimmed bowls (17.8 per cent) and mortaria (8.7 per cent).

Working area [2079] produced a very small assemblage of three sherds of kiln ware weighing 128 g from fill (2078). The rake-out from the stokehole mixed with the upper pit levels (2071) produced a further 163 sherds of pottery, 2709 g and with 4.57 EVEs. Apart from one sherd of Silchester ware and six of Alice Holt reduced ware, the sherds are all kiln products and are particularly dominated by white wares (fabric K1) at 43 per cent count, followed by oxidised/pink wares (fabric K7) at 29.45 per cent. Just over half the rims, 50.7 per cent EVEs, comprise collared-rim flagons (FL1) (FIG. 58.13–14) followed by 36.4 per cent curved-wall platters (PL1) and a smaller number of bowls (FIG. 58.16, 18), thus mirroring the repertoire from [2079].

Pit [2086], thought to cut the kiln deposits, produced a sizeable assemblage of 138 sherds weighing 1932 g and with 3.33 EVEs. With two exceptions, the sherds are all Little London kiln wares, and are dominated by grey-slipped wares (fabric K5) followed by fine oxidised wares (fabric K3). Most of the fabric K5 sherds are curved-wall platters (types PL1, PL3) (FIG. 59.27–29) which effectively account for 58.7 per cent EVE, followed by collared-rim flagons (type FL1a) at 28 per cent EVE. Of particular note is the presence of the only two examples of dolia-type jars (Type J2) (FIG. 59.30–31); two jars with carinated shoulders (FIG. 59.33–34); a bowl (FIG. 58.17); and a lid (FIG. 59.26). The similarity of this material with that from within the kiln itself suggests the fills were derived from a similar source material. This is the largest dump of

TABLE 3. QUANTIFIED SUMMARY OF FABRICS FROM DEPOSITS ASSOCIATED WITH KILN 3 [2040]

| | | Kiln structure fills [2040] | | | | | | Upper fills Kiln 3 [2040] | | | | | | Rake-out /Working area [2079] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fabric** | **Description** | **No.** | **No. %** | **Wt** | **Wt %** | **EVE** | **EVE %** | **No.** | **No. %** | **Wt** | **Wt %** | **EVE** | **EVE %** | **No.** | **No. %** | **Wt** | **Wt %** | **EVE** | **EVE %** |
| K1 | white ware | 151 | 75.5 | 1539 | 79.4 | 0.64 | 52.9 | 438 | 43.2 | 5702 | 40.5 | 2.95 | 21.0 | 70 | 42.9 | 1308 | 48.3 | 2.31 | 50.5 |
| K2 | grey sandy | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 14 | 1.4 | 144 | 1.0 | 0.35 | 2.5 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| K3 | fine oxidised | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 15 | 1.5 | 347 | 2.5 | 0.73 | 5.2 | 19 | 11.7 | 384 | 14.2 | 0.43 | 9.4 |
| K4 | fine grey with iron specks | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 9 | 0.9 | 122 | 0.9 | 0.78 | 5.5 | 8 | 4.9 | 129 | 4.8 | 0.78 | 17.1 |
| K5 | grey-slipped | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 12 | 1.2 | 151 | 1.1 | 0.27 | 1.9 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| K6 | hard fired grey ware | 4 | 2.0 | 22 | 1.1 | 0.07 | 5.8 | 29 | 2.9 | 438 | 3.1 | 1.25 | 8.9 | 11 | 6.7 | 198 | 7.3 | 0.41 | 9.0 |
| K7 | oxidised pink | 41 | 20.5 | 332 | 17.1 | 0.32 | 26.4 | 311 | 30.7 | 2691 | 19.1 | 4.21 | 29.9 | 48 | 29.4 | 561 | 20.7 | 0.52 | 11.4 |
| K8 | oxidised sandy | 2 | 1.0 | 24 | 1.2 | 0.18 | 14.9 | 77 | 7.6 | 1119 | 8.0 | 1.15 | 8.2 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| K9 | colour-coated whiteware | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 6 | 0.6 | 43 | 0.3 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| K0 | burnt black | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 3 | 0.3 | 89 | 0.6 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| M1 | whiteware mortaria | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 16 | 1.6 | 1855 | 13.2 | 0.96 | 6.8 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| M2 | whiteware mortaria | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 2 | 0.2 | 505 | 3.6 | 0.15 | 1.1 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| BAT AM | Baetican amphora | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 0.1 | 16 | 0.1 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| CNG TN | Central Gaulish TN | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 2 | 0.2 | 56 | 0.4 | 0.3 | 2.1 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| LGF SA | South Gaulish samian | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 0.1 | 5 | 0.0 | 0.17 | 1.2 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| ALH RE | Alice Holt reduced ware | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 28 | 2.8 | 237 | 1.7 | 0.51 | 3.6 | 6 | 3.7 | 121 | 4.5 | 0.12 | 2.6 |
| SIL F1 | Silchester ware | 1 | 0.5 | 14 | 0.7 | 0 | 0.0 | 14 | 1.4 | 210 | 1.5 | 0.21 | 1.5 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| GR | grog-tempered | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 2 | 0.2 | 21 | 0.1 | 0 | 0.0 | 1 | 0.6 | 8 | 0.3 | 0.00 | 0.0 |
| GR4 | grog-tempered | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 13 | 1.3 | 127 | 0.9 | 0.08 | 0.6 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| GRSA | grog-and-sand-tempered | 1 | 0.5 | 8 | 0.4 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| SAFLFE | sand, flint & iron | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| GYFSY | fine grey sandy | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 2 | 0.2 | 19 | 0.1 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| GYSY | grey sandy | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 13 | 1.3 | 104 | 0.7 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| BWSY | black sandy | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 4 | 0.4 | 55 | 0.4 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| BWNF | fine brown sandy | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 1 | 0.1 | 11 | 0.1 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0.00 | 0.0 |
| **TOTAL** | | **200** | **100.0** | **1939** | **100.0** | **1.21** | **100.0** | **1013** | **100.0** | **14067** | **100.0** | **14.07** | **100.0** | **163** | **100.0** | **2709** | **100.0** | **4.57** | **100.0** |

grey-slipped sherds from the site with the remainder associated with the upper levels of Kiln 3 [2040].

**Kiln 4 (2031)** (Tables 4–5)

The primary deposit (2075) within the firing chamber was aceramic, but a moderately large group of 162 sherds, 1892 g and with 1.58 EVEs, came from layer (2074). These are all derived from kiln products with a mixture of broken oxidised and reduced sherds, the former dominating, and with examples of flagons (FL1a, FL2) (FIG. 60.38), jars (J3) (FIG. 60.47) and lids (FIG. 60.49). Backfill deposit (2063) yielded a larger group of 2,687 sherds, weighing 140 kg and with 3.93 EVEs. Apart from three sherds of Silchester ware, all the sherds are from kiln products, mostly in oxidised fabrics, some of which are over-fired, and almost exclusively comprise sherds from jars, particularly form J3 (FIG. 60.42–45), suggesting these resulted from a single failed firing, and one lid (FIG. 60.48). Upper level (2024) yielded a further 66 sherds, eight of which are Silchester ware, the remainder kiln wares with just two rims from a jar and platter and a flagon handle.

The sondage into the stoke-pit of Kiln 4 (2031) produced a further 325 sherds of pottery weighing 4373 g and with 212 EVEs from layers (2064–2066). Again, the sherds are all kiln products with the range of forms represented by just one or two vessels, including mortaria,

TABLE 4. QUANTIFIED SUMMARY OF FABRICS FROM KILN 4 (2031)

| | | Kiln 4 (2031) | | | | | |
|---|---|---|---|---|---|---|---|
| **Fabric** | **Description** | **No.** | **No. %** | **Wt** | **Wt %** | **EVE** | **EVE %** |
| K1 | white ware | 503 | 50.0 | 5310 | 52.8 | 4.85 | 53.9 |
| K2 | grey sandy | 64 | 6.4 | 963 | 9.6 | 0.76 | 8.5 |
| K3 | fine oxidised | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| K4 | fine grey with iron specks | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| K5 | grey-slipped | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| K6 | hard fired grey ware | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| K7 | oxidised pink | 317 | 31.5 | 2221 | 22.1 | 2.88 | 32.0 |
| K8 | oxidised sandy | 77 | 7.6 | 663 | 6.6 | 0.33 | 3.7 |
| K9 | colour-coated whiteware | 3 | 0.3 | 22 | 0.2 | 0 | 0.0 |
| K0 | burnt black | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| M1 | whiteware mortaria | 1 | 0.1 | 406 | 4.0 | 0 | 0.0 |
| M2 | whiteware mortaria | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| BAT AM | Baetican amphora | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| CNG TN | Central Gaulish TN | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| LGF SA | South Gaulish samian | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| ALH RE | Alice Holt reduced ware | 5 | 0.5 | 16 | 0.2 | 0 | 0.0 |
| SIL F1 | Silchester ware | 32 | 3.2 | 450 | 4.5 | 0.17 | 1.9 |
| GR | grog-tempered | 3 | 0.3 | 6 | 0.1 | 0 | 0.0 |
| GR4 | grog-tempered | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| GRSA | grog-and-sand-tempered | 2 | 0.2 | 3 | 0.0 | 0 | 0.0 |
| SAFLFE | sand, flint & iron | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| GYFSY | fine grey sandy | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| GYSY | grey sandy | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| BWSY | black sandy | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| BWNF | fine brown sandy | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| **TOTAL** | | **1007** | **100** | **10060** | **100.0** | **8.99** | **100** |

TABLE 5. DISTRIBUTION OF VESSEL TYPES ASSOCIATED WITH KILNS 3 [2040] AND 4 (2031)

| | | | Kiln 3 [2040] | | Upper fills [2040] | | Rake-out | | Working area [2079] | | Kiln 4 (2031) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Forms** | **Type** | **Type No.** | **EVE** | **EVE %** | **EVE** | **EVE %** | **EVE** | **EVE %** | **EVE** | **EVE %** | **EVE** | **EVE %** |
| **Kiln wares** | | | | | | | | | | | | |
| Flagon | collared rim | FL1 | 0.35 | 40.7 | 3.69 | 43.6 | 2.26 | 103.2 | 1.00 | 40.7 | 0.87 | 38.8 |
| | squared rim, wide mouthed | FL2 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.15 | 6.7 |
| | disc-mouthed flagon | FL3 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 1.00 | 44.6 |
| | double-handled, triangular rim | FL4 | 0.00 | 0.0 | 0.53 | 6.3 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 |
| | ring-necked | FL5 | 0.00 | 0.0 | 0.12 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 |
| Bowl | flat rim deep bowl | BL1 | 0.22 | 25.6 | 2.28 | 27.0 | 0.37 | 16.9 | 0.00 | 0.0 | 0.05 | 2.2 |
| | other bowls | B | 0.00 | 0.0 | 0.10 | 1.2 | 0.20 | 9.1 | 0.00 | 0.0 | 0.00 | 0.0 |
| Dish | curved-wall dish/kiln furniture | D1 | 0.00 | 0.0 | 0.07 | 0.8 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 |
| Platter | curved-wall copy Cam. 16 | PL1 | 0.07 | 8.1 | 3.67 | 43.4 | 1.62 | 74.0 | 2.09 | 85.0 | 0.27 | 12.1 |
| Beaker | short everted rim | BK1 | 0.00 | 0.0 | 0.40 | 4.7 | 0.00 | 0.0 | 0.03 | 1.2 | 0.27 | 12.1 |
| Jar | dolium | J2 | 0.00 | 0.0 | 0.32 | 3.8 | 0.00 | 0.0 | 0.10 | 4.1 | 0.35 | 15.6 |
| | expanded rim neckless jar | J3 | 0.42 | 0.0 | 0.24 | 2.8 | 0.00 | 0.0 | 0.00 | 0.0 | 0.35 | 15.6 |
| | necked jar | J4 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 | 0.24 | 9.8 | 0.00 | 0.0 |
| Lid | simple domed with a plain rim | L1 | 0.15 | 17.4 | 0.27 | 3.2 | 0.00 | 0.0 | 0.00 | 0.0 | 0.95 | 42.4 |
| Mortarium | mortarium | M1 | 0.00 | 0.0 | 1.11 | 13.1 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 |
| **sub-total** | | | **0.86** | **100.0** | **8.46** | **100.0** | **2.19** | **100.0** | **2.46** | **100.0** | **2.24** | **100.0** |
| **Non-kiln wares** | | | | | | | | | | | | |
| Jar | beaded rim jar | | 0.00 | 0.0 | 0.11 | 8.7 | 0.12 | 100.0 | 0.00 | 0.0 | 0.00 | 0.0 |
| | necked jar | | 0.00 | 0.0 | 0.26 | 20.5 | 0.00 | 0.0 | 0.10 | 100.0 | 0.00 | 0.0 |
| Bowl | 'Surrey'-type bowl | | 0.00 | 0.0 | 0.25 | 19.7 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 |
| | beaded rim bowl | | 0.00 | 0.0 | 0.08 | 6.3 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 |
| | Cam. 52 | | 0.00 | 0.0 | 0.24 | 18.9 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 |
| Dish | fine ware dish | | 0.00 | 0.0 | 0.17 | 13.4 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 |
| Platter | Cam. type 2 | | 0.00 | 0.0 | 0.06 | 4.7 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 |
| Lid | | | 0.00 | 0.0 | 0.10 | 7.9 | 0.00 | 0.0 | 0.00 | 0.0 | 0.00 | 0.0 |
| **sub-total** | | | **0.00** | **0.0** | **1.27** | **100.0** | **0.12** | **100.0** | **0.10** | **100.0** | **0.00** | **0.0** |

platter (FIG. 60.41), lid, bowl, flagon (FIG. 60.39), jar (FIG. 60.46) and beaker (FIG. 60.40). One mortarium base-sherd had a pre-firing graffito in the form of a cross (FIG. 62.85).

### Kiln 5 (2052)

Kiln 5 produced very little pottery. Two sherds of kiln ware, including a flagon handle, were recovered from deposit (2069) with a further 75 sherds from rubble layer (2005). The latter comprises mainly kiln wares, but also includes 20 sherds of Silchester ware and sandy grog-tempered ware. There is a single rim from a collared flagon (type FL1a).

### Ditch 2101

The large linear ditch running through Trench 2 yielded a particularly large assemblage of some 2,862 sherds weighing 44.5 kg and with 34.87 EVEs (Table 6). The distribution of material across the four slots excavated is slightly uneven with the greatest amount of material by far, some 2,095 sherds, 73 per cent, coming from slot [2062] at the northern end. The lowest incidence of sherds is that from slot [2022] located nearest to the excavated Kiln 3 [2040]; with 400 and 301 sherds respectively from slots [2060] and [2043].

Slot [2022] produced some 62 sherds of which just under half are kiln wares from fills (2015) and (2021). The only featured sherds are a collared-rim flagon and lid knobs. Primary fill (2029) produced 11 sherds of non-kiln wares including Silchester ware and an iron-rich sandy

TABLE 6. QUANTIFIED SUMMARY OF FABRICS FROM DITCH 2101

| | | Trench 2 Ditch 2101 | | | | | |
|---|---|---|---|---|---|---|---|
| **Fabric** | **Description** | **No.** | **No. %** | **Wt** | **Wt %** | **EVE** | **EVE %** |
| K1 | white ware | 507 | 17.7 | 7565.5 | 17.0 | 11.51 | 33.0 |
| K2 | grey sandy | 65 | 2.3 | 895 | 2.0 | 0.77 | 2.2 |
| K3 | fine oxidised | 2 | 0.1 | 41 | 0.1 | 0.05 | 0.1 |
| K4 | fine grey with iron specks | 5 | 0.2 | 34 | 0.1 | 0.1 | 0.3 |
| K5 | grey-slipped | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 |
| K6 | hard fired grey ware | 2 | 0.1 | 17 | 0.0 | 0.06 | 0.2 |
| K7 | oxidised/ pink | 712 | 24.9 | 6510 | 14.6 | 3.89 | 11.2 |
| K8 | oxidised sandy | 379 | 13.2 | 4943 | 11.1 | 5.38 | 15.4 |
| K9 | colour-coated whiteware | 5 | 0.2 | 766 | 1.7 | 0.67 | 1.9 |
| K0 | burnt black | 8 | 0.3 | 230 | 0.5 | 0.51 | 1.5 |
| M1 | whiteware mortaria | 22 | 0.8 | 2152 | 4.8 | 0.66 | 1.9 |
| BAT AM | Baetican amphora | 6 | 0.2 | 880 | 2.0 | 0 | 0.0 |
| LGF SA | South Gaulish samian | 10 | 0.3 | 138 | 0.3 | 0.11 | 0.3 |
| ALH RE | Alice Holt reduced ware | 499 | 17.4 | 4950 | 11.1 | 6.35 | 18.2 |
| SIL F1 | Silchester ware | 444 | 15.5 | 10745 | 24.1 | 3.71 | 10.6 |
| GR | grog-tempered | 3 | 0.1 | 22 | 0.0 | 0.03 | 0.1 |
| GR4 | grog-tempered | 7 | 0.2 | 66 | 0.1 | 0 | 0.0 |
| GRSA | grog-and-sand-tempered | 3 | 0.1 | 64 | 0.1 | 0.2 | 0.6 |
| OXGR | grog-tempered storage jar | 155 | 5.4 | 4092 | 9.2 | 0.41 | 1.2 |
| SAFLFE | sand, flint & iron | 9 | 0.3 | 247 | 0.6 | 0.1 | 0.3 |
| GYFSY | fine grey sandy | 3 | 0.1 | 38 | 0.1 | 0.1 | 0.3 |
| GYSY | grey sandy | 10 | 0.3 | 75 | 0.2 | 0.03 | 0.1 |
| BWSY | black sandy | 6 | 0.2 | 58 | 0.1 | 0.23 | 0.7 |
| **TOTAL** | | **2862** | **100** | **44528.5** | **100** | **34.87** | **100** |

and flint-tempered ware. Slot [2043] to the south produced some 299 sherds weighing 5,038 g. A significant amount of this, 69 per cent by count, comprises sherds of flint-tempered Silchester ware. Kiln products contribute just 10 per cent by count, 16 per cent by weight, with examples of collared flagon, mortaria and flat-rimmed, hemispherical bowls. Slot [2060] produced some 400 sherds of which 68 per cent are kiln products with quite a diverse range of forms, including lids, curved-wall platters, collared flagons, flat-rim bowls and a single pod. Two sherds of South Gaulish samian from (2041) are attributed a Neronian–early Flavian date (see Bird above). Silchester ware is again well-represented along with a small quantity of Alice Holt ware and other early or pre-Roman local wares. The primary fill (2049) contained just 15 sherds of local handmade coarse wares including the knob from a Silchester ware lid. Kiln wares start showing up in abundance from (2041) alongside a variety of other wares.

The northernmost slot, [2062], was ceramically the most prolific with some 2,095 sherds weighing 44.5 kg, but also the most fragmented of the ditch groups. Some 65.6 per cent of the assemblage by count comprises kiln products which might strongly suggest further kiln structures to the north beyond the trench. The lowest fill (2088) produced eight sherds of kiln waste followed by a further 788 sherds from layer (2027). This group is exceptional in that 94.3 per cent is composed of kiln products with multiple examples of flagon, mortaria and lids with a few flat-rimmed bowls and the only tazza from the site (FIG. 61.76). The flagons are dominated by collared-rim types with a minimum number of 17 vessels accompanied by four ring-necked forms and single examples of types FL3 and FL6 (FIG. 60.50–58). Horizon (2019) with 393 sherds is similarly dominated by kiln waste, 88.7 per cent. Over half the sherds from this slot came from upper fill (2008) with some 801 sherds. This group has a high proportion of Alice Holt grey wares (39 per cent count) along with 12 per cent Silchester ware and 14 per cent oxidised grog-tempered storage jar. The Alice Holt ware includes at least three 'Surrey' or 'Atrebatic'-type bowls. Also present are eight sherds of South Gaulish samian, with one base of early–mid-Flavian date and one sherd possibly Trajanic. Kiln wares contribute 33 per cent and include examples of ring-necked flagon, mortaria, curved-wall dishes and a perforated lid knob. The tenor of the group from (2008) is slightly later than the other ditch assemblages and it may represent a slightly later re-cut into the top of the ditch or simply later backfilling.

Looking at the assemblage from Ditch 2101 overall (Table 6), kiln wares make up just under 60 per cent by count, 52 per cent by weight of the assemblage, with a diverse range of products. All the identified fabrics are present apart from the grey-slipped variant (fabric K5). The under-fired fabric K7 accounts for nearly 25 per cent by sherd count but just 14.6 per cent by weight, reflecting its softer nature. White-fired wares account for 17 per cent by count and 17.7 per cent by weight. Overall, collared-rim flagons (Type FL1) dominate, accounting for 65 per cent EVE, followed by flat-rim bowls (Type B1/2) (FIG. 60.59) at 10.2 per cent EVE, ring-necked flagons at 5.6 per cent EVE and mortaria at 3.9 per cent EVE. Other forms include bowls (FIG. 61.60–61); platters (FIG. 61.62); beakers (FIG. 61.63); mortaria (FIG. 61.64–67); lids (FIG. 61.68–71) and jars (FIG. 61.72–75). The non-kiln wares (FIG. 61.77–80, 82) are dominated by Silchester ware, which makes up nearly 25 per cent by weight, but also include Baetican amphora, Alice Holt grey ware, South Gaulish samian and local, indigenous coarse wares. Jars dominate the form range with several larger storage vessels. Four examples of simple graffiti feature amongst the ditch assemblage, three on kiln products and one on a local coarse ware (FIG. 62.86–89).

## CATALOGUE OF ILLUSTRATED SHERDS

### Trench 1: Trackway ditch [1086]

1. Narrow-mouthed jar or beaker with a small, slightly concave lip. Black sandy ware with a dark red-brown core. Probably an Alice Holt product. (1062).
2. Collared-rim flagon type FL1b. Fabric: K1. (1056).
3. Curved-wall platter type PL1. Fabric: K8. (1041).

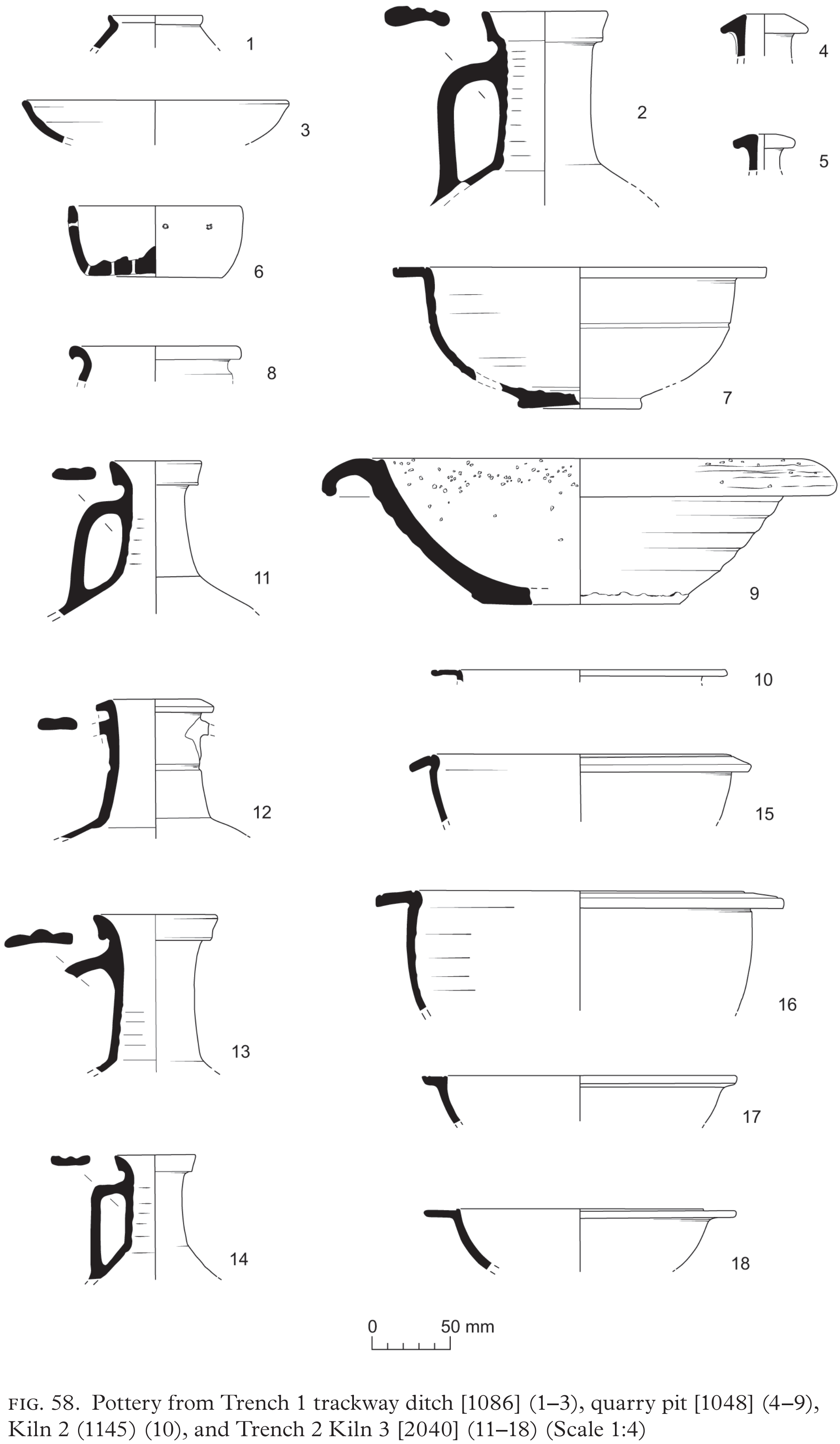


FIG. 58. Pottery from Trench 1 trackway ditch [1086] (1–3), quarry pit [1048] (4–9), Kiln 2 (1145) (10), and Trench 2 Kiln 3 [2040] (11–18) (Scale 1:4)

**Trench 1: quarry pit [1048]**

4. Disc-mouthed flagon type FL3. Fabric: K1. (1046).
5. Small version of flagon type FL3. Fabric: K7. (1046).
6. Small cheese press with a perforated floor and wall. The holes were made before firing but have spalled on the outside of the base. Fabric: K8. (1046).
7. Flat-rim hemispherical bowl with two grooves on the upper surface, variant of type BL1. The centre of the base is holed, possibly deliberately. Fabric: K7. (1030).
8. Small jar with a slightly hooked rim and slight shoulder carination, type J1. Fabric: K1. (1046).
9. Mortarium type M1. The lower interior is worn smooth from use. Fabric: K1. (1043).

**Trench 1: Kiln 2**

10. Flanged rim bowl, BL7. Small fragment. Fabric: K4. (1145).

**Trench 2: Kiln 3 [2040]**

11. Collared-rim flagon type FL1a. Fabric: K1. (2061).
12. Double-handled flagon type FL4. Fabric: K1. (2061).
13. Collared-rim flagon type FL1a. Fabric: K1. (2071).
14. Collared-rim flagon type FL1a. Fabric: K7. (2071).
15. Flat-rim bowl, type BL1 variant with a single groove. Fabric: K1. (2054).
16. Flat-rim bowl, type BL1 variant with two grooves. Fabric: K7. (2071).
17. Flanged-rim bowl, type BL5. Fabric: K8. (2037).
18. Shallow, hemispherical bowl with a flat flange and a small beaded rim, type BL6. Fabric: K7. (2071).
19. Beaker type BK2. Fabric: K3. (2061).
20. Beaker type BK3. Fabric: K3. (2061).
21. Beaker type BK3. Fabric: K2. (2054).
22. Mortarium type M1. K1 variant. The vessel has scoring on the flange and lower interior but not immediately adjacent to the spout. The interior appears to have a thin wash of slurry but no very clear trituration grits. Impressed stamp to right of spout. Stamp set within an ansate-shaped frame. Reading slightly faint over the flange; possible reading: A REGALI O. (2061) (p. 59).
23. Mortarium type M1 with a simple spout. (2054).
24. Mortarium type M2. (2054).
25. Mortarium with a double-beaded rim, type M5. Upper fill of [2084].
26. Simple lid type L1. Fabric: K1. (2037).
27. Curved-wall platter type PL1. Fabric: K4. (2072).
28. Curved-wall platter with a shallow foot-ring, type PL1. Outline of a central abraded stamp with no letters visible. Fabric: K4. (2073), SF 212.
29. Curved-wall platter with a slightly beaded rim, type PL3. Central illegible stamp set within a double incised circle. Fabric: K5. (2072), SF 209 (p. 61).
30. Flat rim dolium-type jar J2. Fabric: K1. (2072).
31. Flat rim dolium-type jar J2. Fabric: K1. (2072).
32. Wide-mouthed jar with a short everted rim, type J5. Fabric: K1. (2054).
33. Jar type J7 with a high carinated shoulder. Fabric: K7. (2037).
34. Jar type J7 with a high carinated shoulder. Fabric: K4. (2072).
35. Single vessel leg (pod) with a slight depression at the base. Round cross-section. Form BL8. Fabric: K7. (2054).
36. Flared bowl Cam. type 52. Fabric: CNG TN. Surfaces abraded. (2061).
37. Wheel-made 'Surrey-type' bowl. Fabric: ALH RE (black variant). (2054).

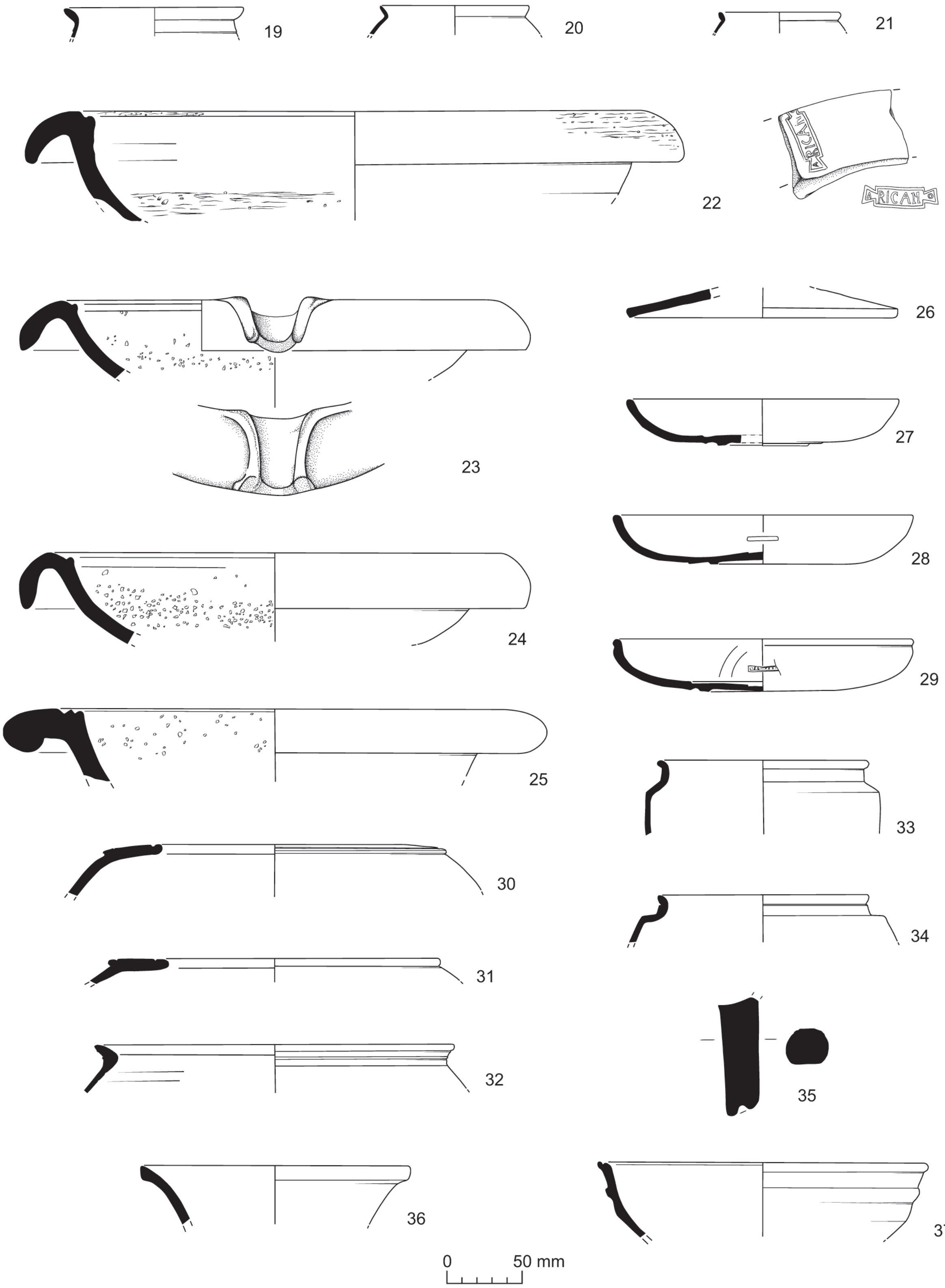


FIG. 59. Pottery from Trench 2 Kiln 3 [2040] (19–37) (Scale 1:4)

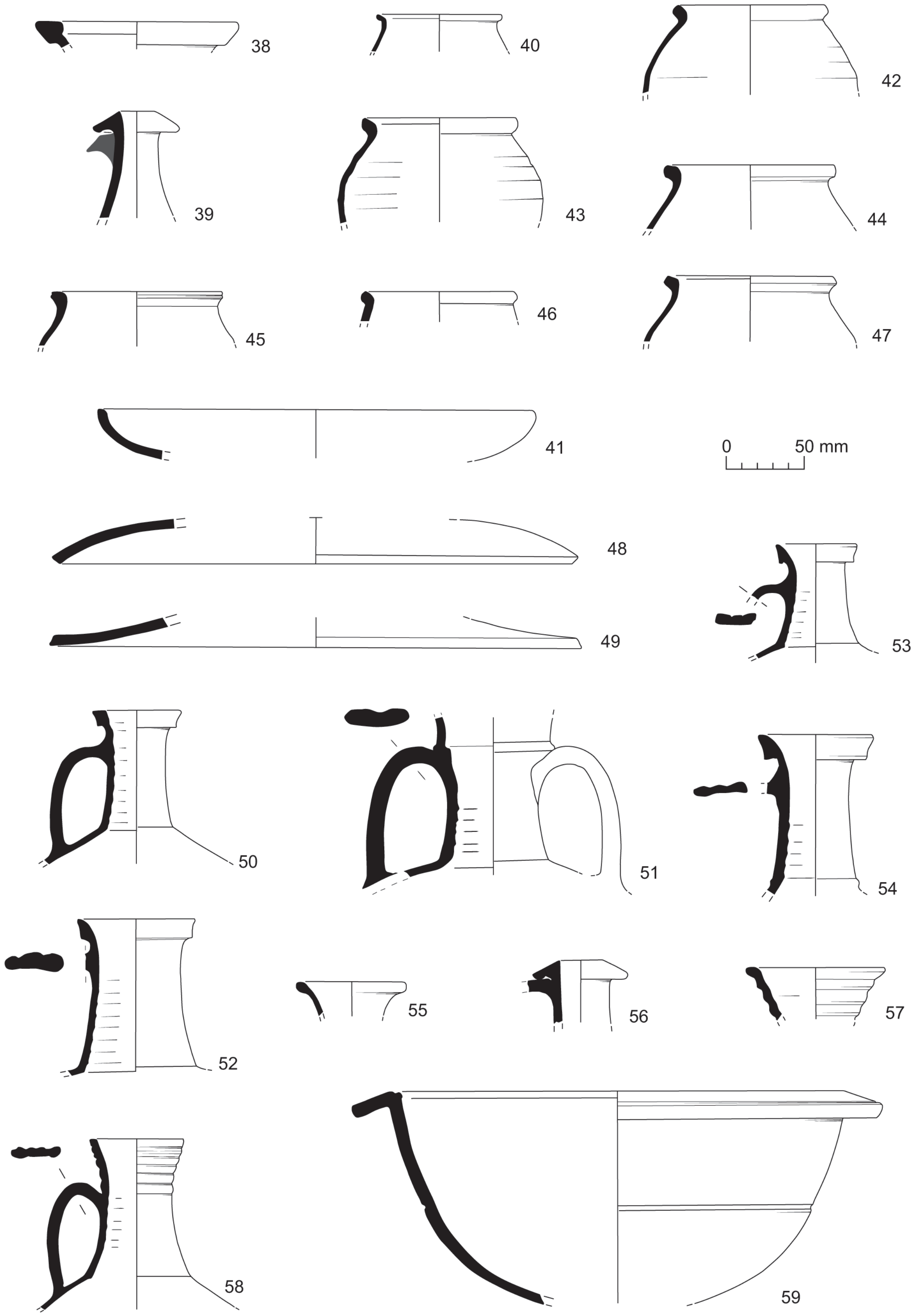


FIG. 60. Pottery from Kiln 4 (2031) (38–49) and Trench 2 Ditch 2101 (50–59) (Scale 1:4)

**Trench 2: Rectangular Kiln 4 (2031)**

38. Collared-rim flagon thickened on the interior. Type FL2. Fabric: K2. Kiln chamber backfill (2074).
39. Single-handled, disc-mouthed flagon FL3. Fabric: K7. Stoke-pit backfill (2066).
40. Beaker type BK1. Fabric: K1. Stoke-pit backfill (2066).
41. Curved-wall platter type PL1. Fabric: K8. Stoke-pit backfill (2066)
42. Jar type J3 with a slightly facetted body. Fabric: K1. Deposit (2063).
43. Jar type J3 with a slightly facetted body. Fabric: K1. Deposit (2063).
44. Jar type J3. Fabric: K1. Deposit (2063).
45. Jar type J8 with an externally grooved rim. Fabric: K7. Deposit (2063).
46. Jar type J3. Fabric: K1. Stoke-pit backfill (2066).
47. Jar type J3. Fabric: K1. Chamber backfill (2074).
48. Large lid, type L1. Fabric: K2. Deposit (2063).
49. Large lid type L1. Fabric: K2. Chamber backfill (2074).

**Trench 2: Ditch 2101**

50. Collared-rim flagon, type FL1c. Fabric: K1. Ditch slot [2060] (2041).
51. Funnel-mouthed, double-handled flagon, type FL7. Fabric: K1. Ditch slot [2060] (2041).
52. Single-handled, collared-rim flagon, type FL1a. Fabric: K1. Ditch slot [2062] (2019).
53. Single-handled, collared-rim flagon, type FL1a. Fabric: K1. Ditch slot [2062] (2019).
54. Single-handled, collared-rim flagon, type FL1a. Fabric: K1 (over-fired). Ditch slot [2062] (2027).
55. Flared-rim flagon type FL6. Fabric: K1. Ditch slot [2062] (2027).
56. Disc-mouthed flagon type FL3. Fabric: K9. Ditch slot [2062] (2027).
57. Ring-necked flagon type FL5. Fabric: K1 (over-fired). Ditch slot [2062] (2027).
58. Ring-necked flagon type FL5. Fabric: K1 (over-fired). Ditch slot [2062] (2008).
59. Large hemispherical bowl, type BL1. Fabric: K1 with a grey inner core and pale orange margins. Ditch slot [2062] (2019).
60. Bowl type BL3. Fabric: K1. Ditch slot [2062] (2019).
61. Short flat-rim bowl, probably grooved, type BL4. Ditch slot [2060] (2034).
62. Curved-wall platter type PL2. Fabric: K2. Ditch slot [2062] (2019).
63. Beaker type BK3. Fabric: K7. Ditch slot [2062] (2013).
64. Abraded rim of a mortarium type M3. Fabric: K1. Ditch slot [2043] (2028).
65. Mortarium type M2 with sparse flint trituration grits. Fabric: K7. Ditch slot [2060] (2041).
66. Mortarium type M2. Fabric: K7. Ditch slot [2062] (2027).
67. Mortarium type M4. Fabric: K1 with a blackened interior and flange. Ditch slot [2062] (2019).
68. Small, simple, concave lid with a single perforation made before firing (L1). Fabric: K1. Ditch slot [2062] (2019).
69. Small, simple, flat lid with a single perforation made before firing (L2). Fabric: K8. Ditch slot [2062] (2027).
70. Simple lid type L1. Fabric: K1. Ditch slot [2062] (2019).
71. Perforated base from a possible strainer. Holes made before firing. Fabric: K8. Ditch slot [2062] (2008).
72. Expanded rim, wide-mouthed jar (J3). Fabric: K2. Ditch slot [2062] (2027).
73. Necked jar/bowl J4. Fabric: K2. Ditch slot [2062] (2019).
74. Necked jar/bowl J4. Fabric: K2. Ditch slot [2062] (2019).
75. Cordon-necked jar, form J6. Fabric: K2. Ditch slot [2062] (2019).
76. Tazza. Fabric: ?K8 burnt. Ditch slot [2062] (2027).
77. Handmade lid with a solid knob. Fabric: Silchester ware. Ditch slot [2060] (2049).
78. Handmade, cordon-necked jar. Fabric: GRSA. Ditch slot [2060] (2049).

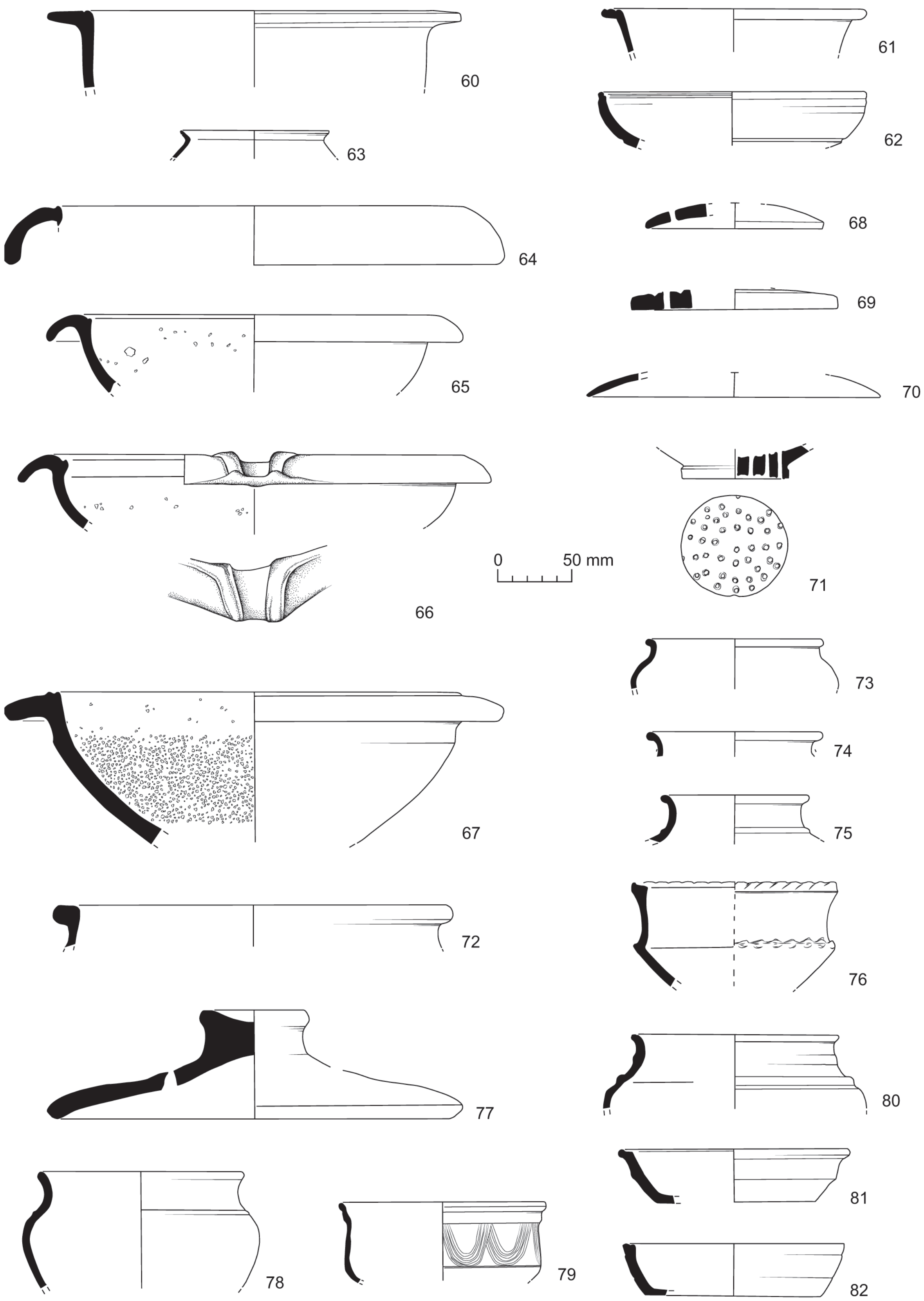


FIG. 61. Pottery from Trench 2 Ditch 2101 (60–82) (Scale 1:4)

79. Small bowl loosely copying a samian bowl with lightly combed decoration. Fabric: GYFMIC. Ditch slot [2062] (2008).
80. Wide cordon-necked jar. Fabric: ALH RE. Ditch slot [2062] (2008).
81. Shallow variant of an Atrebatic bowl (Lyne and Jefferies 1979, Class 5). Fabric: ALH RE (black variant). Burnt. Ditch slot [2062] (2008).
82. Dish with a single groove on top of the rim. Fabric: ALH RE (black variant). Ditch slot [2062] (2008).

### Kiln furniture

83. Probable saggar or kiln spacer. Thick-walled powdery oxidised ware as fabric K8. Quarry pit [1048] (1036).
84. Dish or kiln furniture, D1. Fabric: K8. Ditch slot [2062] (2008).

### Graffiti

85. Base of a mortarium with flint trituration grits. A cross was inscribed on the base before firing. Fabric: K1. Fill of Kiln 4 (2031) stokehole (2066).
86. Base from a closed form with a post-firing graffito incised onto the underside. Fabric: GYSY. Ditch slot [2060] (2041), SF 205.
87. Body sherd with edge of graffito incised before firing. Fabric: K7. Ditch slot [2062] (2027).
88. Body sherd with part of a simple graffito made after firing. Fabric: K7. Ditch slot [2062] (2027).
89. Body sherd with graffito incised after firing. Fabric: K7. Ditch slot [2062] (2027).

### Modified sherds

90. Flat base-sherd with an abraded break possibly suggesting re-use. Fabric: K1. Quarry pit [1048] (1023), SF 5.
91. Trimmed base-sherd. Fabric: K7. Ditch slot [2060] (2026). SF 203.

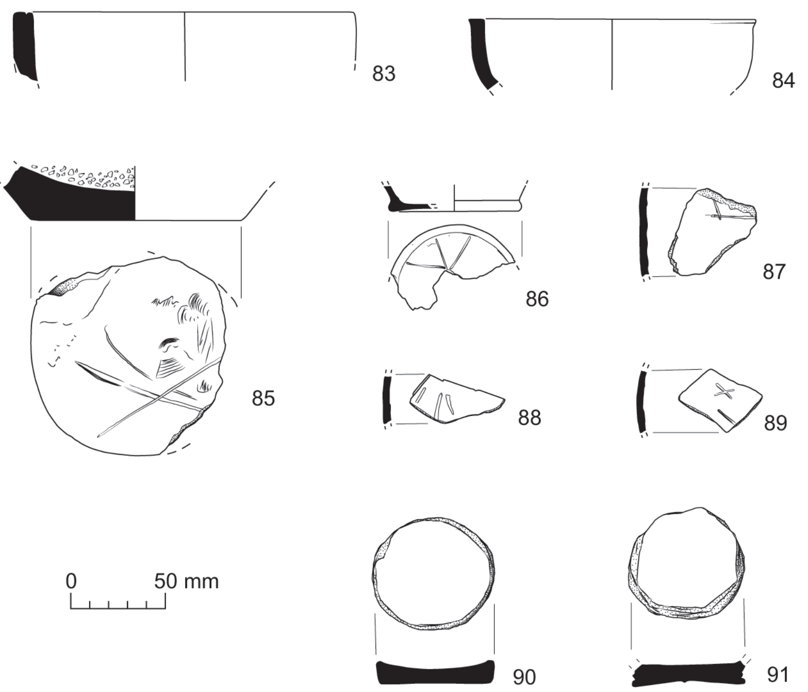


FIG. 62. Kiln furniture (83–84); graffiti (85–89) and modified sherds (90–91) (Scale 1:4)

## DISCUSSION

### FORMS

The pottery assemblage recovered from Little London can be dated to the Neronian–early Flavian period on typological grounds; from the association with a nearby tile kiln producing Neronian stamped tiles and from the dating of the small quantity of associated samian. As with all kiln excavations, unless the final load of pottery had been abandoned *in situ* in the chamber, it is uncertain whether pottery recovered from the kiln structures represents waste from the use of that particular kiln or from an adjacent kiln(s). The only kiln on the site to contain much pottery was Kiln 3 [2040] and the very mixed nature of the debris from the fills, with both reduced and oxidised wares present, strongly suggests this was not the debris from a single last firing of this kiln, but waste which had accumulated from the general area after its abandonment. A kiln assemblage also represents the failures and may not necessarily reflect the complete range of output. In the case of Little London it is not possible to directly link the production of a specific vessel form to any particular structure and there are undoubtedly further kilns at the location. The paucity of associated finds from the other kilns and a general similarity of material make it impossible to sequence the operation of the kilns or link them with the firing of a specific product.

The range of vessels produced at Little London is distinctly Roman in character, with flagons, mortaria and tableware amongst other types. Whilst quite a wide range of types has been defined, many are present as single examples. On the basis of the recovered pottery, collared-rim flagons, flat-rim bowls and curved-wall platters are the most frequent types found, suggesting that these were the main forms produced. This would reflect the prevalence of these particular forms elsewhere at this time. However, whilst it is possible to individually parallel many of the types made with those made at other broadly contemporary production sites in Britain, both military and civilian, it is difficult at present to find a direct parallel which embraces all, or a significant number of the individual types, most notably the platters, alongside the other wares. Some key contemporary production sites, for example, Eccles, Kent, have not been published in detail, whilst other sites such as Oaksey, Minety, Wilts., have been subjected to extremely limited excavation and publication. More useful comparison can be made with production sites in the Verulamium area, specifically Bricket Wood and Brockley Hill.

As noted above flagons are a particular feature of the Little London kilns and account for 52 per cent EVE of the complete assemblage. The most ubiquitous type, and perhaps the most difficult to make, is the collared-rim flagon (FL1) accounting for 32.7 per cent overall (Table 2). This was made at many sites in the Claudian–early Flavian period and can be shown to have an Augustan military pedigree on the Continent (Greene 1993, 17). The general form was made at military, or assumed military, kilns at the legionary fortresses at Usk, Longthorpe and Kingsholm amongst others, and at civilian or presumed civilian kilns, for example, those in the Verulamium area, Eccles, Minety, Duxford, Hoo (Blumstein 1956), Canterbury (Jenkins 1956), possibly Sugar Loaf Court, London (Chadburn and Tyers 1984) and Colchester (see Table 7). There are minor variations in the rim shape, perhaps most notably at Longthorpe and Duxford, where the external face is slightly concave and undercut, presumably reflecting the quirks or background of individual potters. At Little London significant concentrations of the form were recovered from the Trench 2 boundary ditch and Kilns 3 [2040] and 4 (2031). Although the fabric was not known when the bulk of the Silchester Insula IX and Forum Basilica assemblages were recorded and, if present, would have probably been recorded as Verulamium-type ware, there have been negligible examples of collared-rim flagons in the Silchester assemblages. In Britain, although not necessarily on the Continent (Tyers, pers. comm.), the trend is for collared-rim flagons to be succeeded by the ring-necked form from the early Flavian period. The ring-necked flagon (FL5), also made at many of the production sites cited above, with the exception of Duxford, is generally quite rare in Silchester as a whole. The low incidence of this form at Little London could suggest that the kilns had been abandoned before the form became popular, supported by the fact that all the examples documented came from the upper fills of

Ditch 2101. The disc-necked flagon (FL3), another form with a strong continental pedigree, was also quite widely produced, although never common. Examples have been found at the Verulamium kilns, Eccles and Colchester. A similar picture is presented by the *Camulodumum* type 169/170 (FL7), although only one example of this type was recognised at Little London. Types FL2, FL4 and FL6 are also rare occurrences at Little London and seemingly not popular types elsewhere.

An analogous pattern is shown with the bowls in that the most common forms at Little London, namely those with horizontal or dropped flanges (BL1, BL3), were extensively made at the Verulamium kilns and feature at Colchester and Usk. Other bowl forms are rarer, although examples of BL3–5 feature in the Bricket Wood assemblage. Beakers are not particularly common in any of the assemblages, although it can be observed that butt beakers were made at Verulamium and probably at Eccles but do not feature at Little London.

In terms of tableware, the curved-wall platters (PL1) with functional foot-rings, in oxidised, reduced and grey-slipped wares are a particular feature at Little London, contributing 13.15 per cent EVE to the assemblage. Some vessels bear an illiterate potter's stamp (see above). These forms can be directly linked back to the Gallo-Belgic form Cam. type 16 and were widely made on the Continent. This style of platter was particularly common at the Roman fort at Hofheim where Ritterling (1913) suggests it dated from at least A.D. 40. This was one of the latest forms to feature in the Gallo-Belgic potters' repertoire and is one of the few Gallo-Belgic products, along with cups Cam. type 58 and bowls Cam. type 46, to be associated with early military sites in Britain although by no means exclusively. The main import period falls between *c.* A.D. 40 and 70. Although in general terms the form was widely copied in Britain, the only close parallels for the production of similar fine ware platter imitations so close to the originals in Britain come from Eccles, where there are also copies of Cam. types 8, 12–14 as well as stamped 16s, and Colchester, where examples with imitation stamps came from a grave in Colchester West cemetery (May 1930, 290–1) dated to the Neronian period. Examples were also recovered in association with collared flagons in Colchester kilns 34 and 35 (Niblett 1985, 51) and from Wherstead, Suffolk (Rigby 2001). Curved-wall platters were made at Usk, but show an external base angle and the foot-ring is not always functional (Greene 1993, 41, type 29.2). Most of the military vessels appear to be copying the flat-based Pompeian red ware form which presumably functioned more as a cooking vessel. Wares with imitation stamps were also made at a few other production, or presumed production, sites in Britain, but are either slightly later in date, for example, Wiggonholt, Sussex (Evans 1974) and West Stow, Suffolk (Rigby 1990) or not on Cam. type 16 platters, as at Keston, Kent (Philp 1999) or Rushden, Northants. (Woods and Hastings 1984).

The cheese press is another rare form in early contexts but appears at Eccles, Usk and amongst early pottery groups at Brockley Hill (Seeley and Thorogood 1994). The type was particularly popular with the military potters at Longthorpe fort (Dannell and Wild 1987, 151), but this seems to be exceptional.

Jars are less easy to directly compare and most production sites manufactured vessels showing a diversity of rim and body shape. Two particular types, however, can be highlighted: first, Little London type J2 with the flat dolia-type rim which is quite rare. Dolia-type vessels do feature among the Usk fortress coarse wares (Greene 1993, type 17) but these vessels, which Greene (ibid., 34) traces back to forms found in Republican Italy, differ considerably in the rim detail. Typologically closer examples of dolia were made by the XXth Legion at the Novaesium kilns (Filtzinger 1972, taf. 69, abb. 9, 11–13). Another close parallel for the form comes from two examples from a kiln site excavated in Gloucester (Rawes 1972, fig. 5.51–2), which would also have probably developed from the military kilns set up at Gloucester. Interestingly the XXth Legion was also stationed there for a period of time. The form also features at Camulodunum (Cam. type 275) in Roman and native ware but with just three examples in Roman 'buff' ware.

The other jar form found at Little London which appears to have a direct continental antecedence is type J7 with the high carinated shoulder. Identical jars were produced at Brockley Hill (Castle 1973a, fig. 2.4–5), with similar vessels with high shoulders from Eccles (Detsicas 1977, fig. 3.4.83) and Usk (Greene 1993, type 13). Tyers (1998, 226) considers the type to originate from the Lyon area whilst Greene (1993, fig. 12) shows the distribution to be focused in a zone extending eastwards from central France across Switzerland with a scatter of examples along the Rhine.

The mortaria found at Little London account for 4.04 per cent of the kiln assemblage and show great diversity of form, although all fall within the flange and beaded category as opposed to the wall-sided forms more common in pre- and early Roman contexts in Britain. Both types were made at Novaesium (Filtzinger 1972) and the flanged form, including stamped examples, was made at Lyon in the second half of the first century A.D. (Saison-Guichon 2001, fig. 4). In general terms, examples with a bead lower than the flange can be paralleled at the Verulamium and Eccles kiln sites and are found in many Neronian and early Flavian assemblages. A single stamped mortarium was recovered from the flue of Kiln 3 [2040] (FIGS 56; 59.22) (see above). It is presumed that this vessel was made on site, although the absence of trituration grits stands it apart from the other mortaria. The stamp set within the ansate-shaped frame is unusual and the die currently unique; it is a style more often associated with legionary stamped tile. One aspect to be addressed, but impossible to determine, is whether the mortaria production should be seen as separate from the other wares, and whether any of the kilns were designated specifically for the firing of these considerably heavier vessels, which may have required higher firing temperatures. The association of mortaria and other stamped vessels alongside tile production has been attested at some of the Italian brickyards in the Tiber Valley and Campania (Hartley 1973). Here, where there was a regular practice of stamping tile, it has been observed that the same names occur on both the tile and mortaria (ibid.). There are several instances of mortaria being made at certain tileries, for example, Holt, Eccles, Minety and perhaps the Verulamium region, but not stamped with the same die stamp. In Britain there have only been eight recorded examples of mortaria and tile being impressed with procuratorial stamps using the same die stamp, all from London (Betts 1995; Hartley 1996). This strongly suggests they were being made in the same workshop(s) although using different clays. At least three of the six mortaria with procuratorial stamps from London examined by Hartley (1996, 148) are identified as typical of the Verulamium kilns and the other three examples, although not totally typical, fall into the same broad group. They are attributed a date range of A.D. 80/90–120. There is little evidence the tiles from the Watling Street tileries were stamped, although Suggett (1953, 186) found two fragments both showing the letter N retrograde (Betts 1995, die type 8). Unfortunately, both fragments are now lost and cannot be verified. Clearly such instances are a rarity but the presence of the ansate-shaped stamp with clearly defined letters strengthens an official link between the production of the mortaria and the tile at Little London. However, as Hartley (1996) points out, the method used to make tiles is quite different to that used to make mortaria, so it is possible the potter making mortaria was also making other vessels.

The double-beaded mortaria (types M4, M5) by contrast appear to be a particularly rare variety and do not feature amongst the types made at the Verulamium potteries. A broadly similar example is published from Exeter (Hartley 1991, 194, type TC4) from the late military levels (*c.* A.D. 50–*c.* 85). This vessel, made in a non-local fabric, was regarded as a potential import and recently western France, specifically Brittany, has been suggested as a possible source (Hartley and Tomber 2006, 26; Bidwell 2021). Typologically, the Exeter vessel differs slightly in that the bead nearest the flange is slightly smaller than the inner bead whereas in the Little London examples the beads are of similar size. A mortarium stamped by the potter Lesbius from Colchester, dated A.D. 50–80, may also come from the same workshop as the Exeter vessel; the only other parallel is from Nanstallon, Cornwall (Hartley 1999, 198) although the rim profile differs. The Nanstallon assemblage also features an unstamped double-beaded mortarium (Fox and Ravenhill 1972, fig. 22.6). Another close parallel, particularly for type M5, comes from a vessel published from Richborough, described as being made of hard, pinkish white clay with grit in the interior surface (Bushe Fox 1932, 185 and pl. 41.355). The vessel came from the late first-century filling of the Claudian ditch. Although the sample is small, if the mortaria are related to types made in western Gaul, not only do they show a distribution strongly biased towards the South-West (cf. Bidwell 2021, fig. 12.6), but the unusual profiles may have some ramifications for the cultural origins of the potter who was making the Little London vessels.

Products which do not feature amongst the output from the Little London kilns, but which were made at the Verulamium region kilns, include butt beakers, honey pots and open lamps. Lamps also feature in pottery made at the military kilns at Usk, Kingsholm and Longthorpe and at potentially non-military kilns such as Sugar Loaf Court and Brockley Hill. In addition, a number of sites, for example, Eccles, Sugar Loaf Court and Colchester, were also producing fine cups and roughcast beakers comparable to wares being produced in Central and Southern Gaul. In the light of the recent discovery of an early fort at London (Dunwoodie *et al.* 2015), the Sugar Loaf Court kilns may in fact have a military link (see below). Of the various production sites discussed above, at least four — Brockley Hill, Eccles, Oaksey and Canterbury — had tileries (see discussion below).

## POTTERY PRODUCTION AT LITTLE LONDON

The vessels produced at Little London are the products of specialist potters familiar with Roman forms, kiln construction and the use of white-firing clays. These are not indigenous potters experimenting with new forms, but potters familiar with continental types and the most likely candidates are either those individuals brought across the Channel with the Roman army at the conquest or craftsmen following in its wake. Initially, many of the Claudio-Neronian military establishments appear to have been producing pottery for their own consumption, supplementing any available local pottery. Many forms regularly used in Roman cooking and dining practices did not exist in pre-Roman Britain other than as imports. It would seem likely that, in the first instance, before the necessary supply systems could be established, the army would have been self-sufficient bringing essential stock and equipment as part of the baggage train. It has been noted that the earliest military levels excavated in the legionary fortress at Colchester show an overall paucity of imported fine wares, with the exception perhaps of samian, and no imported mortaria (Timby 2004). There was, however, evidence of locally made military products from the earliest layers (A.D. 44–49), with examples of Colchester mortaria, colour-coated ware, fine black and grey wares, oxidised cream and orange tablewares and coarser, oxidised and reduced grey wares. This would suggest the necessary expertise was immediately available to start 'on-site' production of pottery and probably other items of essential equipment. Hartley (1985, 92) also observed that it was very likely that mortaria would have been made at Colchester soon after A.D. 43.

A similar situation prevailed at other early military sites, for example, Kingsholm/Gloucester, Usk, Wroxeter and Longthorpe. The assemblages from these sites all share a very characteristic profile of forms, featuring flagons, mortaria, honey pots, face pots, bowls, cups, cheese presses and open lamps, most, or all, of which are reflected in the assemblages from the military forts along the Rhine. Comparison with the Claudio-Neronian military kilns at Longthorpe (Dannell and Wild 1987) demonstrates that, whilst the same broad complement of types feature — namely, flagons, bowls, beakers, platters, mortaria, dishes, jars, lids and cheese presses — there are considerable differences in the typological detail. The flagons do not have the simple collared-rim profile, but are more moulded externally and there are no ring-necked examples. The few mortaria comprise wall-sided forms and an unusual flanged type (Hartley 1987, fig. 35); the beakers are predominantly cornice-rim types and the platters mainly copy samian types. Additional forms include small hemispherical cups imitating Central Gaulish forms, lamp filler or feeding bottles and open lamps. At Usk there is again considerable overlap in forms in terms of flagons, flanged-rim bowls and some jars, but less so in terms of the mortaria, which equate to Cam. type 192, while the platters generally have non-functional or no foot-rings. Distinctive types made at Usk but not found at Little London include face pots (Greene 1973, type 18), handled bowls (ibid., types 20, 22), copies of samian forms (ibid., type 21), cups (ibid., types 23–5) and open lamps (type 27).

From the Neronian period there seems to be an expansion of ceramic production in southern Britain exemplified by the kilns seen along Watling Street near Verulamium; the Alice Holt kilns, Surrey; at urban settlements developed out of Roman fortresses such as Colchester and, later, Gloucester; and from individual, short-lived kilns such as at Duxford, Cambs. (Anderson and Woolhouse 2016), Eccles, Kent (Detsicas 1977), Hoo St Werburgh, Kent (Blumstein 1956; Davies *et al.* 1994, 38) and Sugar Loaf Court, London (Chadburn and Tyers 1984). This is followed by a second phase of more extensive ceramic production from the Flavian-Trajanic period with the establishment, or expansion, of many of the large regional industries and a greater standardisation of output.

TABLE 7. COMPARISON OF FORMS FROM CONTEMPORARY KILN SITES

<table>
<tr><th>Typology</th><th>Little London</th><th>Usk</th><th>Brockley Hill/Ver</th><th>Bricket Wood</th><th>Eccles</th><th>Oaksey, Minety</th><th>Colchester Kiln 23</th><th>Colchester Kiln 26</th><th>Gloucester College of Art</th></tr>
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Table 7 compares the output of selected contemporary kilns in Britain against the Little London typology. Whilst most of the kilns were producing broadly the same classes of vessels there is much variability in terms of which types were present at each site. On present evidence none of the kilns appears to be replicating the exact range of types seen at Little London. The earliest kilns in the Verulamium complex, namely those at Brockley Hill (Field 410) (Castle 1973a), show one of the closest overlaps in many of the types produced. This industry was producing Roman forms before the Boudican revolt and appears to have been a civilian enterprise supplying the newly established markets at Verulamium, Colchester and London. In its early phases the potters were making mainly collared flagons, bowls, funnels, lamps, tazze, jars, mortaria, plain dishes with flat bases, lids and wine amphorae of Dressel 2-4 form (Tyers 1998). Of the two kilns excavated at Brockley Hill (Castle 1973b), one is rectangular in form whilst the other is a normal updraught type with a pear-shaped furnace and projecting tongue pedestal. These particular structures are of early second-century date and not associated with the earliest pottery but could reflect earlier antecedents.

The potter or potters at Little Munden Farm, Bricket Wood (Saunders and Havercroft 1977), located some 7 km away from Brockley Hill, appear to have been active in the period A.D. 55–75 and show a similar overlap, particularly in terms of flagons, bowls and lids. The kiln at Little Munden is an updraught type with a rectangular-shaped firing chamber featuring a central tongue pedestal and tile-built piers. Unfortunately, there is no evidence that the stamped mortaria made at the site were specifically fired in this kiln or whether it fired mixed consignments. Hartley (1976, 152) observed that in the early second century the Verulamium mortarium potters often had workshops at more than one location. There is also evidence of extensive brick and tile production in the Verulamium region from the first and second centuries with kilns documented at Blackboy pits, Netherwylde Farm, Park Street, Old Parkbury and Elstree (Saunders and Havercroft 1977, fig. 1). Over this period it has been estimated that the Watling Street tileries provided around 90 per cent of the tile used in London (Crowley and Betts 1992, 221).

A large number of kilns have been excavated at Colchester but four in particular can be identified as early in date, although it is not certain whether these were operated by the military or civilians. Kiln 23 at Colchester (Hawkes and Hull 1948, 106; Hull 1963, fig. 83) was rectangular in plan with clay walls (see further discussion below). The structure was badly burnt and the interior contained burnt clay and the remains of buff flagons and jugs interpreted by the excavator as the last load from the kiln itself. The reconstructed forms include disc-mouthed flagons (Cam. 149–50), ring-necked flagons (Cam. 154) and reeded-lip flagons (Cam. 171). Other vessels found in, or in association with the kiln included hemispherical colour-coated bowls/cups (Cam. 62), ovoid colour-coated roughcast beakers (Cam. 94b), one hemispherical bowl with a flat rim (Cam. 244), some platters (Cam. 17) and a few lid fragments (Hawkes and Hull 1948, fig. 58). The kiln is dated to the period immediately before the Boudican revolt of A.D. 61. Hawkes and Hull also note an unfinished kiln nearby (1947, 106; 281ff.). A further three kilns have also been identified at Colchester dating to the Claudio-Neronian period: kiln 26 (Hull 1963, 157–61) and kilns 34–5 (Swan 1984, mf 287), two of which (26 and 34) were also rectangular in form. Kiln 26 produced a number of buff flagons (Cam. 140, 143, 149, 154), honey pots and bowls. Other wares were associated with the structure but not definitely made there. To the north of Colchester two pre- or early Flavian kilns were excavated at Wherstead (Gill *et al.* 2001) producing a mixture of 'Belgic' and Roman forms presumably destined for the nearest urban centre at Colchester.

At Eccles there is evidence for pottery and tile production from the Neronian period which had apparently ceased by A.D. 65 (Detsicas 1977, 29). The pottery includes platters, jugs, beakers, including vessels with roughcast decoration, lids, cheese presses, flagons (collared, disc-mouthed and ring-necked) and various mortaria, including wall-sided, flanged with an upright rim and hammer-head types (cf. Davies *et al.* 1994, fig. 28.126–9). Some platter forms, in particular Cam. types 8 and 14, in Eccles-type fabrics were stamped (Rigby pers. comm.) and at least one can be paralleled at the Arcadia Buildings site in Southwark. The reason for locating a pottery and tile industry at Eccles is not clear. At least some of the products appear to have achieved a non-local distribution with pottery, roofing tile, flue tile and mortaria ascribed to an Eccles source reaching London (Davies *et al.* 1994, 36; Chadburn and Tyers 1984, 22). A small amount of ceramic building material in the Eccles fabric has been identified at Silchester (Machin 2018, 121–3). Greene (1979, 85) and Pollard (1988, 188–9) suggest the Eccles production represents an estate interest and that the unusual range of forms may be connected with the authority that commissioned the building of the subsequent villa at the same location.

The evidence from Oaksey is more enigmatic. Minety is well-known as the location of an extensive tile industry with at least ten tile kilns known along with probable stone structures and clay pits (McWhirr 1984). One of these was partly excavated in 1974 (Scammell nd). Although negligible dating evidence was recovered the excavator dated the use of the kiln to *c.* A.D. 80–90. Further subsequent investigations in 1984 in an area away from the initial excavation revealed pottery wasters mixed with tile and fired clay. Although again a date of *c.* A.D. 80 is given, the illustrated pieces would suggest a late Neronian–early Flavian date is perhaps more likely. The assemblage includes several flagons with collared-rim, ring-necked examples and disc-mouthed forms, and flanged-rim mortaria with the beads level with the top of the flange but lacking any internal trituration grits and jars. The pottery appears to have been oxidised or reduced but as this is waster material this is not necessarily certain. Due to its proximity, Cirencester was undoubtedly one of the main markets for the Minety kilns although tile products have been found further afield, for example at Silchester (Machin 2018; 2020).

At Gloucester the picture with regards local pottery supply is quite complicated and not fully understood. A number of kilns are now known, or suspected, which may in essence be documenting the transition from military production to a civilian pottery industry supplying the new *colonia* founded at some point in the late first century A.D. The earliest Roman pottery is that from the short-lived legionary fortress located at Kingsholm dating to the Neronian period. Further kilns dating to the Flavian-Trajanic period have been excavated at Berkeley Street (Hurst 1972; Timby 1991), Kingsholm Rugby Ground and the College of Art site (Rawes 1972). The fabrics of the Kingsholm fort and the other sites are completely different in character and there is a different suite of vessels associated with the later kilns. These later kilns located both within and outside the defences were presumably initially supplying the occupants of the second fortress and *vicus* and then, from the later first and second centuries, the *colonia*. More recently, another kiln site has been excavated just outside Gloucester at Longford also dating to the later first and early second century (P. Booth, pers. comm.) and further kilns have been found on the College of Art site (CA 2016) suggesting substantial local demand.

From the above it can be seen that the various components of the range of vessels found at Little London can be paralleled with the products from several other kilns in Britain, both military and civilian in the pre- and early Flavian periods. These assemblages can be distinguished from other contemporary kilns such as those at Rushden (Woods and Hastings 1984), Chichester (Down 1978) and Keston (Philp 1999), where the products are very much influenced by copies of Gallo-Belgic forms, particularly platters, butt and girth beakers and jars, suggesting that either potters, perhaps of Gallo-Belgic origin, were arriving in the pre-conquest period or enterprising indigenous potters were adopting new forms copying the imported wares. The potters at Little London were clearly familiar with continental forms, specifically ones that have a strong connection with the military repertoire, and they are thus likely to be immigrants. Various mechanisms could explain their presence at Little London. They could be potters still officially under the aegis of the Roman military, particularly as the tilery appears to have been under imperial control on the basis of the stamped tiles (see below, Ch. 10, for further discussion). Alternatively, as has been suggested by Swan (1984, 8), military establishments attracted civilian potters to work in their immediate vicinity so the existence of the tilery may have attracted potters already in Britain and who were originally in the employ of the army but subsequently setting up independently. A third possibility is that these were civilian potters with no military connection but with continental backgrounds who saw an entrepreneurial opportunity in the newly conquered territory and were part of a flood of non-military, economic immigrants. The Roman army undoubtedly acted as a catalyst in stimulating trade and manufacturing activity and evidence is accruing to suggest that many of the early legionary camps on the Rhine were occupied by military personnel alongside civilians and officials (Willems and van Enckevort 2009). At Nijmegen there was an extensive *canabae* outside the legionary fortress with strip buildings occupied by potters, glass-blowers, butchers and bakers catering for the troops (ibid., 26).

If it is accepted that the potters are migrants, then one might expect to identify a specific region or regions for the likely origins of the individuals based on the individual styles of pottery made as has been attempted for the Usk assemblage (Greene 1993). This becomes problematic with the Little London assemblage as it appears to show rather a mixture of influences. At Brockley Hill, Tyers (1998, 290) highlights two vessels in terms of searching out a possible area of origin for the potters there: one based on the angular shouldered jar (Little London type J7), the other on the Dressel 2-4 type amphorae. The former may have developed from a similar style of jar found in the area around Lyon and seen in Britain at Usk (Greene 1993, type 13) and Sugar Loaf Court, London (Davies *et al.* 1994, fig. 68). It is suggested that the potter making the amphorae at Brockley Hill may have originated from the Upper Rhine or eastern-central Gaul where similar forms are known to have been made (Tyers 1998, 296). Of the other forms at Little London, the curved-wall platters copying the Cam. 16s would seem to originate from Gallia Belgica with kilns producing the forms known at Trier, Courmelois, Reims and Tours-sur-Marne. Although the form is well-known in Britain, both as imports and generic copies, there are probably only three other locations — Colchester, Wherstead and Eccles — where stamped copies were made closely adhering to the original forms. The mortaria from Little London are quite diverse in form but none approximate the Cam. form type 192 which appears to be the standard type made at Usk, Gloucester and Colchester. Type M1 is similar to Cam. 195/Gillam 238 for which a source in the Oise valley, northern France is now likely. This was among the most common types of mortarium imported into Britain in the first century. There may also be a link with western Gaul with mortaria types found largely in south-west Britain.

In conclusion, we are perhaps seeing in Britain in the Neronian-early Flavian period a new era of pottery production composed of at least five strands which by the later Flavian-Trajanic period had coalesced to create a more widespread, standardised industry. At one end of the spectrum are the potters producing vessels following the later Iron Age traditions where the repertoire is dominated by jars, seen for example with Silchester ware, Savernake ware, the Durotrigan-early Roman potters at Poole Harbour and perhaps the earliest phases of the Alice Holt potteries. These are industries with, or potentially with, pre-conquest origins which continued to function in the early Roman period. At the other end of the spectrum are the kilns which can be identified as directly linked with the legionary forts and fortresses to which a military label can be attached, such as Usk, Kingsholm, Wroxeter and Longthorpe. A third group can be identified where the potters are diversifying their repertoire to produce an array of forms, many with a Gallo-Belgic antecedence such as copies of platters, girth and butt beakers alongside jars and bowls, but not the flagons, mortaria and other forms found in the military assemblages. The kilns at Chichester and those inferred at Keston and in the Dorchester-Abingdon axis (Timby *et al.* 1997) may fall into this group. This could reflect an initial wave of craftsmen crossing the Channel and establishing themselves in new territory, or enterprising potters attempting to copy the new fashions, reflecting the adoption of new social, cooking and dining practices. The fourth group are those assemblages which appear to be a mixture of 'Belgic' style vessels and copies of Gallo-Roman forms alongside more Roman types such as flagons and beakers as seen at Wherstead, Suffolk, and Canterbury and developing at the Alice Holt potteries. These may be catering for both a military and local market; perhaps local potters working alongside, or apprenticed to immigrant potters.

The fifth strand, and the more enigmatic, is that currently encompassing Little London and sites like Eccles, Little Munden, Brockley Hill and Minety, which have a more military signature but are not ostensibly linked to a military establishment, for which a ready consumer market was available. In some cases, as may have happened with the Sugar Loaf Court kiln, the subsequent discovery of a military fort (Dunwoodie *et al.* 2015) or other installation may change the interpretation. It is suggested that the potters working at these locations were either trained by the army, or were following in its wake and were familiar with the 'Roman' repertoire. In some respects the output at these kilns differs very little from that seen at the known military forts but it is very difficult to create a template specific for each of the categories as there is no standardised repertoire which can be seen replicated at the various sites. Each location displays considerable variability. Given all the economic and social turbulence at this time, it is more than likely that there is no one model but a variety of strands which came together to mark a new era of pottery production in southern Britain and it is at centres such as Colchester and Gloucester where the industry can be seen transitioning from military to civilian and catering for both markets.

CHAPTER 5

# THE CERAMIC BUILDING MATERIAL

*By Sara Machin with Michael Fulford*

## INTRODUCTION

This chapter analyses the corpus of ceramic building material (CBM) in terms of both fabric and form. The catalogue includes all bricks and tiles recorded, from the typical Roman roofing and brick forms to more unusual types, all manufactured at Little London. Since we know the source of the material, the summary fabric descriptions serve to demonstrate the variety that can be seen within the output of a single production centre in the context of its local geology. The confirmation of Little London as the production centre of the Nero-stamped tiles found at Silchester (*Calleva Atrebatum*) raises questions about the purpose or purposes for which the tilery was established. For what building or buildings was this material, which includes some very specialist forms, produced? Was it solely for consumption in *Calleva*?

## METHOD

All CBM recovered during the excavation was separated by context into its constituent forms and recorded on site by weight and count. A total of 17,036 items was recorded from the two trenches with a total weight of just over 4.5 tonnes (4584 kg). Trench 1 accounted for 3406.56 kg with a total of 11,245 fragments while Trench 2 produced 1177.38 kg, a total of 5,791 items. The average fragment weight was 269.07 g.

All forms were catalogued according to Brodribb's (1987) typology along with detailed descriptions of more specialised forms. The dimensions of all complete bricks and tiles were recorded. Flat pieces greater than 30 mm thick and without further distinguishing features have been classified as bricks. The presence of complete dimensions meant that some bricks were able to be assigned to specific form types, e.g. *lydion, bessalis*. Flat pieces measuring less than 30 mm thickness and thus likely to be of *tegulae*, *imbrices* and other forms, but without further diagnostic features, were recorded simply as tile. Flue-tile was recorded noting the occurrence of distinctive scoring, combing, relief-patterning and vents. *Tegulae* were identified where a flange was present, or where there was clear evidence of a flange having been removed, or where a lower or upper cutaway could be identified. Any surface features including signatures, scoring and footprints were also recorded. Lower cutaways and signatures were recorded by type according to Warry's typology (2006, 4, 149).

Small fragments which could not be assigned to a particular form were recorded as unidentified. Such pieces accounted for 6,368 items (430.32 kg). A small number of these were retained as fabric samples: 58 fragments weighing a total of 4.6 kg. Throughout the catalogue, references are made to examples of similar forms recorded during excavations at Silchester, including material held in the Reading Museum archive, most of which was retained by the Society of Antiquaries during their 20-year programme of excavations across the town (1890–1909). For the great majority of this collection there is no further information about provenance other than it derives from within the Roman town.

The ceramic building material which was retained after on-site recording includes examples of the complete range of forms and fabrics characteristic of the output of the site, as well as all examples of unusual forms, stamped material and complete pieces. It was not possible to assign all the material processed on site to a fabric series prior to discard owing to the volume of material recovered. The retained material amounts to 938 items with a total weight of 516.55 kg. All retained material was inspected using a 10x binocular microscope and macroscopic descriptions of the fabrics were based on PCRG (2010) by examination of a fresh break where possible. The colours of the exterior, interior and core of each fabric are described with reference to the Munsell Color Soil Chart. The material was assigned to the fabric groups established by Machin (2018). Petrographic thin sections were prepared of a number of fabric samples to enable detailed characterisation of the fabric range. Petrographic fabric summaries include reference to the raw material resources available on site.

## SITE LOCATION AND GEOLOGY

The field in which the tilery is located straddles two distinct geological formations. To the north is the *Windlesham Formation*, which is part of the Bracklesham Group, and to the south is the *London Clay Formation* (Clay, Sand & Silt) (FIG. 63).

The **Thames Group** includes the *Harwich* and *London Clay* formations (Mathers and Smith 2000, 11). The *London Clay Formation* comprises mottled, non-calcareous fine sandy and silty clays (Jarvis 1968, 6) with subordinate, thin glauconitic sands and pebble beds. It is a fossiliferous unit, of shallow-marine origin, with extensive outcrop, especially in the east of Berkshire. The formation varies in thickness from less than 60 m to *c.* 90 m at Wokingham (Allen 2017, 76). At its outcrop there is generally a brown-weathered zone several feet thick, probably coloured as a result of the oxidisation of iron pyrites in the original deposit. Locally, there are sandy seams, with the lower sandier beds preferred for exploitation in the nineteenth century, with production focusing on bricks, and to a lesser extent tiles (idem).

Above the *London Clay Formation* lie the early to middle Eocene sediments of the pre-dominantly sandy **Bracklesham Group**, which incorporates the *Bagshot Formation*, *Windlesham Formation* and *Camberley Sand Formation* (Jarvis 1968, 12; Mathers and Smith 2000). The *Windlesham Formation* outcrops on the high ground between Wokingham and Finchampstead,

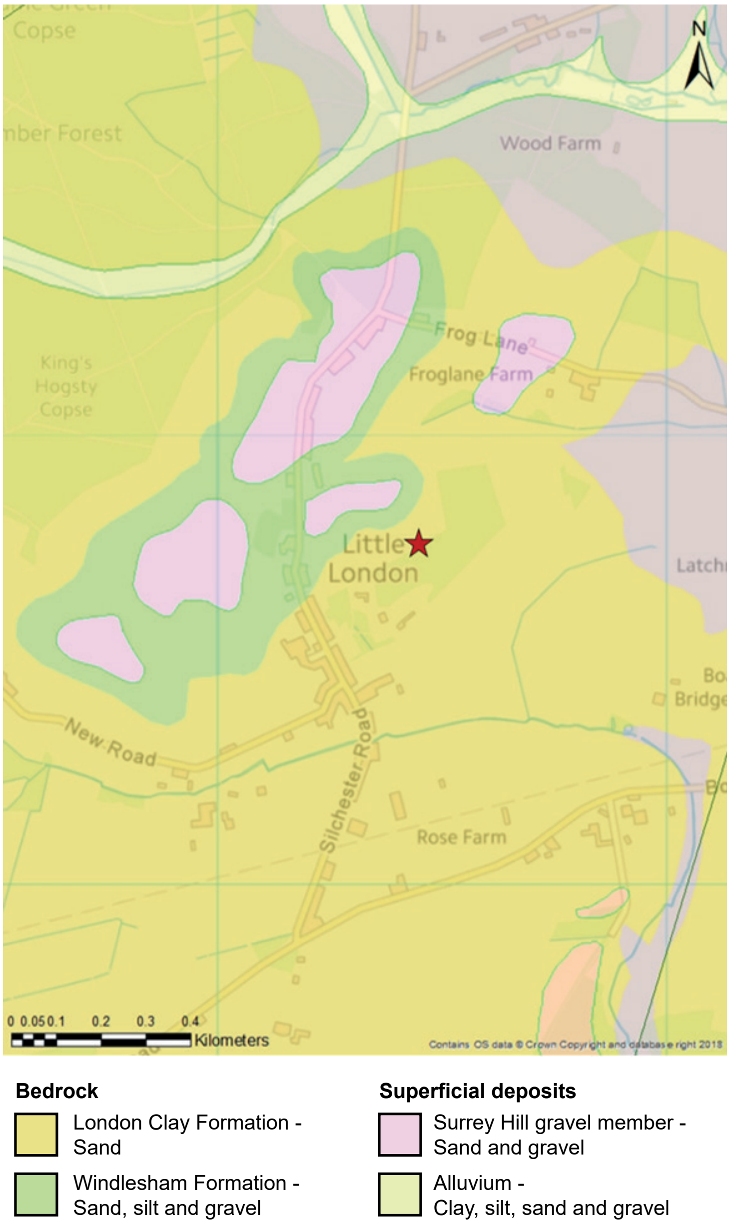


FIG. 63. Little London geological formations

with restricted outcrops to the south-east of Silchester at Hazeley Heath, and to the south-west at Little London. It comprises up to 20 m of dark green to brown, highly glauconitic, bioturbated sand and clay (Mathers and Smith 2000, 13). The *Windlesham Formation* is overlaid in places by the Surrey Hill Gravel Member (formerly *Plateau Gravels*) which is characterised by clasts of abundant angular flints, common rounded flints, sporadic Lower Greensand and very sparse quartz and quartzite (Osborne White 1909, 87).

## FABRICS

While all the retained Little London CBM was examined in hand specimen, a selection of material was examined in petrographic thin section to establish the mineralogy and composition of the different fabrics present. Three fabrics from the Silchester CBM fabrics series could be identified within the material (Machin 2018) and these are described below.

As described above, there were two clay sources available in the immediate vicinity of the kilns: *London Clay Formation* dominates the local geology with an outcrop of *Windlesham Formation* to the north-west. This has therefore resulted in a variety of fabrics which comprise a combination of the clay sources in varying proportions presenting a range of degrees of heterogeneity.

Amongst the material were also many examples where the clay had been under-fired, resulting in a soft fabric which became malleable when water was applied. There was also a large proportion of material that was over-fired, showing signs of sintering and vitrification, resulting in a smooth glass-like fabric with melted moulding sand on surfaces giving a green glass-like finish.

### FABRIC GROUP 1 (SILCBM1) (Machin 2018, 74–83) (FIGS 64–65)

This is a hard, moderately micaceous, homogeneous fabric, with sandy texture and irregular fracture. It is iron-rich and typically oxidised throughout with red (2.5YR 5/8) surfaces, margins, and core. The matrix has very common, fine quartz sand throughout with varying proportions of coarse to very coarse quartz sand (1–4 per cent). There are sparse red iron-oxide grains visible along with sparse large flint inclusions, up to 2 cm. Rare examples of heat-altered glauconite have also been identified in thin section. Inclusions are weakly bi-modal, double spaced, exhibiting weak to moderate alignment.

Fabric variant SILCBM1B is distinguished by a much higher proportion (*c.* 30 per cent) of fine quartz sand present. There are typically few voids evident making it a dense, hard fabric. The occasional reduction in optical activity is the result of a high firing temperature.

This fabric group has been shown to have derived from *London Clay Formation* sources (Machin 2018, 76). The *London Clay Formation* has variability in terms of its lithology and

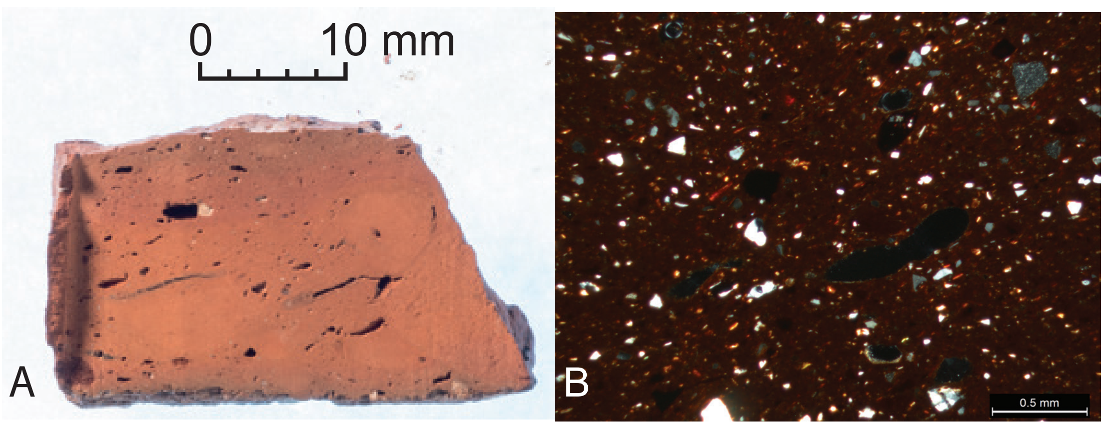


FIG. 64. SILCBM1A: (A) Hand specimen; (B) Photomicrograph of thin section (XP (Crossed-polars); x40 magnification)

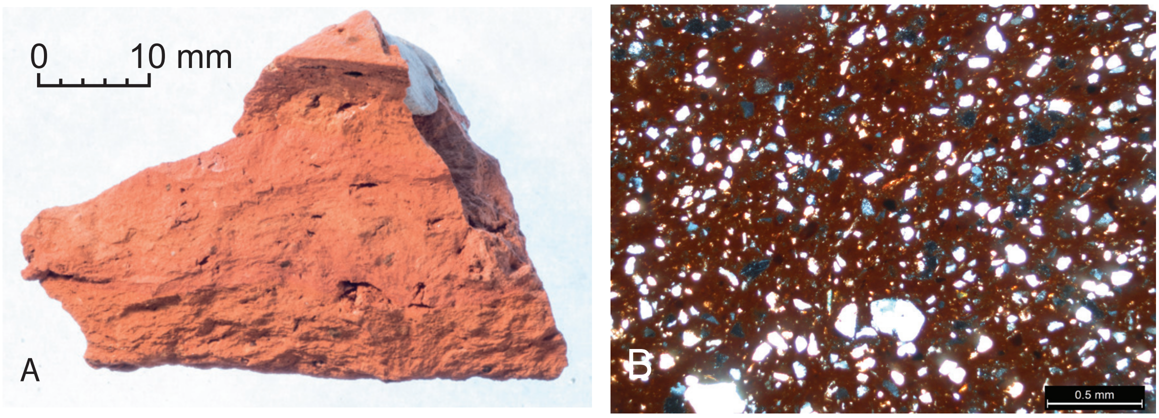


FIG. 65. SILCBM1B: (A) Hand specimen; (B) Photomicrograph of thin section (XP; x40 magnification)

quartz sand components, with the upper beds comprising mottled, non-calcareous fine sandy or silty clays (Jarvis 1968, 6) with localised sandy seams (Allen 2017, 75). This could account for the variability between fabrics SILCBM1A and SILCBM1B, although there is also the potential for the variation to be due to the anthropogenic addition of quartz sand during processing.

## FABRIC GROUP 3/4 (SILCBM3 and SILCBM4) (Machin 2018, 89–102) (FIGS 66–67)

SILCBM3 is a typically heterogeneous fabric with ferruginous bands and clay streaks visible. Surface colours vary from very pale brown (10YR 7/3) to pink (7.5YR 7/4 pink) and yellowish-brown (10YR 5/4). This fabric is generally oxidised throughout but with some examples of reduced cores (2.5Y 5/1 grey) and rare examples of reduction to surfaces, resulting in a greyish-brown colour (10YR 5/2). Most examples show evidence of being poorly worked with folds and voids visible within the fabric. This fabric is an example of the imperfect mixing of a naturally variegated clay defined by the zones of iron-rich and pure crystalline clay, rather than anthropogenic heterogeneity introduced as a result of the mixing of two different raw materials (Quinn 2013, 42). The raw clay has only been partially processed, insufficient to produce a homogeneous fabric. Quartz is present in the form of moderate, fine silt-sized grains (15 per cent) within the matrix and sparse, larger coarse-sand grains visible throughout. Rare red iron oxides can also be identified along with rare flint/chert inclusions. Argillaceous inclusions take the form of clay pellets, pale yellow-brown in colour, of a fine-grained, purely-crystalline clay. The pellets have diffuse-to-merging boundaries and are distorted, indicating they were plastic at the time of processing. There are also rare examples of grog, angular inclusions of previously fired clay, exhibiting clear boundaries, probably derived from crushed kiln material. There are a small number of examples of darker reddish-brown pellets indicating a higher iron content. Inclusions are moderately bi-modal, single-to-double spaced, exhibiting weak orientation. This highly heterogeneous fabric exhibits a wide range of inclusions, all within a common mixed base clay.

Fabric variant SILCBM3B is typically a more homogeneous variant of the fabric, though containing the same suite of inclusions. It is evident through the variety within this fabric group that the raw material was subjected to different amounts of processing before forming and firing, with some examples showing a higher degree of heterogeneity with highly ptygmatic regions visible. Geo-chemical and petrographic analysis has confirmed that the *Windlesham Formation* is the raw material clay source for this fabric.

SILCBM4 is an iron-poor fabric with occasional fine pale cream clay lenses throughout. It is a hard-sandy fabric with irregular fracture. The surface colours vary from a very pale brown (10YR 7/4) to pink (7.5YR 7/4). The fabric is generally oxidised throughout, though reduced examples are consistently mid-grey on all surfaces and throughout the body of the samples.

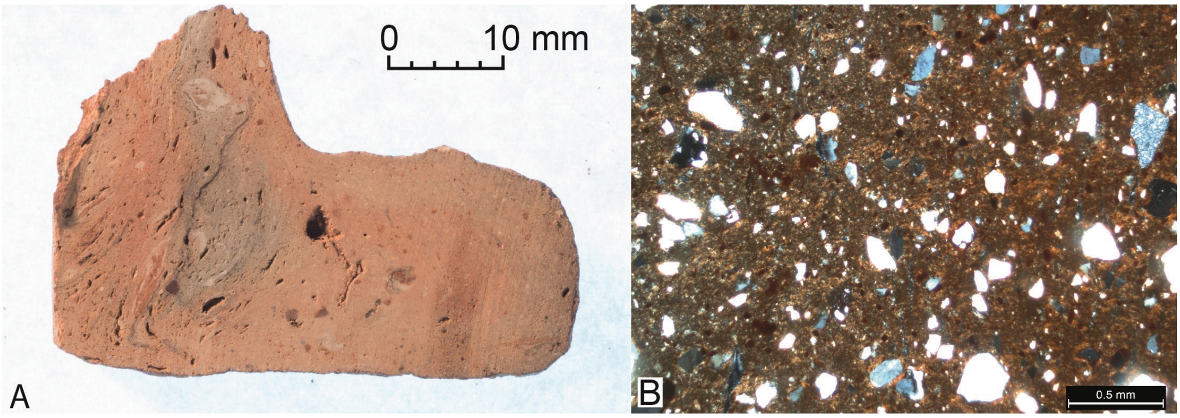


FIG. 66. SILCBM3: (A) Hand specimen; (B) Photomicrograph of thin section (XP; x40 magnification)

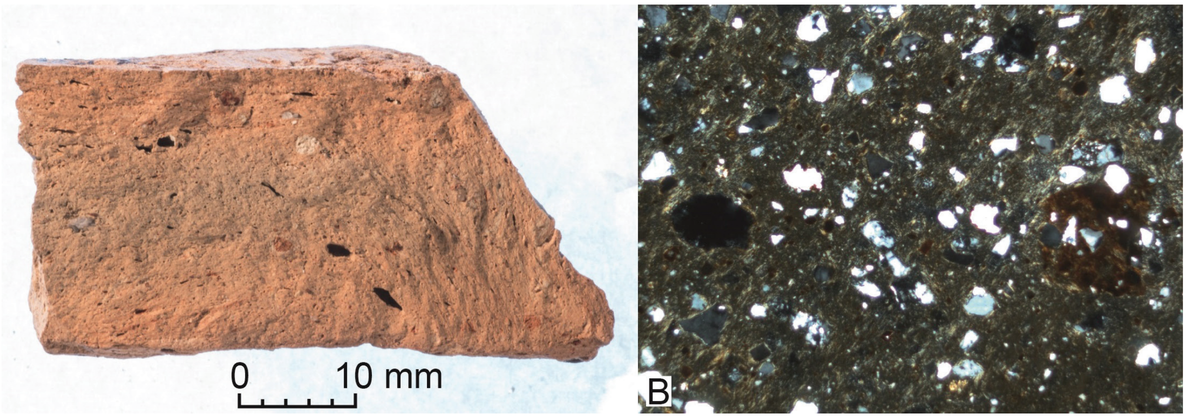


FIG. 67. SILCBM4: (A) Hand specimen; (B) Photomicrograph of thin section (XP; x40 magnification)

The SILCBM4A samples are generally homogeneous whereas the SILCBM4B variant exhibits a large number of pale cream clay pellets resulting in a higher degree of heterogeneity. This is probably a result of a lesser degree of weathering and processing of a naturally variegated clay, rather than the anthropogenic mixing of two different source clays. These clay phenomena have clear to merging boundaries, taking the form of equant, typically rounded pellets, with some evidence of distortion, indicating they were plastic at the time of processing and firing. This fabric has common fine quartz-sand throughout resulting in a sandy texture. There are sparse small iron-rich grains present, with some samples of SILCBM4A having a higher proportion of iron-rich inclusions (10 per cent). Mineral inclusions identified comprise heat-altered glauconite grains, hornblende and plagioclase feldspar. Inclusions are unimodal, single spaced, exhibiting moderate orientation. Geo-chemical and petrographic analysis results show that SILCBM4 also correlates with the *Windlesham Formation* clay source. This would therefore show that the SILCBM3 and SILCBM4 are all variants of the same fabric group.

### FABRIC 5 (SILCBM5) (Machin 2018, 103–9) (FIG. 68)

SILCBM5 is an iron-rich, non-calcareous, homogeneous fabric, typically oxidised throughout with some reduced examples. Surface colours vary between red (2.5YR 5/6) and light red (2.5YR 6/6). The fabric comprises a very fine-grained matrix, with sparse quartz-silt present. It is slightly micaceous, typically mid-brown-orange in colour in XP and PPL. There is a moderate proportion (10–15 per cent) of well-rounded fine quartz-sand, which may be an anthropogenic addition. It also features sparse angular-to-subangular flint fragments, probably added along

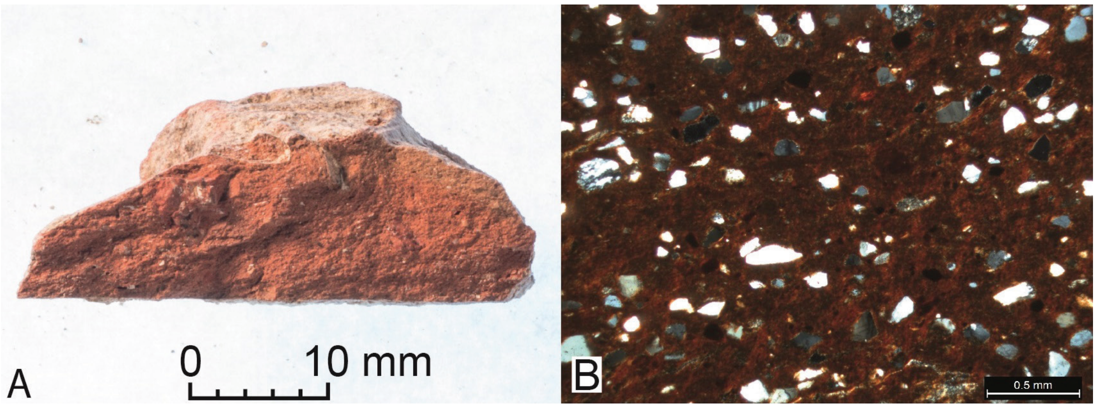


FIG. 68. SILCBM5: (A) Hand specimen; (B) Photomicrograph of thin section (XP; x40 magnification)

with the coarser quartz component. The fabric exhibits very pale brown (10YR 7/3) clay pellets and streaks. These argillaceous inclusions are rounded, equant pellets of a highly birefringent clay, with sharp-to-merging boundaries. The fabric has moderate optical activity, with reduced activity due to a higher firing temperature noted in the SILCBM5B sub-group. The other mineral inclusions comprise heat-altered glauconite grains and plagioclase feldspar. Inclusions are unimodal, single-to-double spaced, exhibiting weak orientation. A source of this fabric was not previously identified; however, it is most likely a result of a combination of the two raw material sources available at Little London. There are no inclusions present in the SILCBM5 fabric that are not identified in either Fabric Group 1 or Fabric Group 3/4. Some examples show evidence of laminating throughout, a potential indicator of the incomplete mixing of two different clays.

## ASSEMBLAGE COMPOSITION

Excluding unidentified fragments, the composition of the Little London assemblage is dominated by bricks whose weight accounts for 45 per cent of the material, followed by tile (28 per cent by weight) and roofing tile (25 per cent by weight). However, when measured by number of fragments, the material is dominated by roofing tile (40 per cent), with 28 per cent brick and 26 per cent tile.

TABLE 8. THE COMPOSITION OF THE LITTLE LONDON CBM ASSEMBLAGE

| **Form** | **Weight (g)** | **Count** |
|---|---:|---:|
| Brick | 1867465 | 3047 |
| Roofing | 1035350 | 4237 |
| Flooring (*opus spicatum*) | 590 | 4 |
| Hypocaust (flue-tile) | 89525 | 634 |
| Tile | 1147837 | 2730 |
| Tile-stamped | 630 | 3 |
| Vaulting (voussoirs) | 9455 | 5 |
| Waterpipe | 615 | 8 |
| Unidentified | 430324 | 6368 |
| **TOTAL** | **4581791** | **17036** |

### FORMS CATALOGUE

The material has been divided into seven key form groups: brick, tile, roofing, flooring, hypocaust, vaulting, waterpipes. Within these groups, where it has been possible, material has been further divided into particular form categories based on dimensions, distinctive features or other diagnostic characteristics.

## Brick

Flat pieces greater than 30 mm thickness are assigned to the brick category. These amounted to 3,047 items with a total weight of 1867.47 kg accounting for 45 per cent of the recorded material by weight (28 per cent by count). As very few complete examples were recovered, the absence of *bipedales* may be more apparent than real.

### *Bessalis*

There were four examples of bricks that could be identified as *bessalis*. These are small square bricks, measuring approximately 200 mm$^2$, the equivalent of ⅔ Roman foot. They are typically used to create *pilae*, to support the *suspensura*, the floor suspended above a hypocaust (Brodribb 1987, 36). The complete *bessales* recorded had an average weight of 2.74 kg each. One example, measuring 200 mm$^2$, has an unusual signature on the surface in the form of a quadrant around one corner (FIG. 69). There is an example of a *bessalis* with the same signature in the Reading Museum archives (Accession: 1995.98.82). Another complete example from Little London is slightly smaller, measuring only 187 mm$^2$.

Three examples were recovered from Trench 1 – (1029)x2 and (1032) – and a single example from Trench 2 – (2028). *Pilae* of this type have been recorded on a number of occasions during excavations at Silchester. The Society of Antiquaries described numerous hypocausts uncovered during their 20-year programme of excavations, 28 of which are described as pillared (Machin 2018, 54), constructed with *pilae* beneath the *suspensura*. *Pilae* were also utilised in ‘composite’ hypocausts where a system of channels between earthen or rubble baulks led to a central chamber filled with *pilae* (FIG. 70).

At Little London, *bessales* were found to have been used to construct the *pilae* which supported the floor of the circular pottery kiln (Kiln 5) (above, p. 46).

### *Lydion*

Five bricks could be categorised as *lydions*, where surviving dimensions were sufficient to make a positive identification. A *lydion* is a flat brick measuring approximately one Roman foot by one-and-a-half Roman feet (295.7 mm by 443.5 mm). One complete example recorded had a total weight of 11.3 kg. The four *lydions* found at Little London all had a ‘spacer’ of clay added centrally to the surface of the brick (below, p. 97, for a discussion regarding ‘spacers’). *Lydions* were used for a range of purposes, including being considered most suitable for bonding courses in walls. Bonding courses are considered to have emerged as a device to provide a firm and level base for walls, developing to be used at regular intervals through the height to aid construction of tall, slender walls by ensuring their trueness (DeLaine 1997,


FIG. 69. *Bessalis* with quadrant signature (1029)

145). There are very few examples of bonding courses reported at Silchester, those recorded predominantly occur in the public buildings, including the temples and temenos wall of Insula XXX, the west gate (Machin 2018, 48), the Hadrianic-Antonine forum-basilica, as revealed at the north end of the basilica (Fulford and Timby 2000, 59), and the *mansio* baths as illustrated

FIG. 70. Composite hypocaust below *tepidarium* at Silchester bath-house (Insula XXXIII)

FIG. 71. *Pilae* supports within Kiln 5 (2052)

FIG. 72. *Lydion* used as a liner of Kiln 5 (2052)

by the Society of Antiquaries in the baths structure in Insula VIII (Hilton Price 1887, pl. XIX). *Lydions* were also observed within the structure of the bath-house at Silchester during the recent excavations. *Lydions*, however, could also have been used as large flooring bricks, both for internal and external pavements, with examples recorded in the timber forum-basilica (Period 5, *c.* A.D. 85–125) contexts and further examples identified in tile settings flanking either side of the entrance to the forum from the basilica (Fulford and Timby 2000, 51).

One particularly distorted *lydion* was found to have been used as a lining of Kiln 5 – (2052) (FIG. 72).

*Chamfered bricks*

Nine examples of bricks were recorded where one end had been cut at an angle, i.e. chamfered. This was typically along the shorter edge of the brick and at an angle of between 45 and 70 degrees (FIG. 73). Eight of the bricks were cut to remove clay from the top of the brick, while a single example was 'undercut' removing clay from the underside. This chamfering is understood to have facilitated the overlap of the bricks when used in bonding courses, thus creating a superior join between two bricks (Brodribb 1987, 40). If the brick was to be used in this way, then it means that alternate bricks would have been laid 'upside-down' to facilitate the overlap. This was seen to be the case during the recent re-excavation of part of the Silchester public bath-house (Insula XXXIII) (Fulford *et al.* 2018b; 2019). There is a single example of a *lydion* with a chamfered end in the Reading Museum Silchester archive. Examples of chamfered brick were recovered from Period 2B levels at the legionary bath-house in Exeter; these were 75 mm thick, 260 mm wide and at least 250 mm in length (Bidwell 1979, 153).

*Scored brick*

Eight fragments of brick, each in excess of 30 mm thickness, were recorded where the surface


FIG. 73. Chamfered brick (1098)

had been scored. This scoring could have been to assist keying into a mortar bed or to provide a key for plastering, as is more typically found on box-flue tiles and wall-jacketing *parietalis*. The scoring on these bricks, however, was of a more rectilinear design rather than the typical diamond-shaped lattice found on flue-tiles (FIG. 74). There are two examples with signatures visible on the surface, and one example with a 'spacer' scar present. There is a possibility that these bricks had been scored to be broken into tesserae after firing.

*Brick – column*

Three examples of 'segmented' brick were recorded with a total weight of 6.68 kg. The bricks ranged in thickness from 58 to 68 mm. None of the examples was complete. All examples included one curved edge and at least one straight edge (FIG. 75). Moulding sand present on the surviving edges evidences their production in a mould. These bricks would probably have been used to create columns which were then plastered and decorated with stucco. All three have curved edges which would have produced a column with a diameter of approximately 560 mm. One example had been made with two straight edges creating an angle of 135 degrees (1000). Two of these bricks together could have been used around a right-angled corner or square post to form a column. In Roman Britain examples of column bricks are rare and, where bricks are used to form columns, these are typically found to be semi-circular or formed into quadrants.

*Brick – narrow*

There were 16 examples of unusually narrow bricks, with an average width of 137.2 mm. These bricks have a total weight of 30.1 kg and average 41.2 mm in thickness (FIG. 76). There were no examples complete in length. Bricks of similar dimensions with a width of 6 in (*c.* 150 mm) were reported from the military tileworks at Holt. These bricks were found *in situ*, used as kiln bars to traverse the flues and create the firing floor within a pottery kiln (Grimes 1930, 40, 136;


FIG. 74. Scored brick: possible tessera production (1098)

fig. 30). Other examples were recorded in the CBM assemblage from Princesshay, Exeter, where the site included brick-making debris, probably associated with the construction of the forum-basilica and town baths (Pearce and Steinmetzer forthcoming, 82). An example is also held in the archive of the material retained during the excavation of the tile and pottery production site at Oaksey Park, Minety (Scammell n.d.). These unusually narrow bricks have therefore typically been interpreted as fire-bars or kiln furniture. Seven of the examples from Little London were recovered from the fill of Kiln 4 (2031). A single example was recorded during the 2019 excavation season at the Silchester bath-house.

*Spacers*

As mentioned above, a large number of the bricks in the assemblage have 'lumps' of clay added to the upper surface of the brick. These have often been described as *mammatae*, clay additions designed to create a cavity when used in heating systems. All the

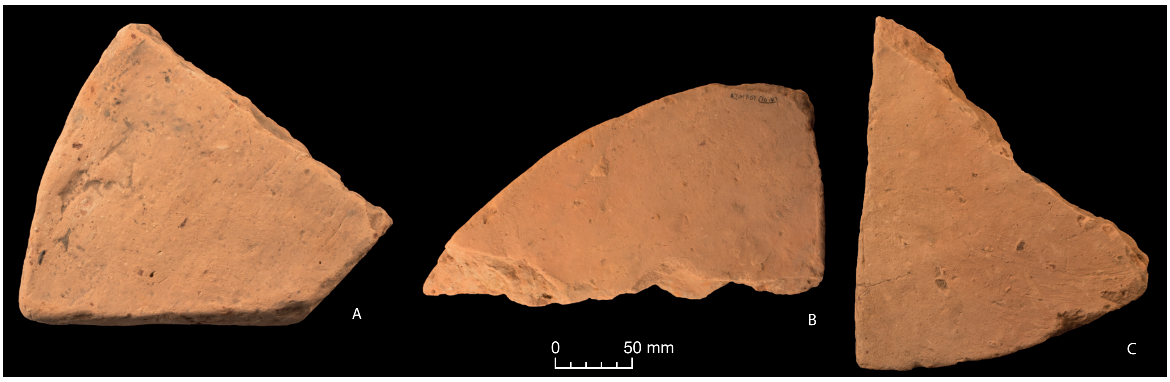


FIG. 75. Column fragments: (A) (1000); (B) (1074); (C) (1074)

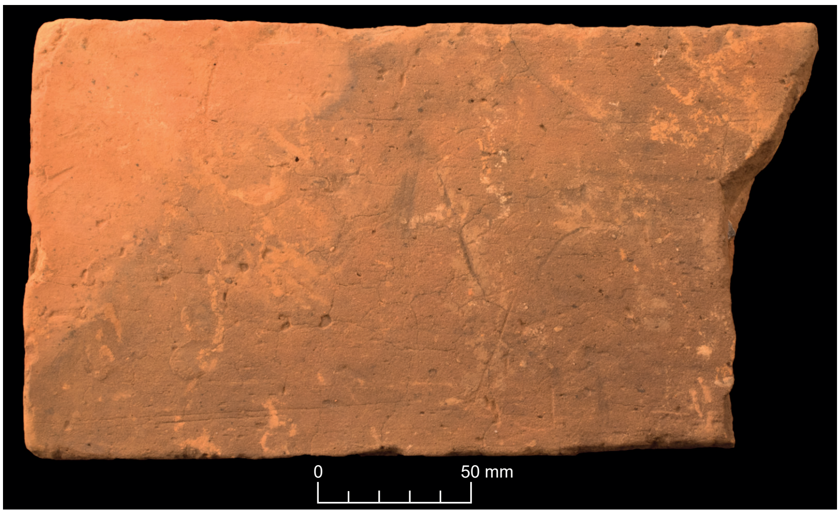


FIG. 76. Narrow brick (2035)


FIG. 77. Hoofprint underneath spacer (1046)

examples recorded on the Little London material were very insubstantial, typically <2 cm in height, and were therefore clearly not for this function. These lumps of clay would have been added to the surface of bricks to act as spacers, to create a gap between the bricks when they were stacked for drying and within the kiln during firing (Wheeler and Wheeler 1936, 141; Cunliffe 1971, 43). Depending on the intended final use of the brick, the 'spacer' was sometimes retained and examples are found at sites such as Silchester and Fishbourne (Brodribb 1987, 40). It is likely that the spacers were added just before firing, or at least after the brick had partially dried, evidenced by an example where the spacer has been added on top of a hoofprint (FIG. 77).

It has also been suggested that these bricks were used sanded-side up as paving, the nibs anchoring the tile into the mortar bed below (Betts 2006, 81).

**Roofing**

Roofing material incorporates the typical *tegulae* and *imbrices*, along with more specialist roof furniture in the form of antefixes, chimneys and skylights. A total of 4,237 items of roofing material was recorded with a weight of 1035.35 kg. Roofing material accounts for 25 per cent of the corpus by weight (40 per cent by count).

*Tegulae and imbrices*

*Tegulae* represented 2,521 items, with a weight of 792.83 kg, whilst *imbrices* accounted for 1,699 items, 237.89 kg in weight.

A single complete *tegula* was recorded, with a length of 488 mm and weight of 10.65 kg. The


FIG. 78. *Tegula colliciaris* (2037)

average length of the *tegulae* was 472.83 mm, whilst *tegulae* beds varied in thickness between 17 and 32 mm. All signatures recorded on *tegulae* were Warry Type S1 (Warry 2006, 149), taking the form of a single semi-circle to the bottom surface of the *tegula* bed (see below for other signatures recorded on the Little London material). There is a single example of a *tegula* with a pre-formed nail-hole, which was located 62 mm from the top of the *tegula* bed and 124 mm from the surviving flange.

All lower cutaways recorded were of Warry Type C5 (Warry 2006, 4), with 28 complete cutaways recorded. This type of cutaway was formed using a mould insert that ran the full height of the flange, and the diagonal cut was made after moulding using a knife (ibid., 24). All Little London examples confirm this method of production having moulding sand from the insert present on the vertical edges of the cutaway, with the diagonal cut made with a knife after moulding. With a *terminus ante quem* of A.D. 68, the confirmation of Little London as the producer of the Nero-stamped *tegulae* contradicts Warry's dating of his cutaway type C5 (A.D. 160–260) (2006, 72–3).

### *Tegula colliciaris*

Within the *tegulae*, there is one unusual example. This *tegula* has all the typical features of a *tegula*, including a lower cutaway Warry Type C5, but the bed of the *tegula* has been cut obliquely, at an angle of 120 degrees. The cut starts at 47 mm from the left-hand flange thus allowing space to accommodate the *imbrex*. This example was found within the fill of Pottery Kiln 3 [2040]. This *tegula* was fired in a reducing atmosphere resulting in a uniform grey colour (FIG. 78).

Roofing tiles cut in this way are known as *tegulae colliciares*, derived from *collicia* meaning a gutter or gulley. They were used at the intersection of two sloping roofs forming a valley. The overlapping joints of such gutter segments could either be fitted dry or sealed with lead or watertight mortar (Gerding 2013, 180) (FIG. 79). Excavations at Silchester have shown a

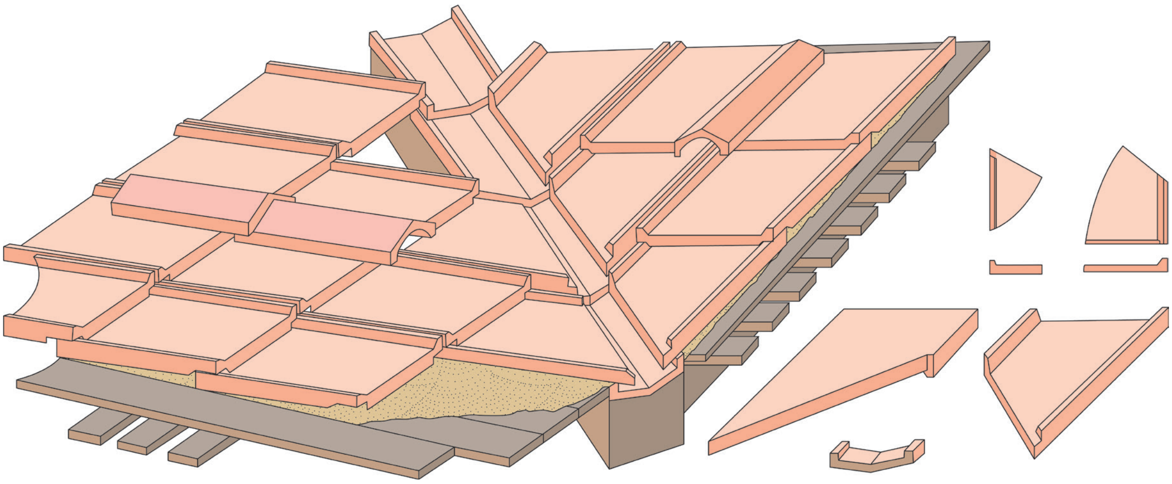

FIG. 79. Example of roof covering of *tegulae colliciares* (after Gerding 2013, A9.21)

number of buildings whose layout would have included roof valleys, notably the forum-basilica in Insula IV and the public bath-house in Insula XXXIII. The *tegula colliciaris* is an example of a type of building material probably produced to order for a specific building. An example of such a cut *tegula* is known from Roman Southwark, London. This example had the top right corner removed, approximately 180 mm from the bottom of the tile, and is thought to have been specially made for a 45-degree roof junction (Pringle 2002, 153). Flat tiles, not *tegulae*, cut at an angle to fit a junction between two roofs are also known from the Courage's Brewery site in northern Southwark (Betts 2003, 113).

*Skylight*

The roofing material also included five fragments of two *tegulae* which were manufactured with a central hole surrounded by a raised border. The holes measure between 130 mm and 140 mm in diameter, the circumference around the outer edge of the raised border measures approximately 300 mm. The central hole was cut after the forming of the *tegulae* and the edge of the hole was indented to act as a key for the addition of the border. The Little London *tegulae* are examples of Wikander Type 1, with a plain opening surrounded by a raised border, with estimated diameters varying between 16 cm and 31 cm (FIG. 80). It is the simplest and probably the oldest type (Wikander 1983, 91–3). Both the Little London examples were found within a post-hole in Trench 1 [1008] located approximately 3.5 m from the eastern corner of Tile Kiln 1 [1125].

The function of these tiles has been debated, typically being considered to have been either to let in light and air, or to let out smoke. Research has shown that their use was not restricted to a particular type of building and Wikander (1983) concludes that the use of skylight tiles was varied and they could be used to fulfil whatever need existed. The dating of the use of this type of tile is difficult due to extensive re-use and recycling of material, but its origin is believed to have been on the Greek mainland in the sixth century B.C. (ibid., 94). Ludowici reports the discovery of some interesting brick fragments, namely roofing with smoke openings and with dormers in different sizes, with one example bearing the stamp of *legio I*, from Rheinzabern (1912, 191–2) (FIG. 81).

Brodribb (1987, 19) cites only two examples of these from Roman Britain, one from the tile and pottery production centre at Holt, which was described by Grimes as an outlet for smoke (1930, 135) and featured a perforation of approximately 210 mm diameter, and the other from Colchester (Crummy 1992b, 256, fig. 7.2). More recently, an example was found at Paternoster Square, London, where the hole is described as possibly a ventilation hole or smoke vent and therefore it may have been linked in some way to a chimney (Betts 2006).

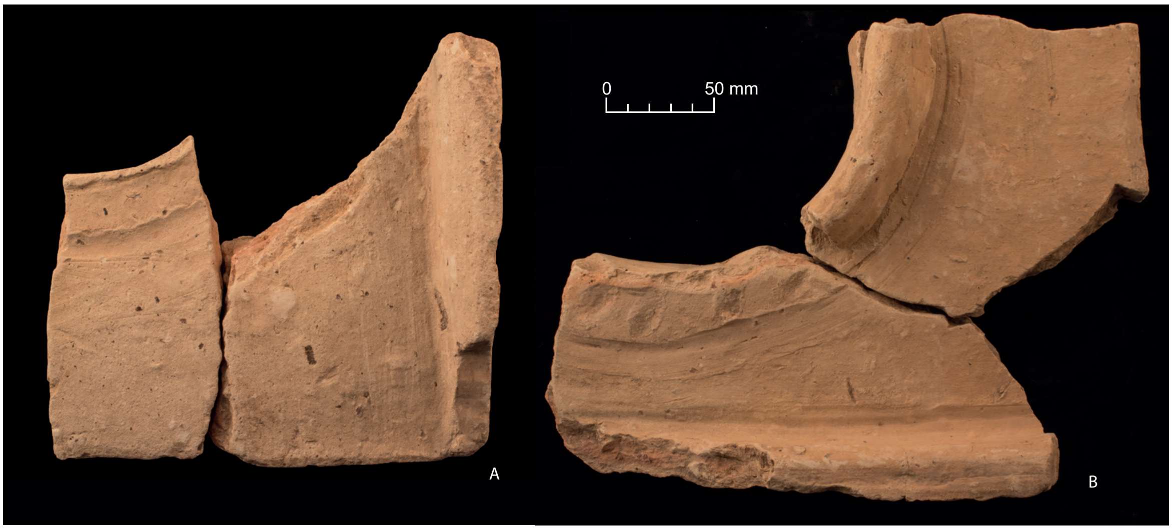


FIG. 80. Skylights (1009)

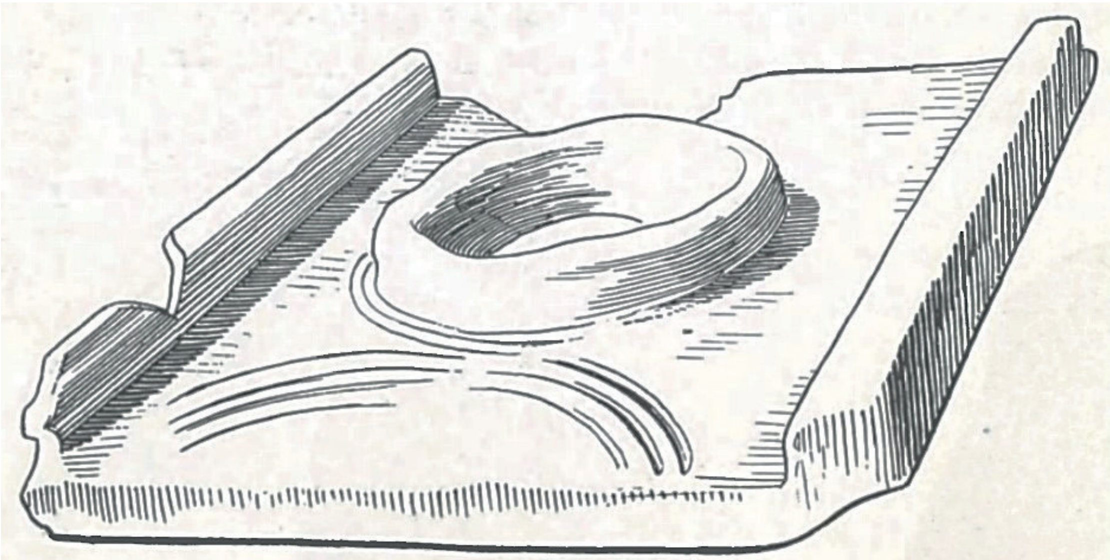

FIG. 81. Example of a skylight, opening 15 cm (after Ludowici 1912, 192, fig. 142)

Outside of Roman Britain, examples have been found at Conimbriga, Portugal, which are very similar in form to the Little London examples. Roofing at Conimbriga was made of typical *tegulae* and *imbrices*, and these special forms were described as being used to allow smoke from the fireplace to escape. Here they have been dated to the Augustan period (27 B.C.–A.D. 14) (Alarcáo 2000, 33, 99). They are also known from Pompeii, where one example was discovered *in situ* on the roof of a house from Regio V. The example from Pompeii shows that these *tegulae* were used in conjunction with traditional *tegulae* on the roof slopes (FIG. 82). If used with a chimney, one would expect the *tegulae* to be laid flat, along the ridge of the roof but there is no evidence to suggest that the bases of chimneys were angled to fit on a sloping roof.

Measurements of the internal circumference of the possible lamp-chimneys from Little London (below, p. 105) and the external circumference of the raised border around the central holes in these *tegulae* also do not support their use in conjunction with lamp-chimneys. It is most probable that they served as vents or skylights with the raised border deflecting the majority of any rainfall around the opening.

FIG. 82. Example of a skylight *in situ* at Regio V, Pompeii (© *Massimo_Osanna (Instagram)*)

*Antefix*

Two fragments have been identified as parts of antefixes, ceramic ornaments attached to the end of the lower course of *imbrices* at the edge of roofs. One example takes the form of the lower portion of a face, including the lips and chin (FIG. 84). Vines are visible below the chin and the right-hand edge is raised up to form the border, as is seen on the Silchester antefix examples held in the Reading Museum collections (below).

The other example takes the form of part of the plaque/surround of the antefix (FIG. 83). This differs somewhat in fabric, being a paler cream colour, possibly the result of different firing conditions. The surface is quite abraded, but it is possible to make out the frame of the plaque and part of the vine scroll, which show it to be the bottom right-hand corner of the antefix.

Neither of the examples has any sign of moulding sand on the surface. Antefix moulds would have been made from fired clay which retains some porosity after firing. When wet clay was then applied to it, the mould would absorb moisture from the surface, thus drying it. This allowed for the mould to be removed, leaving a clear rendition of the antefix without the need for any separating agent (G. Taylor, pers. comm.)

There are four fragments of antefix, seemingly from the same mould, held in the Reading Museum Silchester collection, two on display in the museum and two held in the archive. One example is described in the report of the investigations into the environs of the forum-basilica, in Insula IV, as 'part of an antefix with a crudely executed face, which evidently belonged to a building of some importance' (Hope 1893, 561) (FIG. 85). Another fragment is described by


FIG. 83. Antefix (1046)

FIG. 84. Antefix (1046)


Cotton in the report of her excavations of the town rampart between the north gate and the amphitheatre. It was found in an occupation layer, dated to *c.* A.D. 100–120, and is described as having been made in a local mould since it is identical to the three other examples previously recorded (Cotton 1947, 127). The two examples on display are more complete, but are not referenced in any of the published excavation reports.

Boon saw the images as representations of a local deity, noting that 'the face is male, beardless, and has hair *en brosse* surmounted by wings or horns' (Boon 1974, 169). He considered that

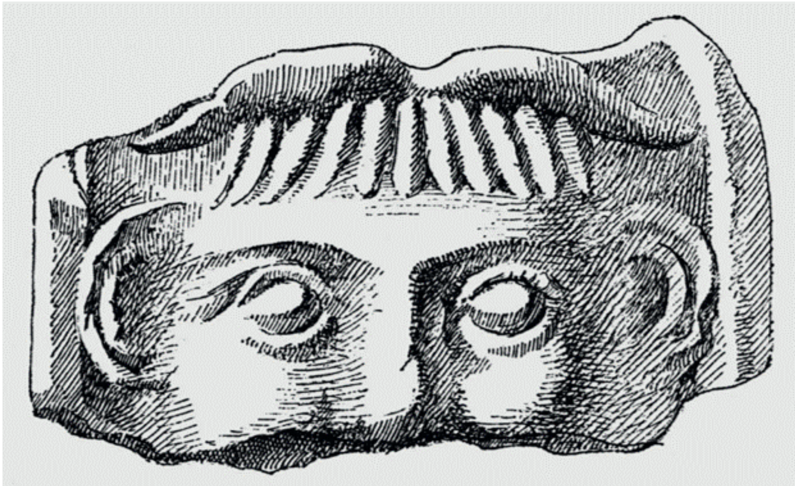

FIG. 85. Fragment of antefix found by the Society of Antiquaries (after Hope 1893, fig. 3)

they might all depict wind gods designed to protect the dwelling against storms and evil spirits (ibid., 170) (FIG. 86). Previously the Silchester examples had been interpreted by Toynbee as displaying an outlandish version of Medusa, the features below the chin representing knotted snakes, and had been compared with an antefix recovered at Dorchester, Dorset where the face, though similar in other respects, was bearded and so seen as a male Medusa (Toynbee 1964, 430–1, pl. XCIXc). Antefixes with a Medusa head have also been found in Colchester (Crummy 1992b, 252–3, fig. 7.1). None is from a closely dated context but they are probably to be associated with the legionary fortress. We can also add the four examples with human (?female) faces recovered from Period 1A contexts from the legionary bath-house at Exeter and dated *c.* A.D. 55/60–75 (Bidwell 1979, 56–7, 149, pl. XVIII, 1–2). Many more fragments were recovered from later levels associated with the legionary bath-house, with other finds recorded from across the town after 1979 (P. Bidwell, pers. comm.).

Boon, observing that most antefixes have been found on military sites, typically bearing inscriptions of the occupying legion, suggested they were placed along the eaves to close the open ends of the *imbrices*, and this is supported by the antefixes from Exeter which show scars where they were detached from their *imbrices* (Bidwell 1979, 149). By contrast, Boon saw the scarcity on civilian sites as evidence of a different function, to serve as finials to finish the gable-ends of private houses or public buildings (Boon 1957, 148).

That there was a long ancestry of stylistically similar facial depictions on

FIG. 86. Almost complete antefix (after Boon 1957, 148, fig. 28)

antefixes is indicated by the mid-fourth-century B.C. representations of Artemis Bendis from Taranto (BM Collection 1849,0724.2; 1856,1226.434; 1884,1011.6) (cf. Blagg 1979, 277–80). Fragments of antefix were also described by Ludowici, at the same site, Rheinzabern, which produced the skylights (see above) (Ludowici 1912).

*Chimney*

Ten small fragments of possible lamp-chimney were recovered with a total weight of 780 g. Five fragments join together to make a large portion of a tiered-vessel (FIG. 87). This has pie-crust decoration and the fractures provide evidence that the chimney was constructed in a number of separate sections and subsequently joined together. The ribbing to the interior surfaces suggests that this chimney was coil built with the exterior surfaces smoothed. Its interior diameter is estimated at 200 mm. There are two other fragments of this chimney which do not join with the rest.

Three fragments of possible lamp-chimney, also with pie-crust decoration, evidence arched-window vents. They are of a finer version of Fabric 5 than the other pieces and are very similar to the wheel-thrown chimney fragments recovered from second-century contexts at Silchester Insula IX, which have triangular window-vents (Timby 2011).

Ceramic roof accessories of this type have been described as decorative finials as well as functional chimneys. Based on comparable examples from the Continent, Lowther (1934) changed his interpretation from chimneys or ventilation cowls, to votive or religious artefacts. He argued that, if they were chimneys, they would be found in far greater numbers, and in association with box-flue tiles of hypocaust systems. They typically take the shape of a tiered, tapering cylinder with triangular, window-like vents. Examples have been found at numerous sites in Britain with a corpus collated in a posthumous paper by Lowther (1976) where he again discussed their possible function. Brodribb suggested that the fumes from vertical box-flues could have emerged into a roof space sealed from the rooms below, and from there escaped through a chimney (1987, 32).

The fragments of possible lamp-chimney at Little London and Silchester compare stylistically with the examples from Ashtead, Surrey (Lowther 1934), also a brick and tile production centre, and Verulamium (Wheeler and Wheeler 1936). At both sites fragments feature window-vents and pinched pie-crust decoration. There are rare examples of lamp-chimneys from Roman London; they have been found at Billingsgate Buildings, Plantation Place, and at the pottery production centre located in the Walbrook Valley (Betts 2015, 175, fig. 158; Seeley and Drummond-Murray 2005, 56).

It has been suggested that the form of these chimneys would be more suited to the production skills of a potter rather than a tile-maker, with some examples shown to have been wheel-thrown in sections. The Roman tile and pottery kiln site at Berkeley Street, Gloucester, included chimneys in their repertoire. The reconstructed form is shown to have similarities to the Ashtead and Verulamium examples and the evidence of their having been wheel-thrown supports, at least in part, the association of lamp-chimneys with pottery production (Timby 1991, 25). Indeed, two of our three examples were found among waste from the pottery kilns, only one from near the tile kiln, from the ditch of Trackway 2, but also associated with pottery wasters.

Previously, Lowther had suggested a third-to-fourth-century date for these objects. Noting the similarity between them and stone finials and the lack of smoke-staining, he favoured their interpretation as decorative finials, rather than chimneys (Lowther 1976, 41). With the exception of two examples, which are actually integrated into curved ridge tiles, there is no evidence of how they were set on the roof.

Bearing in mind the fact that the above items were wheel-thrown, it is also possible that fragments of finer fabric are not of lamp-chimneys but of terracotta ovens or *tannur* and part of the pottery, rather than CBM, repertoire at Little London. Few examples are known from Roman Britain though this may be the result of mis-identification (Darling 2012, 355). There is an example from the legionary tile and pottery production centre at Holt (Grimes 1930, 184, fig. 60.9) (FIG. 88). This is described as an oven of red ware with a thickened rim decorated with


FIG. 87. Fragments of chimney: (A) (1031); (B) (2027); (C) (2014)

thumb impressions. An example of a similar form, described as a portable brazier which could would have been fuelled by charcoal or wood, has been found at Pompeii (Roberts 2019, 164, fig. 180) (FIG. 89).

## Flooring

### *Opus spicatum*

Although any type of brick could have been used for flooring, *opus spicatum* was specifically designed for this purpose. Four examples were recorded at Little London, with a total weight of 590 g. There were no complete examples, the fragments measuring on average 86.5 mm wide and 18.5 mm thick. *Opus spicatum* bricks were typically laid on edge in a herringbone pattern and were recommended by Vitruvius for use on floors open to the elements (*De architectura* 7.1.3). While the examples from Little London clearly have no signs of wear, as they never left the kiln site, the majority of the examples identified in the Reading Museum Silchester collection, 113 in total, are worn smooth on one side. The Society of Antiquaries recorded the

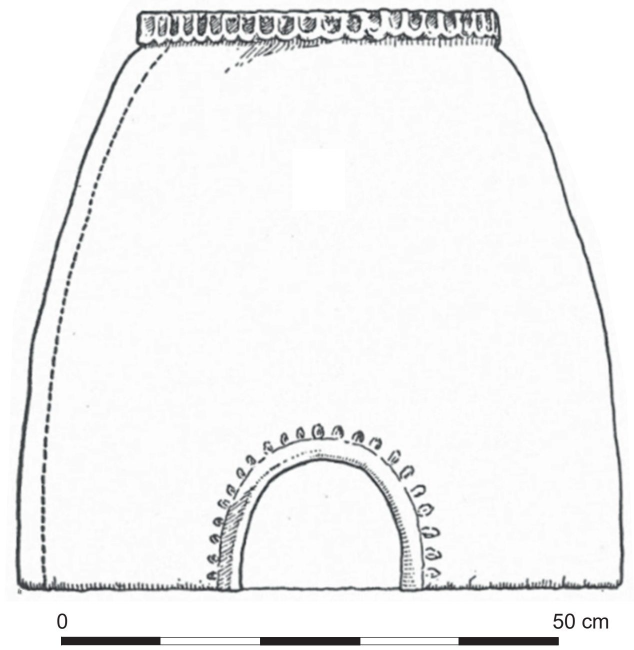


FIG. 88. Example of ceramic oven from Holt (after Grimes 1930, 184, fig. 60.9)

FIG. 89. Portable brazier from Pompeii (after Roberts 2019, fig. 180)

use of *opus spicatum* in the *frigidarium* of the public baths, describing its floor as paved with herringbone bricks measuring 6"x 3"x 2" laid on the side (Hope and Fox 1905, 343). A few of these were observed *in situ* on the floor of the *frigidarium* during the 2019 re-excavation of the bath-house (FIG. 90). It is likely that the great majority of the *opus spicatum* bricks in the Reading Museum collections were found in the public baths.

## Hypocaust

### *Flue-tile*

Box-flue tiles take the form of a pipe, typically thin-walled and square or rectangular in cross-section. They could be easily mortared and fixed to the wall to enable hot air to rise from the under-floor voids up the inside of the walls and so help heat the space above. Box-flue tiles were made in a number of sizes and forms. No complete example was found at Little London and it is possible that some are fragments of specialist forms of box-tile, including hollow voussoirs, half-box flues and double-box flues. The material from Little London has therefore been categorised by the method of keying, whether by combing, scoring or roller-stamping. A total of 634 fragments of flue-tile has been identified with a total weight of 89.53 kg (Table 9).

TABLE 9. THE QUANTITIES OF EACH TYPE OF BOX-FLUE TILE RECORDED IN THE LITTLE LONDON ASSEMBLAGE

| **Types of box-flue tile** | **Weight (g)** | **Count** |
|---|---:|---:|
| Flue-tile – no keying | 31406 | 265 |
| Flue-tile – combed | 1700 | 16 |
| Flue-tile – scored | 32745 | 190 |
| Flue-tile – relief-patterned | 18084 | 136 |
| *Parietalis* | 4830 | 24 |
| *Parietalis* – relief-patterned | 760 | 3 |
| **TOTAL** | **89525** | **634** |

FIG. 90. *Opus spicatum* flooring *in situ* (top) and as impressions after removal (below) at Silchester bath-house in 2019

There was a single example of a box with a complete height of 122 mm and two examples with a complete depth measurement of, respectively, 76 mm and 92 mm. There were 12 examples of complete widths, ranging from 112 to 224 mm (mean = 172.45 mm), which illustrate the variation in the dimensions of the flue-tiles manufactured at Little London. Vents through the sides of the box-flue were recorded on 55 examples. Both circular and rectangular shapes were identified with some examples having two vents on each side (FIGS 91–92). There is no correlation between the form of keying and the shape of the vent.

*Flue-tile – combed*

There were 34 fragments of combed flue-tile with a total weight of 4890 g. The material was very fragmentary and most of the examples were in a reduced fabric, over-fired with evidence of vitrification in places (FIG. 93). The combed flue-tile was typically thin-walled with an average thickness of 16.9 mm. 20 fragments were recovered from context (1144), fill of Kiln 2 in Trench 1.

*Flue-tile – scored*

There were 190 fragments of scored flue-tile with a total weight of 32.745 kg. The scored flue-tile typically featured a lattice design and had an average thickness of 18.7 mm (FIG. 94).

*Parietalis*

A total of 27 pieces of flue-tile were identified as *parietales*. These weighed 5590 g and were typically thicker than box-flue tiles averaging 26.38 mm. *Parietales* or facing-tiles were used to form a cavity for warm air when complete box-flue tiles were not utilised. These were vertically



FIG. 91. (above) Example of box-flue tile with circular vent

FIG. 92. (right) Example of box-flue tile with rectangular vent


FIG. 93. Combed flue-tile (1144)


FIG. 94. Example of scored flue-tile (1040)

attached to walls using iron T-cramps and spacers. The majority were scored to provide a key, either with a grid or lattice design, while three were keyed with a relief-patterned design (see below). There were six examples with a notch to the edge to accommodate the T-cramp for mounting to the wall (FIG. 95). Three examples were identified in the Insula IX archive (Machin 2018), all of which were in fabrics originating from the Little London tilery.

*Relief-patterned flue-tiles*

There were 139 examples of relief-patterned keyed flue-tiles at Little London, with a total weight of 18.84 kg, accounting for 20 per cent of the flue-tile recorded at Little London. Relief-patterned tiles differ from others in that, instead of having been combed or scored, the surface has been keyed with an impressed design applied using a roller. The patterns vary from relatively simple, geometric diamond-and-lattice designs to complex motifs and often elaborate decorative schemes, albeit solely to provide a key for wall-plaster rather than for decoration. Whilst relief-pattern keying is primarily found on box-flue tiles, a number of other types have been found to have been keyed in this way, including voussoir, *parietalis*, and flat wall-tile (Betts *et al.* 1997, 8–12). Once the requisite roller had been made, no greater effort would be involved than that necessary to comb or score the surface and the resultant product could be readily identified as the work of an individual craftsman or workshop, which, it was thought, would facilitate payment according to output (Lowther 1948, 6).

There are examples of four of the published relief-patterned designs in the assemblage from Little London (FIG. 96). Three of the dies, 38, 39, and 68, belong to the diamond-and-lattice group while Die 54 is included in the miscellaneous group in the corpus of relief-patterned tile (Betts *et al.* 1997). The breakdown of dies by weight and count is shown in Table 10. Of these four dies, three are known to have been found at Silchester, but there are no known examples of Die 54 from within the Roman town.

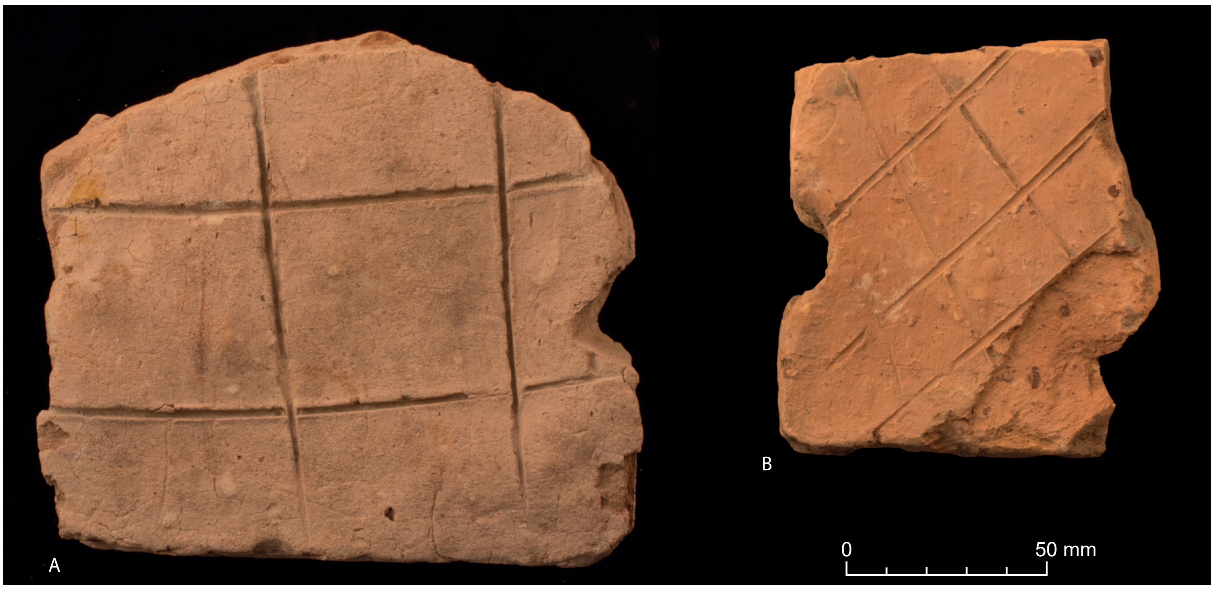


FIG. 95. Scored *parietalis* with notch for T-cramp: (A) (1046); (B) (1101)

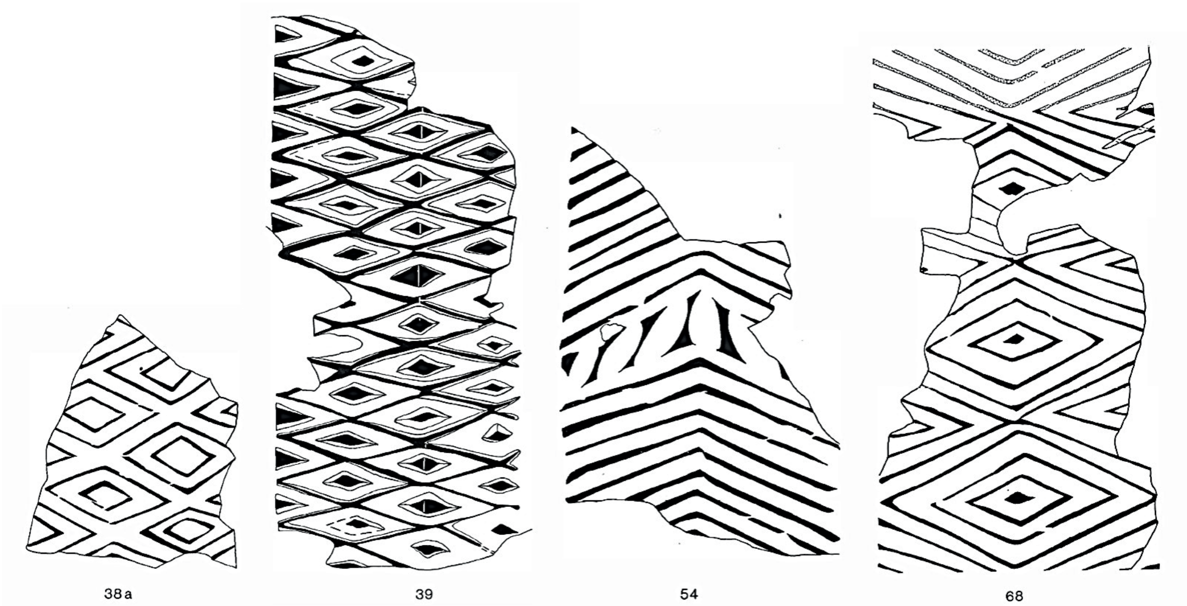


FIG. 96. Relief-patterned dies found at Little London (after Betts *et al.* 1997, figs 27b, d, e and f)

TABLE 10. QUANTITIES OF THE VARIOUS RELIEF-PATTERNED DIES FOUND AT LITTLE LONDON

| Relief-patterned die no. | Weight (g) | Count |
|---|---|---|
| 38 | 8644 | 77 |
| 39 | 8000 | 43 |
| 54 | 1530 | 15 |
| 68 | 670 | 4 |
| **TOTAL** | **18844** | **139** |

Three examples of Die 39 have been applied to wall-facing bricks (*parietalis*), rather than box-flue tiles. All of these examples are thicker than the box-flue tile, averaging 26 mm, and one example has a notch to one edge to accommodate the iron T-cramp used to fix it to the wall.

The identification of tiles with matching dies informs the study of the mechanisms behind their distribution and of roller-stamped tiles more generally. Lowther noted examples of the same die made in different fabrics suggesting the movement of the tiler, or at least the roller, between different production centres (1948, 6). This led to the suggestion of the movement of itinerant, specialist tile-makers between production centres where demand for these specialist products had arisen, rather than the movement of the somewhat fragile, final products. The movement of tilers, rather than tiles, was to some extent based on the long-held assumption that CBM was a high-bulk, low-value commodity and therefore would not have been transported over long distances.

### Die 38

Die 38 has a small number of known examples with a relatively widespread distribution (Betts *et al.* 1997, 108–9) (FIG. 97). Single examples are recorded from Winchester, Hants., and Canterbury, Kent, but, since both are now apparently lost, their fabrics could not be examined. Eighteen examples have so far been recorded from Silchester; six in the Reading Museum Silchester collection, one in the Lowther collection held at the British Museum and recorded as from Silchester, and another 11 examples have so far been recorded during the re-excavation of the Silchester public bath-house. Recently, a single example has also been reported from a site in Sonning, Berks. (Williams forthcoming).

The only other example is held in the collection at the Ashmolean Museum. It is a single tile donated to the museum by a resident of Oxford. The tile is recorded as being from Alchester. A label on the reverse of the tile reads 'Roman Brick Tile from Aichester' (FIG. 98). The first two letters are certainly open to interpretation, but it has generally been accepted to refer to the Roman settlement at Alchester, Oxon. This example shows elements of overlapping roller, as does one example from Little London (FIG. 99). All examples of Die 38 examined were found to be made of Little London SILCBM3/4 fabrics.

### Die 39

Die 39 is another diamond-and-lattice design, albeit with smaller design elements (Betts *et al.* 1997, 109) (FIG. 100). There is also one example from Little London with overlapping roller patterns (FIG. 101). Another example of Die 39, found during field-walking, was recorded from Little London prior to the 2017 excavation (Greenaway 1981, 291). This item has since been lost. Examples of Die 39 have been recorded to the south-west and north-west of Little London (FIG. 102).

There are now 14 examples known from Silchester; five are held in the Silchester collection at Reading Museum and another four were recovered from the excavations of Insula IX (Warry 2011, 226–8). A further five examples have been recorded from the re-excavation of the Silchester bath-house. Other examples of Die 39 are known from Cirencester, Glos., where three have been examined by Machin, along with two examples found in the archive from the villa excavation at Littlecote Park, Wilts. (Walters and Phillips 1979, 7). The CBM assemblage from the roadside villa at Lower Wanborough, Wilts. included another two examples (Mepham 2001, 313) and a single example is known from Rockbourne Villa, Hants. (RCHM 1983, 132), all three examined by Machin. Four specimens of tile keyed with Die 39 were also recovered during the 1988 Brooks excavation in Winchester where they had been made into tesserae and incorporated into a mosaic pavement of late Roman date, A.D. 240–400 (Betts *et al.* 1997, 109). This fragment of mosaic floor could not be located in the archive and has been recorded as lost. However, the fabric of these has been described as resembling the fabric of the Little London example (Foot 1974).

Macroscopic and petrographic inspection of the Die 39 flue-tiles shows the majority are of fabrics within the range found at Little London. The Littlecote villa and Rockbourne examples are all of Fabric Group 3/4. One of the Lower Wanborough examples is of Fabric Group 4, while the other is a coarse, iron-rich fabric corresponding to Little London Fabric Group 1.

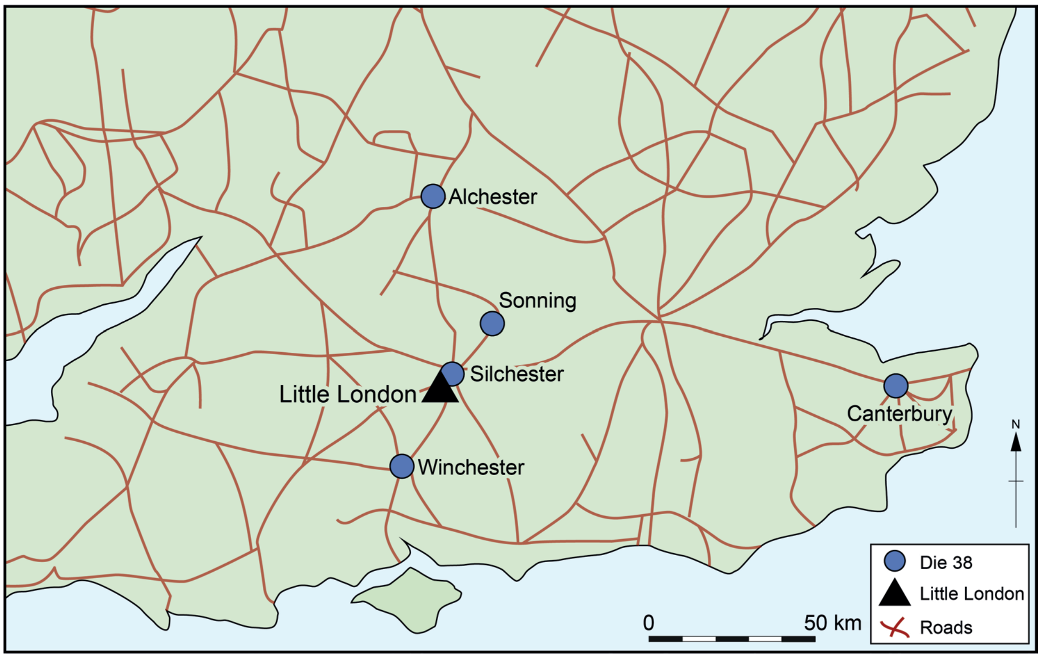


FIG. 97. Distribution of examples of Die 38


FIG. 98. (A) Example of Die 38 from Alchester; (B) Label on the reverse side (*Copyright Ashmolean Museum. Accession number: 1967.609*)

One of the Cirencester examples is of a fabric not represented in the Little London fabric range. Comparison with material from other production centres shows a match with tiles from the tilery at Minety, Wilts. (Scammell n.d.). Minety is known to have produced relief-patterned tiles, supplying both Lower Wanborough and Cirencester, as well as other sites, although only examples of Die 56 have been found at Minety itself. Analysis of all the examples of Die 39 therefore shows that Little London material was transported to nearby Silchester, south-west to Winchester and Rockbourne, as well as north-west to Cirencester, Lower Wanborough and Littlecote villa. Flue-tile with Die 39, potentially produced at Minety, appears to have been transported to Cirencester.


FIG. 99. Die 38 with overlapping prints (2008)


FIG. 100. Example of Die 39 (2008)


FIG. 101. Example of Die 39 with overlapping roller (1098)

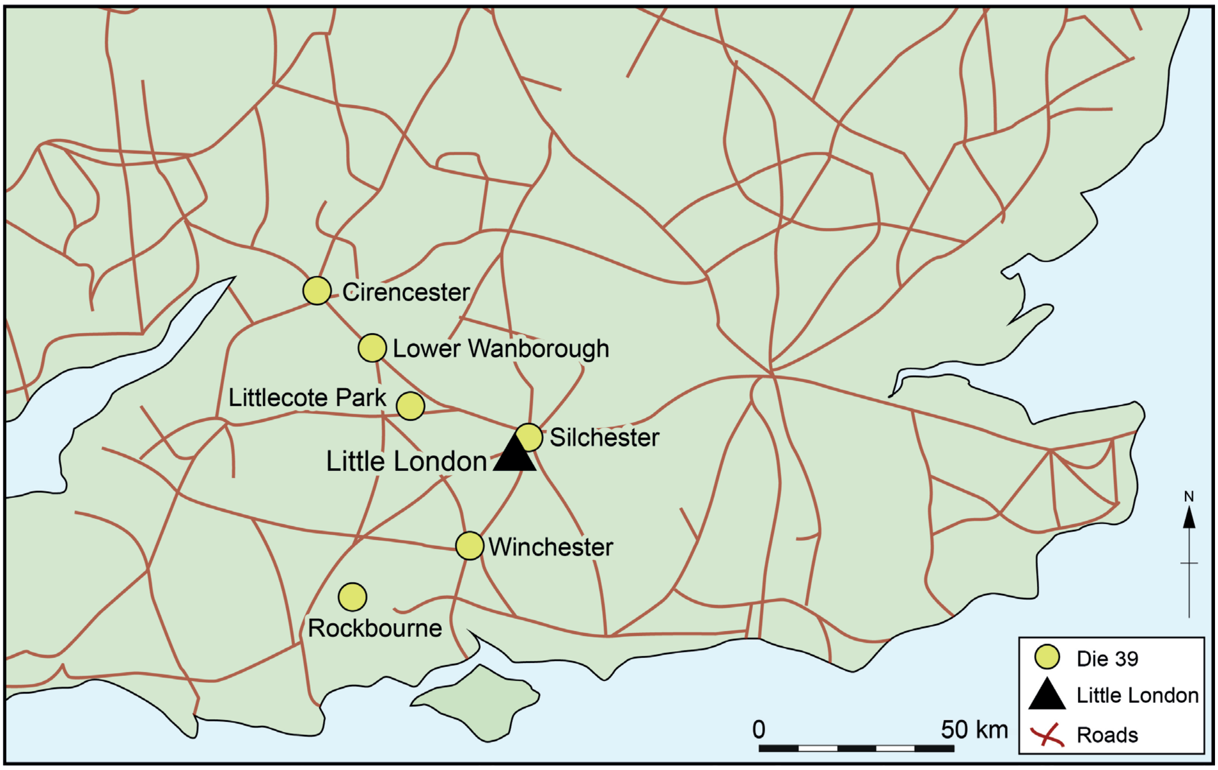


FIG. 102. Distribution of examples of Die 39

FIG. 103. Example of Die 54 (2008)

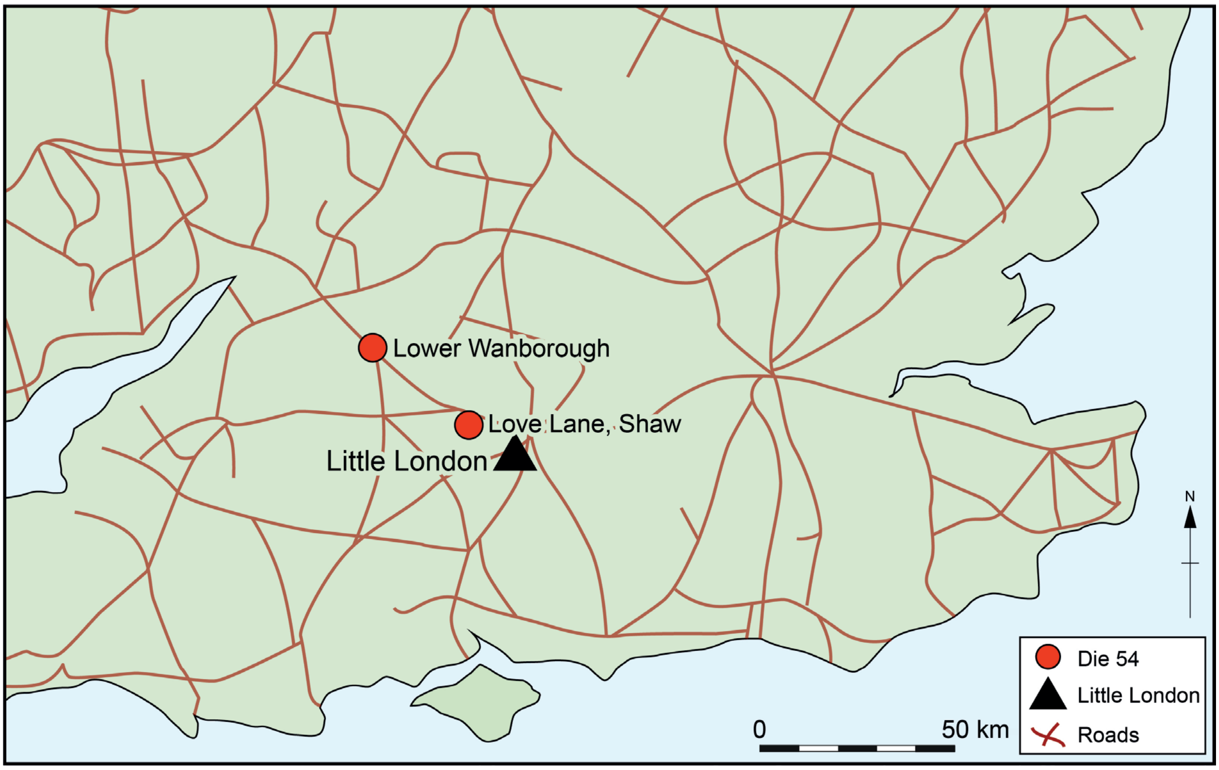


FIG. 104. Distribution of examples of Die 54

## Die 54

Die 54 is categorised among the group of miscellaneous designs in the corpus of relief-patterned tile (Betts *et al.* 1997, figs 27b–c, 118) (FIG. 103). The corpus only includes two examples, one unstratified from Lower Wanborough (Mepham 2001) and one from the pottery production centre at Love Lane, Shaw, near Newbury, Berks. (FIG. 104), where two circular kilns were excavated along with a large quantity of Roman brickwork showing evidence of being subjected to extreme heat (Wilson 1974, 457; Ford 1974). The shape and size of these kilns are more indicative of pottery production than the manufacture of brick and tile. The Little London examples are of Fabric Group 4, a coarse sandy and moderately heterogeneous fabric, buff-cream in colour. The Shaw and Lower Wanborough examples are of an iron-rich coarse fabric, matching the Lower Wanborough example of Die 39 (described above) and indicative of a *London Clay Formation* source, potentially Little London Fabric Group 1.

## Die 68

The final type of diamond-and-lattice design in the Little London corpus is of Die 68 (Betts *et al.* 1997, 126), of which four examples were recorded from the excavation. This has larger design elements than both Dies 38 and 39 (FIG. 105).

Tiles keyed with this design are known from four of the sites where Die 39 was also found. They demonstrate a linear distribution along Ermin Street from Silchester, Hants., north-west to Cirencester, Glos. (Machin 2018, 244) (FIG. 106). Two examples are known from Silchester, one from a tile-setting in the entrance of the Flavian timber basilica dating to *c.* A.D. 85 (Fulford and Timby 2000, 45), the other recovered from a make-up associated with the construction of the successor, masonry forum-basilica *c.* A.D. 125/150 (ibid., 68). Six examples of Die 68 were found in the archive from the 1964–66 investigations at Cirencester abbey and Saxon church (Wacher 1965; Brown and McWhirr 1966; 1967). A number of examples were recovered from Littlecote villa, Wilts., but there is no published reference to specific dies, although the first interim report

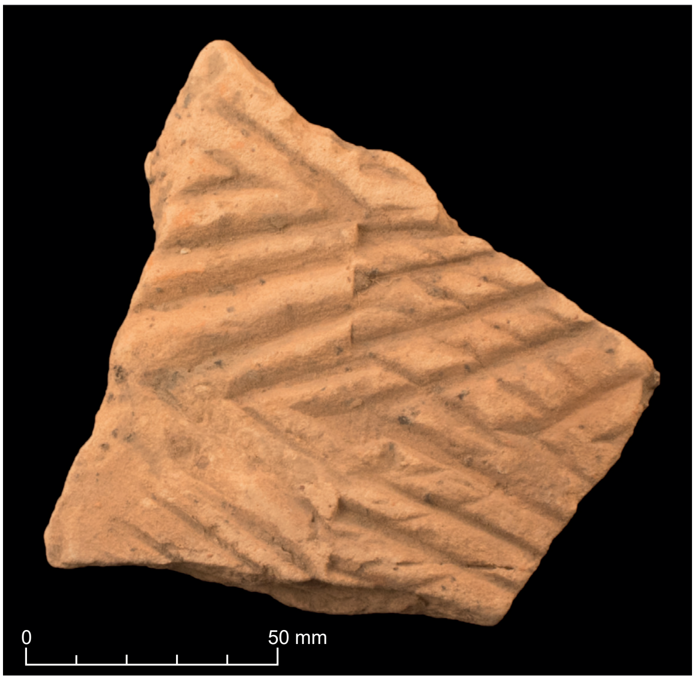


FIG. 105. Example of Die 68 (2013)

of the excavations mentions a large number of roller-stamped box-flue tile fragments recovered during the 1978 season (Walters and Phillips 1979, 7). At Lower Wanborough, Wilts., one specimen of Die 68 from context (WAN1766) is incorrectly identified as an example of Die 13 (Mepham 2001, 313, fig. 109.8). Another very small fragment was also identified by Machin in the assemblage (Context: (WAN67A IX (1)).

All but one of the examples examined are of Little London Fabric Group 3/4, being heterogeneous with varying proportions of quartz, iron oxides and clay pellets. One example from Cirencester differs in that it is an homogeneous iron-rich fabric with a high proportion of fine quartz-silt throughout the matrix and thus showing similarities in composition to the material from the tilery at Minety, Wilts.

## Tile

As per the methodology, fragments <30 mm thick with no features to allow them to be assigned to a specific form category were recorded as tile. They accounted for 2,730 items with a total weight of 1147.84 kg representing 28 per cent of the material by weight (26 per cent by count). As discussed above (p. 87), it is probable that many of these fragments belong to *tegulae*, box-flue tile etc.

## Vaulting

### *Voussoir – solid*

While it is possible to make curved arches with any size of flat bricks by adjusting the amount of mortar to induce a curve, there are some bricks specifically designed for the purpose. These solid voussoirs, or *cuneatus/cuneati*, could be used radially, taking advantage of the tapering thickness, or vertically where the width tapers (Lancaster 2015a, 40). No complete solid voussoirs were recovered from Little London, but two fragmentary examples were identified. One, weighing 2680 g, has a complete width at the thicker end of the voussoir, with the thickness tapering from 48 to 38 mm (FIG. 107). The other is from the thinner end of a voussoir, weighing 2470 g, the thickness increasing from 20 to 38 mm. Both examples have moulding sand applied to all sides. Using *cuneati* radially minimised the mortar between the bricks, regularising the thickness of the mortar joints, thus reducing the time required for the mortar to dry (DeLaine 1997, 164) and enabling a more even transfer of forces from one brick to the next (Lancaster 2015a).

### *Voussoir – armchair*

Three fragments of armchair or rib-vaulting voussoirs have been identified, with a total weight of 6150 g. None of the examples was complete. All three were recovered from Trench 1. One (1032) includes the tenon (*intrados*) found at the bottom of the voussoir with a rebate of 52 mm

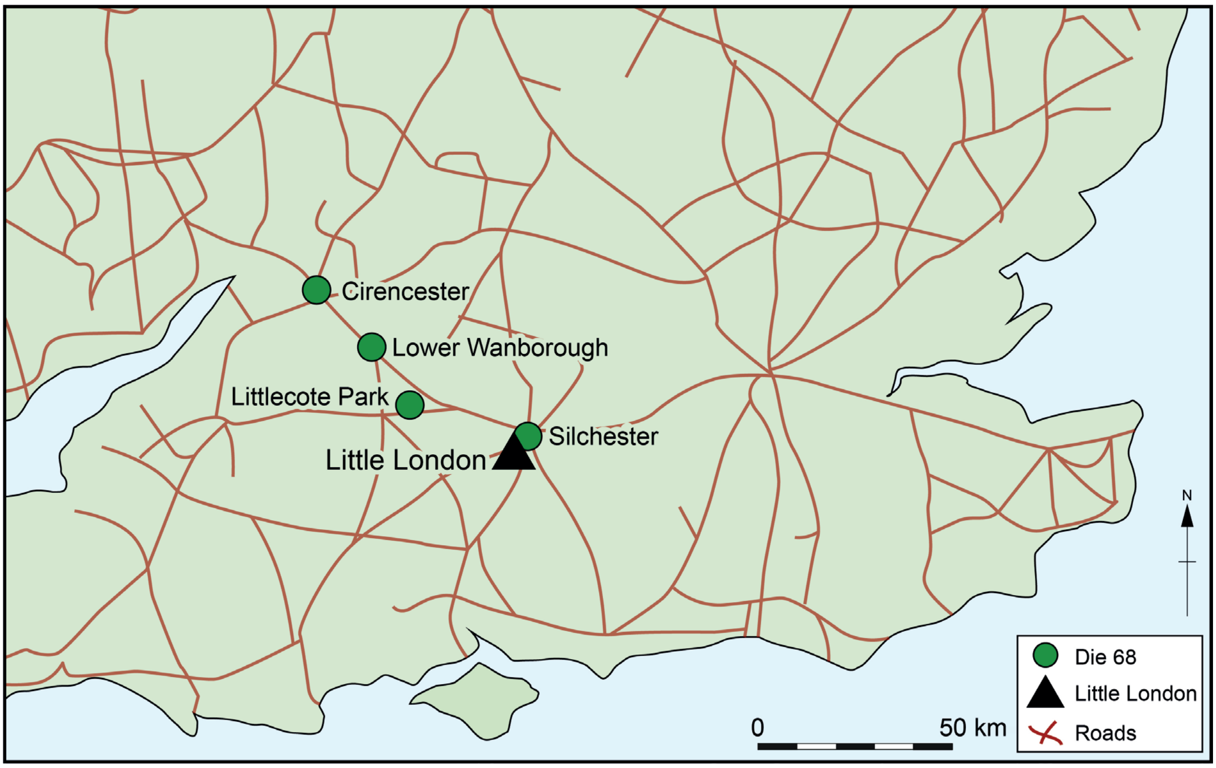


FIG. 106. Distribution of examples of Die 68


FIG. 107. Solid voussoir showing tapering width and thickness (1121)

and height of 40 mm. There is a partial signature (Warry type-S2) in the form of a double semi-circle applied to the surface (Warry 2006, 149) (FIG. 108). The second (1091) includes the mortice (*extrados*) found at the top on both sides. Although the third piece has no complete dimensions (1103) (FIG. 109), it includes a portion of one *extrados* confirming its identification as an armchair voussoir.

All three examples have moulding sand applied to all sides. Assuming that all armchair voussoirs made on site were of the same form, the presence of both *intrados* and *extrados* and the lack of a central perforation mean that these are examples of Bouet Type 3 (Bouet 1999, 94). Despite the lack of complete dimensions, it is also evident that at least two of the examples taper in width from the top to the bottom and are therefore of Bouet Type 3b, with a slight tapering of thickness also evident. This type of voussoir would have been used with two slabs to create a conduit or hollow arch (Bouet 1999).


FIG. 108. Armchair voussoir (1032)


FIG. 109. Armchair voussoir (1103)

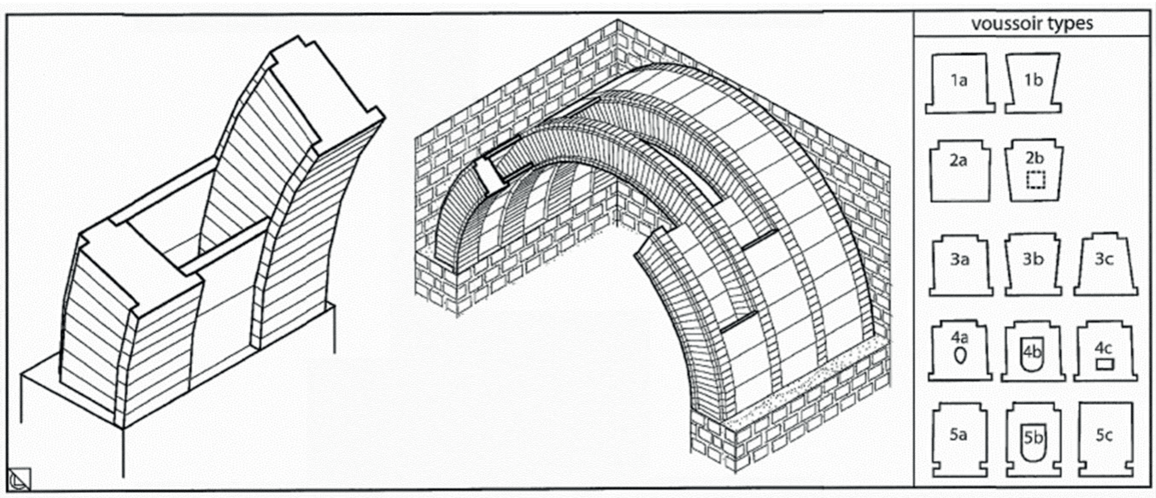


FIG. 110. Diagram of the use of armchair voussoirs in vault construction (after Lancaster 2015a, 153, fig. 101)

It is the most common system of vaulting recorded, accounting for 79 per cent of identifiable components (Lancaster 2015a).

A number of advantages have been attributed to the use of the armchair voussoirs for ribbing. It is a lightweight construction method compared to a solid arch and easier to build without the need for centering, thus facilitating quicker construction without the need for complex wooden supports (FIG. 110). The hollow vault would also protect any wooden roof structure from moisture generated in the bath (Fincker 1986, 148). While the hollow channel could have been connected to vertical flues to provide heating for the vault (Bouet 1999), the system could have offered sufficient structural, constructional and thermal insulation benefits to justify its use without being directly connected to a wall heating system (Lancaster 2015a). These voussoirs were typically used to span quite small vaults, of 3–5 m span, and the technique provided a way to build them quickly and economically.

The armchair voussoir ribbing is almost exclusively used for the vaults in baths (Lancaster 2015a) and its distribution is limited to the western Mediterranean with the greatest concentration found in France, followed by the Iberian peninsula, Britain and Morocco (Lancaster 2015a, 169). The absence of these forms in Roman Italy has been seen as the reason why they are not mentioned in the classical literature on architecture (Fincker 1986, 144). The early examples in both France and Iberia appear in small public baths during the first century A.D., whereas later they are found concentrated mainly in private bath-houses with the technique becoming popular as part of the urbanisation process (Lancaster 2015b, 243).

In Britain Lancaster has identified 24 sites with armchair voussoirs, of which 13 can be associated with the military and two with villa sites, the remaining nine being unattributed (Lancaster 2015a, 170). Stamped evidence on examples from Roman Britain shows that the military were producing armchair voussoirs by the early second century. Military production seems to have been a major agent of diffusion within Britain with patterns of adoption relating to military expansion via the soldiers recruited from areas where armchair voussoirs had been used (Lancaster 2015a, 170–1). Examples have been found at a number of sites in Roman London, including at the Winchester Palace site (Spall 2004), Southwark (Betts 2003, 116) and the Guildhall amphitheatre (Betts 2008, 165). All these sites also produced tiles bearing procuratorial stamps. Armchair voussoirs were also used in the construction of the vaulted roof of the baths at Chester, albeit made of tufa rather than clay (Fincker 1986, 146).


FIG. 111. Curved brick (2035)


FIG. 112. Three curved bricks arranged in an arch

*Brick – curved*

There were 39 fragments of curved bricks recorded, with a total weight of 46.18 kg. These averaged 96 mm in width and their total length is approximately 400 mm (FIG. 111). Thirty of the examples were recovered from (2035), the fill of Kiln 5.

Set vertically these bricks could have been used to produce a 3-brick barrel-vault. This form of arch construction was used to span small spaces, typically of 60 cm width and, like armchair-voussoirs discussed above, eliminated the need for wooden centering during construction, thus providing a quick and economical method of vaulting narrow spaces. The 3-brick method meant that the two side bricks could be mortared to the preceding ring and then the top brick inserted to act as a keystone. This technique also facilitated the use of lime mortar, without the need for quick drying alternatives (Lancaster 2015a, 45). If arranged in this way, the Little London examples would form an arch with a span of approximately 60 cm (FIG. 112).

The earliest examples of 3-brick barrel-vaults are found in the aqueduct in Athens, built by Hadrian and dedicated by Antoninus Pius in A.D. 140. Here the vaults covering sections of the aqueduct channel were built of specially-made, curved bricks so that three of them together created a semi-circular arch (Lancaster 2015a, 50–7; 2009, 377). The distribution of this type of 3-brick arch is limited to Greece and Asia Minor (Lancaster 2015a, 40). That these items typically relate to

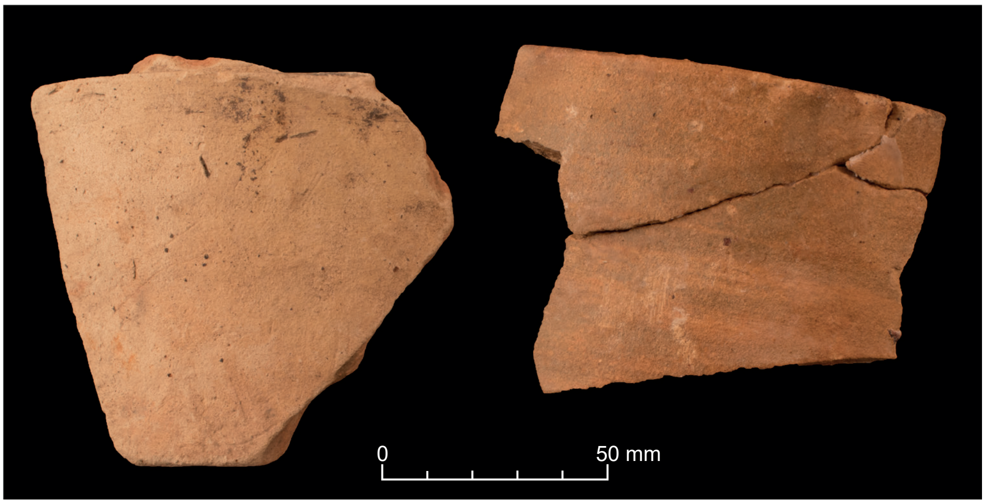


FIG. 113. Waterpipe fragments (1036)

urban aqueducts and drainage infrastructure puts them into a special category where the military is known to have expertise. This, along with the suggested development of the construction technique, that it originated in the region of Parthia, means that the most likely agent of the spread of this technological advancement would have been military personnel just returned from Trajan's Parthian war (Lancaster 2015a, 65–7). However, the find of this type of brick at Little London makes it clear that the innovation had occurred by the A.D. 50s or 60s, though this by no means negates a possible origin in the East. Aqueducts and other water management projects were very expensive and so were often imperially sponsored, as in the case of the Hadrianic aqueduct at Athens (Lancaster 2010, 466). Such projects required specialist knowledge that was not typically available in the local pool of builders, so the necessary expertise was drawn from the military. The same type of bricks was also used to construct the vertical air vents (*putei*) typical of Roman aqueducts, using six bricks to create a circular shaft (Lancaster 2015a, 52).

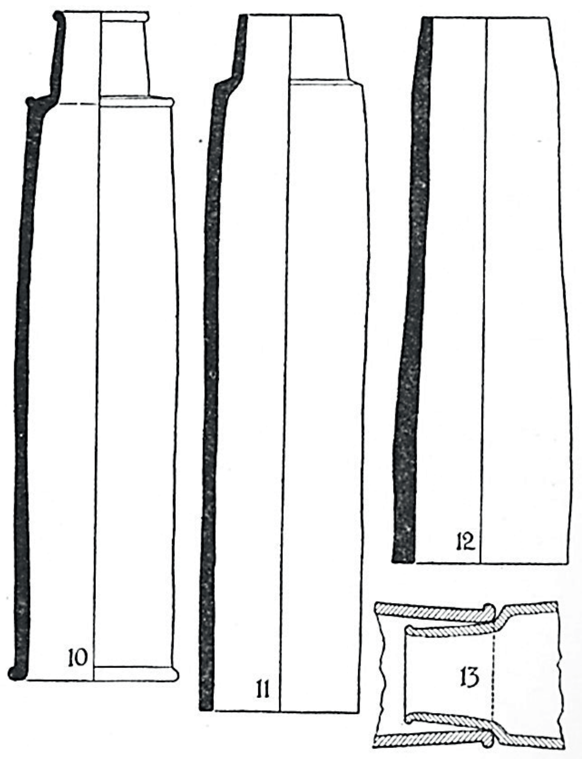


FIG. 114. Waterpipes from the legionary tileworks at Holt (after Grimes 1930)

**Waterpipe**

Six small fragments of ceramic waterpipe have been identified in the Little London assemblage, with a total weight of only 725 g and the diameter of the pipes measuring *c.* 18–20 cm (FIG. 113). Two of the fragments have the remains of a collar or socket to facilitate the joining of the pipes. It would appear that the pipes had been wheel-thrown, evidenced by the rilling present on the internal surfaces. This was also noted on the socketed waterpipes found at the legionary tileworks at Holt (Grimes 1930, 134, fig. 60.10–13) (FIG. 114).

Pipes had a number of uses in Roman buildings including bringing water to or from buildings or gardens, internal piping within a bath-house, or drainage (Spall 2004). There appear to be no standard shapes or sizes. The earliest dated occurrence in Britain appears to be a dump containing a significant quantity of ceramic waterpipe fragments from the Winchester Palace site on the Southwark waterfront which was deposited in the A.D. 50s and early 60s (Open Area 4, Yule 2005, 6, 23–5). Pipes of similar internal diameter to those at Little London were found at the Flavian palace at Fishbourne where they were used to supply water to the fountains and basins in the garden (Cunliffe 1971, 47). However, smaller pipes with an internal bore of 2 cm were found in Claudio-Neronian contexts at Fishbourne (idem). The larger form of waterpipe was also present at Conimbriga, Portugal. They had a cylindrical body slightly widening at the extremities, one of which presents a mortise-shaped *cyma* collar of smaller diameter (Alarcáo 2000). We should also note the pipes with rim and base of similar diameter, and so with no obvious means of linkage, from a dump dated *c.* A.D. 60–70 at Winchester Palace, Southwark. Pringle suggested they might have been used as *pilae* (2007, 207–8).

## MARKINGS ON BRICK AND TILE

### STAMPED BRICK AND TILE

A key objective of this excavation was to confirm whether the site at Little London did indeed produce the tiles stamped with the name and title of the emperor Nero (A.D. 54–68). The material recovered during the 2017 excavation included two examples which can be added to the existing 17 known Nero-stamped tiles. One, a partial impression, includes the letters **NE** (SF12 (1091)) (FIG. 115A). The other has clear lettering: **N[ERCLCAEAV]G·GER**. The E and R are ligatured (SF8 (1069)) (FIG. 115B). Another tile has a partial circular impression with no letters visible, but whose dimensions match that of the stamped tiles (FIG. 116). All three stamped tiles are *tegulae*.

### SIGNATURES

A total of 44 examples of signature was recorded on the retained brick and tile and categorised according to Warry (Warry 2006, 149). Forty of the examples were Warry type S1, taking the form of a single semi-circle. Of these, 19 were recorded on *tegulae*, 20 on bricks and one on a tile. There is one example of a quadrant signature around the corner of a *bessalis* (see above, FIG. 69). One of the armchair voussoirs from (1032) had a Warry type S2 signature, featuring two semi-circles (see above, FIG. 108), while a second of this type was recorded on a brick from (2026). Finally, a single brick featured a Warry type C1 signature from (1046).

### FOOTPRINTS

Animal, bird and human footprints are often found on tile, the impressions having been made after the tiles were laid out to dry before firing. Animal footprints provide evidence of the composition of animal communities (Bar-Oz and Tepper 2010), the nature of the infrastructure, and activities surrounding the tilery. Historically, it has not been possible to provenance foot-impressed tiles recovered from settlement sites, so their value as environmental indicators is necessarily limited. However, a coherent assemblage recovered from a tilery, as here at Little London, has very considerable value in this regard (cf. Cram and Fulford 1979, 202), the more so as no identifiable skeletal remains of animals were found in the excavations.

#### Footprint recording

The details recorded of the footprints identified on bricks and tiles included the metrics of the print, images and identifications. It is acknowledged that all print measurements are approximately 10 per cent smaller than when first impressed as a result of shrinkage during the drying process and firing (Brodribb 1987, 4). The prints have been divided into three categories:

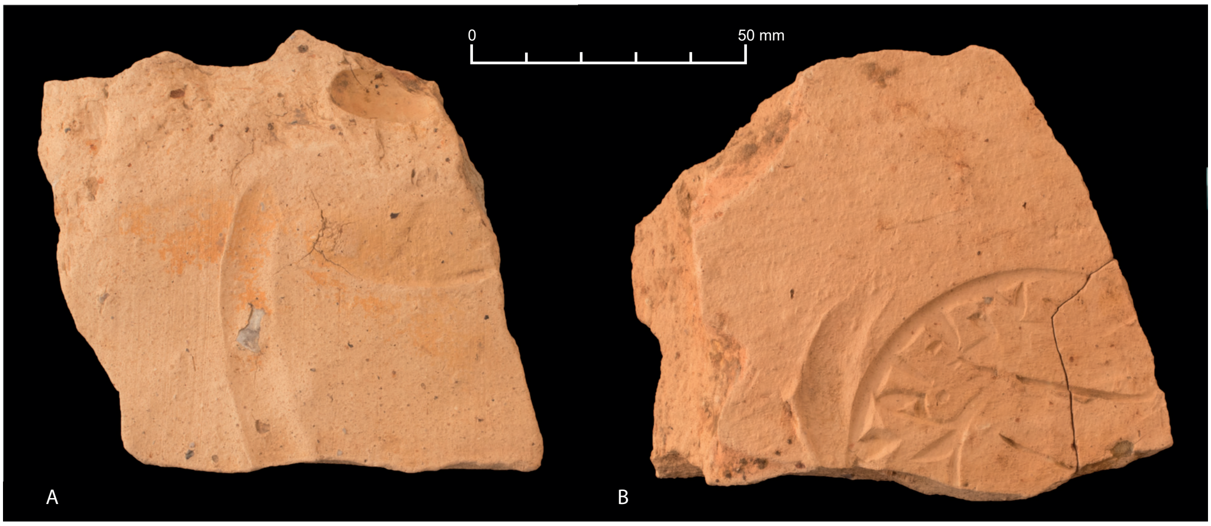


FIG. 115. Nero-stamped tiles: (A) SF12 (1091); (B) SF8 (1069)


FIG. 116. Potential Nero-stamped tile (SF4 (1031))

(a) those made by ungulates — animals with hoofs, cloven or otherwise, including domesticated species such as cattle, pigs and sheep/goat along with wild species; (b) other mammals including cats and dogs, other wild species and humans; (c) impressions made by birds, both domesticated and wild bird species. This section concludes with a discussion of the environments surrounding the tilery and the activities taking place alongside brick and tile production.

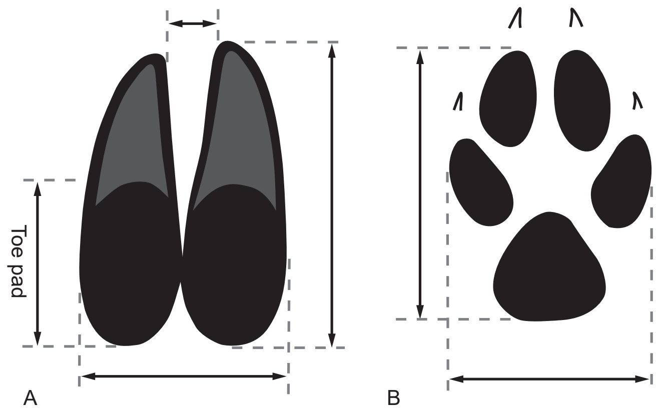


FIG. 117. Locations for measurements of: (A) hoofprints; (B) pawprints (after Bang and Dahlstrom 1974)

*Ungulates*

The length and width of the hoofprints were recorded, along with a measurement of the gap between the toes (FIG. 117A). A note was made as to whether the print was symmetrical, along with details of any other diagnostic characteristics displayed in the print. In addition, ages of the sheep and cattle who made the footprints have been estimated following Barr and Bell (2017).

*Other mammals*

The length and width measurements of the pawprints were recorded (FIG. 117B), also noting the presence/absence of claw impressions and the number of toe-pads present. Brief descriptions of morphological features were also recorded.

*Birds*

The bird footprints have been measured according to Brown *et al.* (2003) and assigned to the relevant size category according to their length (enormous >140 mm; large 100–140 mm; medium 75–99 mm; small 31–74 mm; minute <30 mm). The lengths of the first and third toes were recorded. Notes were made as to whether the print was symmetrical, and the toes segmented. The angle between the second and fourth toes was measured to assist with the identification of the species which was done using the criteria defined by Bang and Dahlstrom (1974).

**Footprint assemblage**

A total of 47 footprints has been recorded on the bricks and tiles recovered from Little London. Of these, there are 24 identified as of ungulates, 22 of other mammals, and a single bird print. Foot-impressed tiles are not common, representing 0.003 per cent of the total CBM assemblage of over 17,000 pieces, but, for example, this figure is very comparable to the proportion of foot-impressed tile (0.004 per cent) recorded on over 23,000 items of CBM of all periods and fabrics from the Silchester forum-basilica excavation (Timby 2000, 116; Cram 2000; Machin 2018, 263).

*Ungulate prints*

Ungulate footprints have been identified on a total of 24 bricks and tiles. Of these, nine are incomplete or distorted prints with indeterminate morphology, where it has not been possible to identify the species. The remaining 15 examples comprise red and roe deer, cattle and sheep/goat.


FIG. 118. Sheep hoofprints on a brick (1032)

## Sheep/goat

Impressions from the hooves of sheep/goat account for 4 of the 15 confirmed ungulate prints. Experimental work by Cram (2000, 123) showed that it is not possible to distinguish the prints made by a sheep from those of a goat. The hoofprints are typically asymmetrical and the size, dependent on the age and breed, is usually about 50–60 mm long and 40–50 mm wide (Bang and Dahlstrom 1974, 73). Using the method described by Barr and Bell (2017), one example has been identified as being made by a sheep aged between three and five months old, indicating that these tiles were laid out to dry during the lambing season, usually in the spring months of March and April. Another example has been estimated to have been made by a sheep aged around nine months old with two examples made by fully-grown adult specimens, estimated to be aged approximately 20+ months (FIG. 118). Three hoofprints on a tile in Fabric 3 in Reading Museum are also of young animals, two newborn and one of three to four months (Machin 2018, 281). A single hoof-print on Fabric 4 from Silchester is of an older sheep of about 29 months (ibid., 285).

## Cattle

There are three cattle-hoof impressions; they are rounded prints, often broad in relation to their length. All of these were made by newborn cattle, less than one month old. Both cattle prints in Fabric 3 from Silchester itself are also of newborn animals (Machin 2018, 281). The absence of hoofprints made by older cattle does not negate their presence near the tileworks. For there to be young cattle, there must be older individuals, too, but it is likely that any brick or tile trampled by fully grown cattle would be destroyed and not make it to the kiln for firing.

## Red deer

There are five examples of hoofprints made by red deer (FIG. 119). Red deer prints exhibit a roughly parallel, broad track, with the outer edges of the hooves curving symmetrically towards


FIG. 119. Red deer hoofprint (1097)

the tip (Bang and Dahlstrom 1974, 66).

The examples recorded range in length from 44 to 71 mm and in width from 44 to 53 mm. All these examples are indicative of a young or female animal, being smaller than would be expected for a fully grown red deer stag (K. Barr., pers. comm.), which typically measures 80–90 mm in length and 60–70 mm in breadth. One example clearly shows the rear pad of the hoof, which accounts for approximately one third of the whole impression (FIG. 119). There is a single hoofprint of a young or female red deer from Silchester itself in Fabric 4 (Machin 2018, 285).

Red deer are indigenous to Britain and are typically found in wooded environments and on farmland fringes, actively selecting broadleaved woodland and areas with cover over upland heath and conifer forest (Staines *et al.* 2008, 579). Red deer hinds usually calve between mid-May and late July.

## Roe deer

There are three examples of roe deer hoofprints, characterised by smaller, pointed tracks, typically 45 mm long and 30 mm wide. When walking, the hind foot registers in the fore-hoof track (Bang and Dahlstrom 1974, 69). One example measures 23 mm in length and is indicative of young deer (FIG. 120). There is also a single print of a young roe deer in Fabric 3 from Silchester itself (Machin 2018, 281).

The birth of roe deer kids peaks from May to mid-June (Hewison and Staines 2008, 608), thus indicating tiles laid out to dry in the summer. The two larger prints measure 36 mm and 45 mm and exhibit blunter tips suggestive of adult roe deer. Roe deer are found in a variety of habitats with open mixed coniferous and deciduous woodland, but where sufficient cover is provided (Hewison and Staines 2008, 606), can also use agricultural fields in these areas too. It is therefore not surprising to find a mix of roe and red deer alongside sheep and cattle.

### *Other mammal prints*

There are 23 bricks and tiles which include other mammal footprints, of which ten are partial

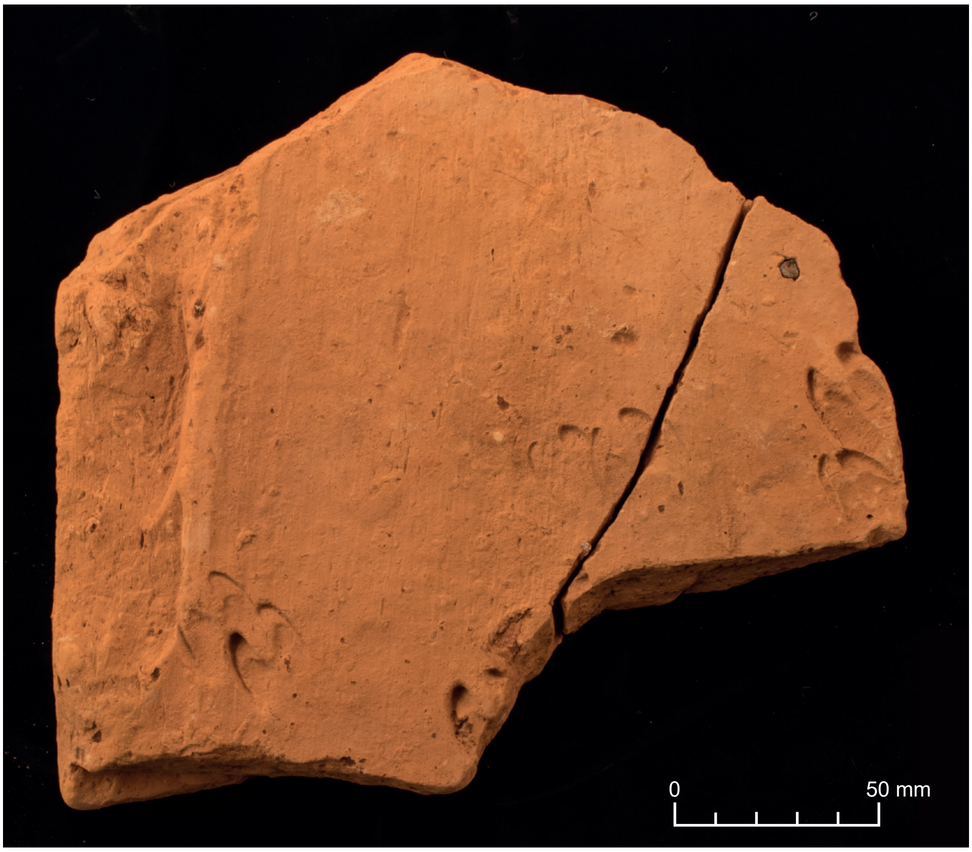


FIG. 120. Roe deer hoofprint

pawprints with insufficient characteristics to make a positive identification and so have been categorised as unidentified. The remaining 13 prints have been identified as made by either cat or dog. No wild mammal prints were identified on the material. However, in addition to examples of dog and cat prints on Fabrics 3 and 4 from Silchester itself, there is also a single footprint of a hare or rabbit (Machin 2018, 286).


FIG. 121. Dog pawprint (1103)

## Dog

A total of ten pawprints have been identified as dog prints, with breadth measurements ranging from 26 mm to 61 mm (FIG. 121). In the Roman period, the size of dogs becomes more variable than in preceding periods, with shoulder heights ranging from 23 to 72 cm compared to heights of 29–58 cm in the Iron Age (Yalden 1999, 99). There are no examples of larger footprints indicative of wolf, typically up to 100 mm broad for the fore-foot and 70 mm for the hind-foot


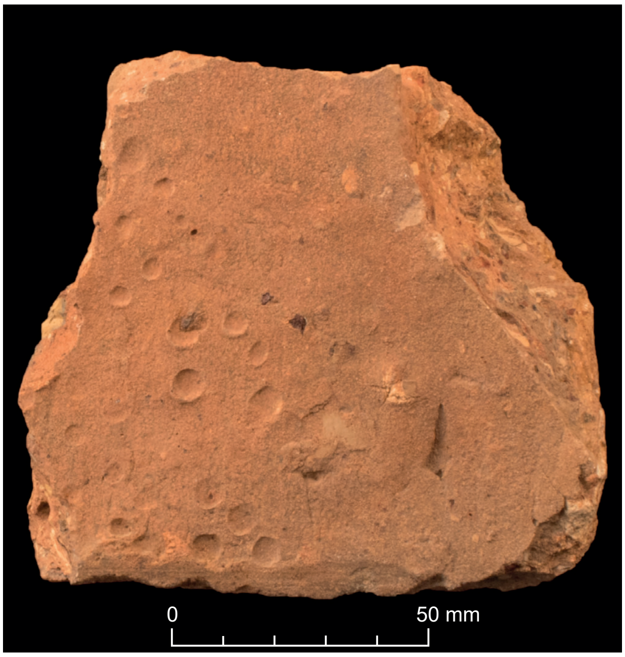


FIG. 122. Cat pawprint (1102) (left)

FIG. 123. Hobnail boot-print (above)

(Bang and Dahlstrom 1974, 56). The range of sizes may represent a variety of different ages of dog as well as perhaps reflecting a variety of dog breeds present at the kiln site. Dog prints are also well represented in Fabrics 3 and 4 in the Silchester assemblage where Machin noted that their print sizes indicate a more restricted range of dog sizes than later (2018, 282, 286, 288).

## Cat

There are three cat prints identified on the kiln products. Cat footprints are distinguished from those made by dogs by their overall size and the lack of claw impressions, as, unlike dogs, cats retract their claws. The overall pad is almost circular in shape with the toe pads well defined and separated from the three-lobed intermediate pad (Bang and Dahlstrom 1974, 42). Two of the cat prints have complete breadth measurements, 40 mm and 42 mm, with the other example having an incomplete width measurement of at least 32 mm (FIG. 122). A medium-sized cat would leave a pawprint about 30–35 mm long and 30 mm wide (ibid., 43). Cat prints are also represented in the Silchester assemblage in Fabrics 3 and 4, including of two kittens and one large cat (Machin 2018, 282, 286).

Identifying domestic cats can be somewhat uncertain from the archaeological record (O'Connor 1992, 112) not least because of the difficulties in distinguishing their bones from those of the wild cat *Felis silvestris*. Some of the tracks of cats are large enough to have been made by wild cats whose prints are typically 40 mm long and 35 mm broad.

It seems quite unusual that there are only 'domestic' animals evidenced in the mammal footprints recorded. However, while there are no examples of wild mammal prints in the Little London assemblage, there is the single print of a hare or rabbit in Fabric 4 noted above from Silchester.

### *Bird prints*

A single, partial bird footprint impression was recorded. This exhibited two segments of a single toe and therefore has insufficient characteristics for the species to be identified. Four chicken footprints have been identified on Fabrics 3 and 4 from Silchester itself as well as single examples of a possible tern, a bird found in Britain between April and October, and a raven (Machin 2018, 283, 286–7).

*Human*

There is a single example of an imprint made by the sole of a hobnail boot in the kiln material. The impressions show a pattern of large studs covering much of the sole. It is a basic pattern found widely in the western provinces (FIG. 123). Often, basic utilitarian shoes have fewer studs with larger heads, presumably to spare the expense of iron (Greene 2014, 33). Prints of hobnail boots have been found on three tiles in Little London fabrics at Silchester itself (Machin 2018, 282, 286).

**Footprints: Discussion**

By considering the footprint assemblages, we can establish a picture, or at least a partial picture, of the working environment as well as insight into some of the infrastructure at Little London, including access to raw materials and seasonality of the production cycle. It is traditionally assumed that tile-making in Britain was restricted to the summer months, to facilitate the laying out of tiles to dry during the least inclement weather. Indeed, Boon's study of all tiles marked with dates before firing argued for a seasonal activity which would call for other occupations such as farming to support the tile-makers (Boon 1974, 279, 365). With the evidence of the prints of lamb and of red and roe deer hinds suggesting that making and firing was under way by May, Little London adds to this picture of seasonal activity. The practice of more recent traditional industries in north-west Europe also suggests that brick-making was a summer occupation. This however relates only to the forming and firing of the tiles, the other related activities of clay preparation, weathering, and timber felling for fuel would most likely be autumn and winter tasks. Tile-makers were thought to be engaged in farming activities for some of their remaining time (Soffe *et al.* 1989, 83), suggesting that the tile industry was complementary to agriculture and stock-rearing. Domesticated livestock prints would not be expected where tile-making was a full-time, year-round occupation, leaving no opportunity for farming or stock-keeping (Cram and Fulford 1979, 201).

The footprints of cattle and sheep are almost evenly represented on the bricks and tile in the Little London and Silchester (Little London) material. This mirrors quite well the evidence of the faunal assemblages at Silchester itself in the Claudio-Neronian period, particularly at Insula IX (Ingrem 2020), but also at the forum-basilica, though cattle are a little more numerous there (Grant 2000). However, the Little London prints are dominated by those made by young animals, including neonates, which indicate animal breeding (Grant 2004, 380). While the Little London animals were alive when they made their marks on the tiles, their age profile is markedly different to that of the faunal remains found in contemporary urban assemblages, as is the case at Silchester, which typically show a broader age range (cf. Ingrem 2012, 190–1). However, there is likely to be an inherent bias here as tiles impressed by heavier, mature animals were unlikely to have made it from the drying-shed to the kiln.

While red and roe deer are the commonest of the wild animals represented by their prints at Little London, accounting for 29 per cent of all the identifiable footprints, there are only two examples in Fabrics 3 and 4 at Silchester itself. Nevertheless, taking the two assemblages together, deer still account for 15 per cent of the identifiable prints. This is considerably greater than their representation among the faunal remains of Claudio-Neronian Silchester where, like dog, the two species together account for less than one per cent of assemblages (Grant 2000, 426, table 62; Ingrem 2020, table 46).

Domestic mammals, cat and dog, were kept alongside the domestic livestock. Dog are the most abundant of all the identifiable prints at Little London, accounting for about one third of the assemblage. This compares with their representation on Little London fabrics at Silchester itself where they account for even more, almost half of the identifiable prints (Machin 2018, 280, 285). By contrast the skeletal remains of dog in Claudio-Neronian Silchester account for less than one per cent of the faunal assemblage (Grant 2000, 426, table 62; Clark 2020; Ingrem 2020, table 46). Compared with the wide range of footprint sizes recorded on Roman CBM, the range of sizes at Little London is somewhat restricted with the lowest complete measurement at 26 mm and the highest at 61 mm (cf. Machin 2018, 282, fig. 10.30). Nevertheless the variation in size is consistent with the range of estimated dog shoulder heights (Clark 2011, 277) and reflects the variability in the sizes of dog breeds in Roman Britain.

Cat remains are relatively rare from Roman Britain and are present in far fewer assemblages than dogs (Allen 2018, 97–8). Here, at Little London, the prints of dogs outnumber those of cats about three to one, though in Silchester the ratio in favour of dog prints on Little London products is greater, about six to one. To date, as there are no skeletal records of cats so far from late Iron Age and Claudio-Neronian Silchester, the Little London prints represent the earliest records of cat from Silchester and its environs.

Of the birds represented in the combined Little London and Silchester Fabrics 3 and 4 assemblages of identifiable prints, those of chicken are only slightly more numerous than those of wild birds, accounting for 6 per cent of the total assemblage. This is slightly higher than the representation of galliforms in Claudio-Neronian faunal assemblages (2–4 per cent) (Grant 2000, 426, table 62; Ingrem 2020, table 46).

What concluding remarks might we make about the assemblage of footprints at Little London and on Little London fabrics at Silchester itself? First, the incidence of these prints is very low, significantly less than one per cent of assemblages in Silchester and at Little London. This suggests that access to the sheds where the brick and tile were dried before firing was not easy, but perhaps easier for birds and small or young animals than for adults. However, we should consider whether the survival of the prints of the small and the young is merely a reflection of a situation where the weight of an adult completely destroys the impressed tile which is then discarded before firing and does not survive in the archaeological record. We cannot therefore exclude bias in the composition of the assemblage.

On the other hand, the rarity of the prints and the preponderance of those of young or neonate animals might suggest a degree of deliberate selection, where sick or vulnerable animals were given shelter and cared for in the spaces where the brick and tile were drying. Is it chance that we find the prints of young red and roe deer, or were they also found or hunted in the wild and then given protection and cared for — and eventually consumed — like the domestic animals?

We have observed that the representation of species and their age profiles in the combined Little London and Silchester Fabrics 3 and 4 assemblages is markedly different from what has been found among the Claudio-Neronian faunal assemblages from the town. Most striking is the complete absence of the prints of pig on Little London products, though it accounts for up to one third of the skeletal remains of the three major domesticates in the town (Grant 2000, 426, table 62; Ingrem 2020, table 46). Even from the much larger sample (152) of identifiable footprints in the London Clay Formation Silchester CBM Fabric 1 recovered from the town, there is only one example of the print of a pig (Machin 2018, 265, fig. 10.3). Surprising, too, is the incidence of wild animals, particularly deer, compared with their representation in the skeletal record from the town. Among the prints of ungulates represented in finds from the town in the Silchester CBM Fabric 1, roe deer (mostly young) (13) are only just second to sheep/goat (14), with cattle (4) a distant third (idem). It does look as if there is a degree of preferential selection of (mostly) young deer at Little London and in those locations where Silchester CBM Fabric 1 was made.

If there remains uncertainty as to whether the deer were accidental intruders in the drying-shed or whether they played a role in the animal husbandry practised at Little London, there can be little doubt that the raising of cattle and sheep/goat and the keeping of chickens formed part of the working life of the brick- and tile-makers. Estimating the relative importance of stock-raising at Little London is more difficult because we do not know the circumstances which led to the impressions being made on the drying tiles. On the face of it, however, the numbers are small, suggesting perhaps that animal husbandry was very much subordinate to the production of the brick and tile.

Finally, what can be inferred about the nature of the shed(s) in which the brick and tile were laid out to dry before firing? It is unlikely to have been completely open, otherwise we might expect there to have been more animals infiltrating the building and leaving their footprints. On the other hand, it is unlikely to have been completely enclosed because the circulation of air would have helped the tile to dry. While it might have been deliberate choice to devote some of the space to the stabling of (mostly) young sheep/goat, cattle and deer, the presence of dogs (especially), cats, chicken and other birds and small mammals may best be explained by their taking advantage of doors or gates casually left open as the brick and tile were brought in and laid out to dry.

## CONCLUSIONS

With its association both with the production of pottery of pre- to early Flavian typology and the Nero-stamped tile, the Little London tile kiln described in Chapter 3 is among the earliest of its kind so far to be discovered in Britain. As we have seen with Kiln 4, rectangular kilns were also used for firing pottery and this may have been the case with the earliest kilns found at Colchester (cf. Swan 1984, 83–5). This tile kiln is among a very small number from Roman Britain where the associated assemblage of waster brick and tile has been reported. The latter is of considerable importance because it provides a snapshot of the not inconsiderable range of types of ceramic building material which was current in the 50s and 60s of the first century A.D. and deemed necessary to meet the architectural requirements of the time. This includes types which have rarely been found elsewhere in Britain.

It is clear that, while most of the Little London material is of the standard forms of brick, tile and roofing tile found across Roman Britain and beyond, there is a small proportion (6 per cent by count; 2 per cent by weight) of more specialised products, the most abundant of which is the hypocaust flue-tile. Together, these are indicative of specific types of building project or projects for which such specialised materials were required. However, if there is a close correlation between the numbers of the different types of waste material and the quantities successfully required, then output was overwhelmingly dominated by the production of brick, tile and roofing material. We should remind ourselves of the fragmentary nature of the material and the rarity of complete examples, such that the absence of *bipedales*, hollow voussoirs and half-box or double-box flue-tile is probably more apparent than real.

These specialised forms were clearly made to order to fit architectural designs, down to the details of types and sizes of bricks needed to complete construction. Judging by their scarcity, the *tegulae colliciares*, armchair voussoirs, and bricks for the 3-brick barrel vaults are not typical products of a Romano-British tilery and were not utilised in the construction of domestic dwellings or other small structures. They were not part of the repertoire produced at Holt later in the first century (Grimes 1930). Armchair voussoirs can provide a particular insight into the type of building for which the material was being produced, Fincker (1986, 144) noted their association with public and private bath-houses; he therefore assumed that these specialist forms were designed for a specific function linked to the construction of baths built between the end of the second and beginning of the fourth century. The presence of this type of voussoir at Little London demonstrates that the form was already being used before *c.* A.D. 70. Likely destinations for material of this kind were bath-houses, including the Neronian public bath-house at Silchester which was built with material from Little London (Fulford *et al.* 2018b; 2019). It is also useful to compare the Little London assemblage with that recovered from the legionary bath-house at Exeter dated A.D. 55/60–75 and so contemporary with production at Little London (Bidwell 1979). There, *bipedales* and small numbers of both full-box and half-box flue-tile were recovered, but none *in situ* and mostly residual in Period 2 and later contexts (ibid., 148–51). The absence of voussoir tile at Exeter is perhaps explained by the estimated size of the vaults which required concrete in order to span a room width of almost 10 m.

A very similar range of materials to that found at Little London was produced by the workshop of *legio XX* at Holt, Denbighshire, which was established in the later first century and not before *c.* A.D. 75, to provide for the building of its fortress at Chester (Grimes 1930). We have noted above types which were not produced at Holt and, by the same token, we can observe that the bridge tiles and ridge tiles evident at Holt have not so far been found at Little London. The antefixes at Holt are not ornamented with representations of the human face, but with the boar, the emblem of *legio XX*. The report does not mention any finds of relief-patterned flue-tile.

By contrast the range of types produced at the late first-/early second-century rural tilery at Great Cansiron Farm, Hartfield, E Sussex, was limited to brick, roofing tile, flue-tile and voussoirs (Rudling 1986, 208–9). Archaeomagnetic dating of the last firing of the kiln gives a date of *c.* A.D. 120 at 68 per cent confidence level (ibid., 198). While there is no quantification of the different types produced at Holt, at Great Cansiron Farm we see that 49 per cent (by weight) of wasters were of *imbrex* and *tegula*, and 33 per cent of flat bricks, including the *bessalis*, *pedalis* and *lydion* types (idem). As our definition of brick, based on thickness, is more restrictive than that used at Great Cansiron Farm, which embraced any tile which could not be classified as a *tegula* or box-flue, comparisons between the two sites are not exactly like-for-like. Nevertheless, brick at Little London amounts to more, at 45 per cent (by weight), and roofing tile considerably less, at 22.5 per cent than the proportions at Great Cansiron Farm. There is also a difference in the proportions of flue-tile between the two sites: 7.4 per cent at Great Cansiron and 2 per cent at Little London. Several factors may account for these differences, such as chronology and variation in wastage rates of the various types produced at the two sites, but the greater representation of the more strictly defined brick category at Little London may be linked to a greater demand for its use as string or levelling courses in masonry buildings as, for example, in the public bath-house at Silchester compared with the demand for such brick in the rural context of the Weald. By the same token, the greater proportion of roofing tile at Great Cansiron may reflect a greater emphasis in its use on timber-framed buildings.

Where differences may reflect change over time is with the treatment of the flue-tile. While, by weight, scored (20.1 per cent) and relief-patterned (36.5 per cent) examples account for over half of the flue-tile recorded at Little London, scored flue-tile is absent and relief-decorated amounts to only 0.04 per cent by weight of the flue-tile assemblage at Great Cansiron. On the other hand, while combing accounts for over 90 per cent by weight of the flue-tile at Great Cansiron, at Little London, with only 16 combed fragments, the figure is considerably less, at 0.2 per cent. The evidence from Little London makes it clear that relief-patterned and scored flue-tile were made side-by-side in the pre-Flavian period bringing forward the date for the start of their production from *c.* A.D. 75 (Black 1985) by between 15 years (production from *c.* A.D. 60) and 25 years (production from *c.* A.D. 50), a time when tile production is first evidenced in London (Betts 2017, 368). Although scored flue-tile has been noted from pre-Flavian contexts in London, so far there has been no report of relief-patterned tile, despite the relative abundance with which it is found there (cf. Pringle 2007). The slight representation at Great Cansiron suggests that production had ceased there by the late first/early second century. Little London is unlikely to have been the first workshop to make relief-patterned tile in Britain and a fuller discussion of the dating of relief-patterned tile and its implications can be found in Fulford and Machin (2021).

Among the more distinctive products of Little London are these relief-patterned flue-tiles, which have now been found, not only nearby at Silchester, but at a variety of quite distant locations including the major towns of Cirencester and Winchester and, also, possibly, Canterbury. With the discovery by Machin that the diamond-and-lattice die 81, which has been found at Fishbourne and Chichester, is also of Little London fabric, but not represented in this excavated sample, another major town can now be added to this list. The Chichester examples were recovered from contexts pre-dating the Flavian phase of the bath-house at Tower Street (Down 1978, 142–4). A Little London flue-tile has also apparently been found at distance at the small town of Alchester, Oxon.

Although the presence of flue-tile does not necessarily imply the construction of bath-houses, this is very likely to have been the case in this very early, Claudio-Neronian phase in the occupation of Britain. At the very least, they signify the building of houses with heated rooms and thus indicate a Little London contribution to the building of hypocausts and/or bath-houses in about a dozen different locations. These tiles have been noted and kept in museum archives because of their distinctive decoration, while the great majority of CBM has been discarded without further record. Given that relief-decorated flue-tile is but one of the many types of CBM produced at Little London, we can perhaps regard it as a proxy for a greater volume and diversity of Little London CBM at the various locations where it has been found.

If the proportion of tile from the Claudio-Neronian/early Flavian phase of Silchester Insula IX attributed to the workshop at Oaksey Park, Minety, Wilts., can be regarded as a guide, then we might suppose that, correspondingly, Little London may have supplied about 10 per cent of the CBM consumed at places as far away as Cirencester at this time (Machin 2020, 414). Indeed, the sharing of the relief-patterned die 39 between Little London and Minety and the similarities in their pottery assemblages (Timby, above, p. 84) suggests that the two workshops were operating in tandem. The evidence from first- and early second-century London also indicates that between 5 and 15 per cent of the CBM supplied to it came from quite distant tileries such as Eccles and a second north Kent source (London fabric 3226). An as yet unlocated tilery in West Sussex, probably close to Stane Street, also supplied London at this time (Betts 2017, 371–6).

To date Silchester is the only place where we have some indication of the scale of consumption of CBM from Little London. Although there has been no systematic study of fabric and form of recently excavated CBM from the town, the incidence of either Nero-stamped tile or relief-decorated tile shows the occurrence of Little London material at all sites within the walls excavated since 1980: public baths (Insula XXXIII), forum-basilica (Insula IV), temple (Insula XXX), Insula III and Insula IX. The greatest variety of forms has been noted at the bath-house, including flue-tile, *opus spicatum* and voussoir. Given that building in timber remained the norm through the first century A.D., especially for domestic and commercial buildings, about 25 per cent of the Little London production consumed at Silchester would have been used for roofing. Of the relatively small number of pieces of CBM retained from Claudio-Neronian (Period 1) contexts at Insula IX, half by count, 28 per cent by weight, is in Fabric Groups 3 and 4 (Machin 2020). Representation of retained Little London fabric groups in Insula IX decreases in the following period, *c.* A.D. 85–125/50, to 36 per cent by count (Machin 2018, 203) and, if not already residual by the end of the first century, its occurrence is certainly residual thereafter.

CHAPTER 6

# WOOD CHARCOAL ANALYSIS: EVIDENCE FOR SITE ECONOMY AND ENVIRONMENT

*By Catherine Barnett*

## INTRODUCTION

Contexts sampled during the excavation were assessed for their ability to provide samples suitable for radiocarbon dating and for wood charcoal analysis. The charcoal comes from six bulk sediment samples of 15–40L taken from discrete contexts and processed by flotation. As at most sites, some of the assemblages come from secondary contexts, the charcoal having been removed from the point of burning and dumped elsewhere, but primary/*in-situ* kiln deposits were also considered. The scale of, and close physical relationship of, the dumps of charcoal in the working areas and quarry pit mean it is relatively safe to assume the assemblages all directly relate to spent fuel from the excavated kilns, with a simple taphonomic path. Of the six contexts available for analysis, two primary contexts contained only sparse charcoal, and, while identifications were made for radiocarbon dating, the assemblages were too small to warrant analysis. Four contexts were subject to full charcoal analysis, all being of early Roman age and with a total fragment number of 390. Analysis has therefore been small-scale but related to one specific group of activities, i.e. industrial-scale pottery-, tile- and brick-making, and within the wider local context provided by analysis of the substantial early Roman assemblages analysed and dated for Silchester Insula IX (Period 1) (Barnett 2020a and b) and late Iron Age–early Roman contexts analysed for the Silchester Environs project (Barnett 2019; Barnett and Fulford in prep.).

## METHODS

A small number of individual charcoal assemblages were selected to address specific questions at the tilery concerning economy, resource acquisition and activities represented by burning. Together these contemporaneous assemblages also provide data on vegetation and landscape in the local area. An evaluation was made of stratigraphic integrity, relationship to archaeological events in the on-site record (e.g. rake-out from kiln, primary deposition in the stokehole), volume/fragment number, and capacity to support other archaeological or palaeoenvironmental analyses and dating.

Wood charcoal >2 mm was separated from the processed flots and the residue scanned or sorted. A random grab subsample was taken from large assemblages, normally *c.* 100 fragments. Those assemblages of <100 fragments >2 mm were identified in their entirety and were prepared for identification according to standard methodology (Leney and Casteel 1975; Gale and Cutler 2000). Each was fractured with a razor blade to show three planes: transverse section (TS), radial longitudinal section (RLS) and tangential longitudinal section (TLS), and examined under bi-focal epi-illuminated microscopy at magnifications up to x400 using an Olympus BHM microscope.

Identification followed the anatomical characteristics described by Richter *et al.* (2004), Schweingruber (1990) and Butterfield and Meylan (1980). Access to modern reference material was limited. Identification was to the lowest taxonomic level possible, usually genus, but sometimes species, where anatomical or external morphological features were highly diagnostic. Juvenile twigwood and roundwood were separated from mature where the whole radius was visible, or where maturity was apparent from ring curvature and ray divergence.

Reflectance analysis of charcoal can provide evidence of original burn temperature (Ascough *et al.* 2010; McParland *et al.* 2009; 2010) but is time-consuming. Instead a rough estimate of the proportion of any assemblages noticeably more reflective by eye was noted during analysis.

Quantification is by fragment number of each taxon per sample (Table 11) and species ubiquity across the site (i.e. number of single-sample contexts in which each species appears). Concentration on ubiquity, a qualitative measure, arguably overcomes issues of differential fragmentation (due to taphonomic process, post-depositional process, sampling and processing), and over-representation of targeted types for particular activities at the site, so allowing consideration of woodland structure. Studies on quantitative measures indicate that the fragmentation rate is similar for all taxa (Chabal 1992) and that recording volume, fragment number or weight as indices leads to similar results in terms of relative taxonomic representation, suggesting fragment counts and the resultant percentage data are meaningful (cf. Chabal 1997; Keepax 1988, 70–9). It provides a non-homogenised dataset, allowing patterns of relative input/differential exploitation to be considered (Asouti and Austen 2005), both indices are used here to maximise the findings. Interpretation of individual taxon preference and habitat is with reference to modern plant ecology (Ellenberg 1988; Peterken 1993; Stace 2010). Latin binomials are given once at first appearance, common names throughout, nomenclature is according to Stace (2010).

## RESULTS

Four contexts were fully analysed and while the minor differences between those are outlined in this report, it is also appropriate to consider the site assemblage as one entity, as below. The assemblages are known to be coherent and of early Roman age, with only well-stratified and well-dated contexts selected for analysis. While the contexts relate to different individual events and phases of site use and are unlikely to be truly contemporary, the radiocarbon dates returned and the excavated artefactual evidence indicate that they are broadly so, at least on a decadal scale. The limited number of contexts available and scale of analysis mean that taxa less frequently selected or those less common in the landscape are most likely absent from the identifications but useful information has been gained on economy and activity.

The taxa identified in the wood charcoal assemblage and their relative proportions are shown in Table 11 and FIG. 124, and their taxonomic grouping given in Table 12. Only five taxa were represented among the total assemblage of 390 fragments identified. Oak (*Quercus* sp.) was ubiquitous (6 of 6 contexts), heavily dominating all samples and making up 94 per cent of the total site assemblage. A minimum of 16 per cent of the total assemblage (21 per cent of the oak) was juvenile, mainly roundwood cut at 4–8 years. The fragmentary nature of the samples means that there was likely to be a greater percentage still in the original assemblage, with age only discernible on the better-preserved pieces. Small quantities of hazel (*Corylus avellana*), birch (*Betula* sp.), ash (*Fraxinus excelsior*) and a member of the Maloideae were also identified and present in 1–2 of 6 contexts (FIG. 125). The charcoal pieces in the samples analysed were in relatively good condition but those from the rest of the contexts sampled and assessed were highly fragmentary and the charcoal relatively sparse. Impregnation with iron oxides was common, markedly so for context 2075, the basal deposit in Kiln 4 (2031).

### Kiln 1

A sparse and fragmentary assemblage was recovered from the primary collapse layer (1098), an abandonment deposit spread across the base of the firing chamber **1161** of Kiln 1, the large brick

TABLE 11. WOOD CHARCOAL IDENTIFICATIONS

| Feature | Context | Context description | Sample | Sample type | Comments | Phase/ period | *Betula pendula/ pubescens* | *Corylus avellana* | *Fraxinus excelsior* | *Maloideae* | *Quercus* sp. | *Quercus* juvenile | Unidentifiable | Unidentifiable twigwood | Total identified | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kiln 1, firing chamber **1161** | 1098 | Primary collapse of Phase 2 main brick kiln, abandonment deposit across base of the firing chamber **1161** | 114 | Wood charcoal from 40L bulk sample | Poor condition, small friable fragments, assume remnants left after clean-out. 14C date but analysis not warranted | Early Roman | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |
| Quarry pit [1048] with dumps of spent fuel from Kiln 1 | 1029 | First dump of charcoal in quarry pit [1048], 4.2 m by 3.3 m in size | 102 | Wood charcoal from 40L bulk sample | Clean and fresh but flaky fragments. 11 young *Quercus* sp. pieces = roundwood, too fragmented to see if rod-like | Early Roman | 0 | 1 | 0 | 0 | 88 | 11 | 0 | 0 | 100 | |
| Kiln 2, [1090] | 1140 | Rake-out from smaller later tile kiln, Kiln 2 [1090] | 127 | Wood charcoal from 25L bulk sample | Excellent condition, large assemblage, dominated by mature frags. Occ highly reflective | Early Roman | 0 | 0 | 12 | 0 | 87 | 0 | 0 | 1 | 100 | |
| Kiln 3, [2040] | 2037 | Second deposit overlying sand in the small circular pottery/flagon kiln, Kiln 3 [2040], with broken *tegulae*, part of the upper firing floor **2050** collapsed into the base of the kiln along with fuel remnants | 206 | Wood charcoal from 40L bulk sample | Small frags and assemblage, assume remnants left after clean-out/from collapse. 14C date but analysis not warranted (presence of oak noted) | Early Roman | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | |
| Associated with Kiln 3, [2040] | 2076 | Rake-out from Kiln 3 [2040] (small circular pottery kiln) into the working area | 220 | Wood charcoal from 15L bulk sample | Good condition, variety of frag. sizes small up to 12mm. Numerous roundwood pieces recorded (several with whole radius or diameter preserved), but, due to fragmentation, undiff./mature *Quercus* sp. frags may also be rwd. Rwd 4–8 yrs: 8x 16 mm 5 yrs, 3x 20 mm 6 yrs, 2x 4–6 yrs, 2x 10 mm 8 yrs (narrow rings), 3x 12 mm 3 yrs, 2x 20 mm 7–8 yrs | Early Roman | 0 | 0 | 0 | 1 | 74 | 45 | 0 | 0 | 120 | |
| Kiln 4, (2031) | 2075 | Ashy basal deposit in firing chamber of earliest, square pottery/flagon kiln, Kiln 4 (2031) (*in-situ* fuel remnants) | 219 | Wood charcoal from 20L bulk sample | Assemblage size good, but pieces dirty and with mineral impregnation. Several vitrified iron-rich non-charcoal lumps | Late Iron Age to Early Roman | 2 | 3 | 0 | 0 | 54 | 6 | 3 | 0 | 68 | Fe-rich vitrified non-charcoal lumps |
| Total | | | | | | | 3 | 4 | 12 | 1 | 303 | 63 | 3 | 1 | 390 | |
| Spp Ubiquity (presence in X of 6 contexts) | | | | | | | 2 | 2 | 1 | 1 | 6 | 5 | 1 | 1 | | |

TABLE 12. TREE AND SHRUB TAXA REPRESENTED AT LITTLE LONDON TILERY

| Family | Sub-Family | Genus/Species | Common name |
|---|---|---|---|
| FAGACEAE | | *Quercus* sp. (*robur*/*petrea*) | Oak |
| BETULACEAE | | *Betula pendula*/*pubescens*<br>*Corylus avellana* | Silver/downy birch<br>Hazel |
| ROSACEAE | Maloideae (formerly Pomoideae) | (Maloideae)<br><br>e.g. *Crataegus* type<br>e.g. *Sorbus* type | Pomaceous fruits, e.g. apple, pear, whitebeam, hawthorn<br>Hawthorn<br>Whitebeams, e.g. rowan, service-tree |
| OLEACEAE | | *Fraxinus excelsior* | Ash |

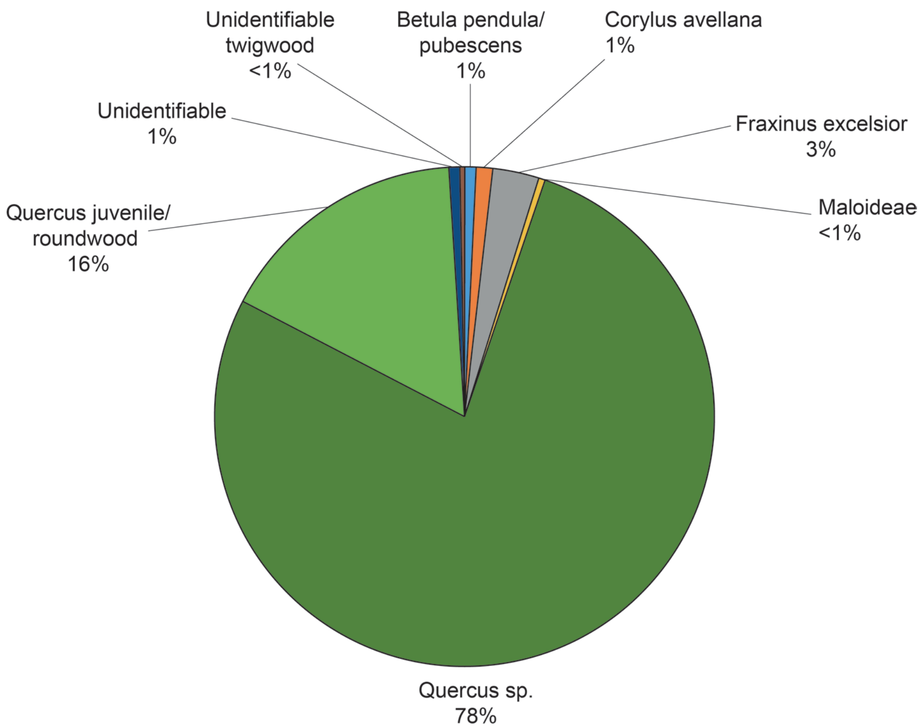


FIG. 124. Pie chart to show proportions of taxa represented, all contexts

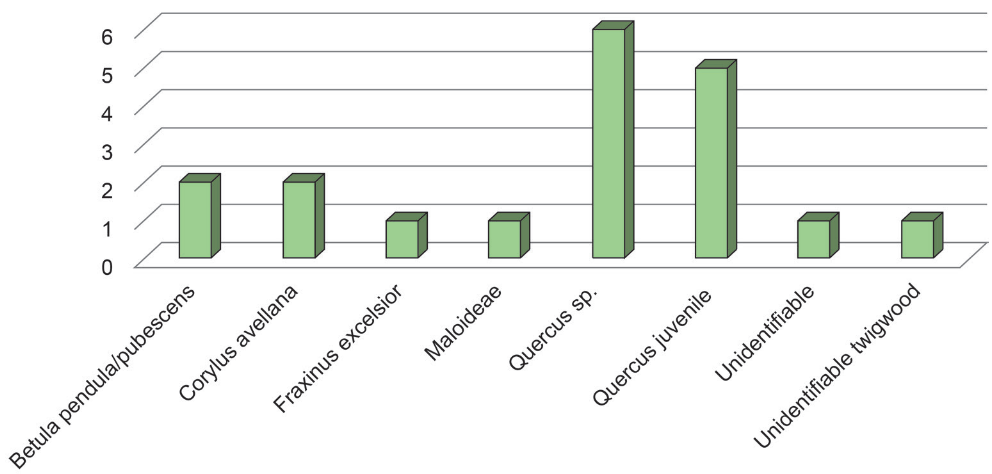


FIG. 125. Bar graph to show species ubiquity

TABLE 13. RADIOCARBON DATES FROM LITTLE LONDON

| Feature | Context | Context description | Sample | Material dated | Species ID | Lab. code | 14C date | ± | δ13 | cal date | | Unmodelled cal range rounded out to 10 yrs | Period |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | from | to | | |
| Kiln 3, [2040] | 2037 | Second deposit overlying sand in the small circular pottery/flagon kiln, Kiln 3 [2040], with broken *tegulae*, part of the upper firing floor **2050** collapsed into the base of the kiln along with fuel remnants | 206 | Wood charcoal | <10 yrs juvenile *Quercus* sp. | SUERC-90860 | 1904 | 24 | -25.9 | 20 | 210 | 27 cal AD (1.5%) 40AD 48AD (91.7%) 140AD 155AD (1.0%) 168AD 195AD (1.1%) 208 cal AD | Early Roman |
| Kiln 4, (2031) | 2075 | Ashy basal deposit in firing chamber of earliest, square pottery/flagon kiln, Kiln 4 (2031) (*in-situ* fuel remnants) | 219 | Wood charcoal | <10 yrs juvenile *Quercus* sp. | SUERC-90861 | 1964 | 24 | -24.3 | -40 | 90 | 40cal BC–90 cal AD | Late Iron Age to early Roman |
| Associated with Kiln 3, [2040] | 2076 | Rake-out from Kiln 3 [2040] (small circular pottery kiln) into the working area. | 220 | Wood charcoal | 5 yr juvenile *Quercus* sp. | SUERC-90862 | 1941 | 24 | -25.3 | 1 | 130 | 1–130 cal AD | Early Roman |
| Quarry pit [1048] with dumps of spent fuel from Kiln 1 | 1029 | First dump of charcoal in quarry pit [1048], 4.2 m by 3.3 m in size | 102 | Wood charcoal | *Corylus avellana* charcoal | SUERC-90863 | 1915 | 19 | -25.9 | 50 | 130 | 50–130 cal AD | Early Roman |
| Kiln 1, firing chamber **1161** | 1098 | Primary collapse of Phase 2 main brick kiln, abandonment deposit across base of the firing chamber **1161** | 114 | Wood charcoal | <10 yrs juvenile *Betula* sp. | SUERC-90867 | 1903 | 24 | -27.7 | 20 | 210 | 28AD (1.3%) 39AD 50AD (91.8%) 140AD 155AD (1.1%) 168AD 195AD (1.2%) 208AD | Early Roman |
| Kiln 2, [1090] | 1140 | Rake-out from smaller later tile kiln [1090] | 127 | Charred plant macrofossil | 1 frag. hazelnut shell | SUERC-90868 | 1918 | 21 | -24.0 | 20 | 130 | 28AD (3.1%) 38AD 50AD (92.3%) 130AD | Early Roman |

kiln used over two phases. Oak was present, along with birch (*Betula* sp.). As shown in Table 13, a fragment of the latter was dated to 50–140 cal A.D. (1903±24 BP, SUERC-90867) but there was insufficient material for meaningful charcoal analysis. Fuel from the working life of this kiln is better represented by the nearby first charcoal dump (1029) excavated from quarry pit [1048] over an area of 4.2 m by 3.3 m. 99 per cent of the charcoal within the dump was of oak with just one fragment of hazel identified. 11 per cent of the oak was of roundwood but the pieces were too fragmented to gauge the age of cutting. The hazel fragment was dated to 50–130 cal A.D. (1915±19 BP, SUERC-90863).

**Kiln 2**

The charcoal assemblage in the rake-out (1140) from the smaller, later tile Kiln 2 [1090] was dominated by large, mature fragments of oak but with 12 per cent mature ash. A few fragments were markedly reflective, indicating a high temperature of burning, and others vitrified and glassy. A fragment of charred hazelnut shell from the sample was dated to 30–130 cal A.D. (1918±21 BP, SUERC-90868).

**Kiln 3**

A charcoal-rich deposit (2037) immediately overlying a base of clean sand in the small circular pottery Kiln 3 [2040] also contained broken *tegulae* and has been interpreted as part of the firing floor collapsed into the base of the kiln. The charcoal proved highly fragmented and relatively sparse, one fragment of juvenile oak was removed for dating (50–140 cal A.D. 1904±24 BP, SUERC-90860) but no further analysis attempted. However, the associated rake-out (2076) which had been spread into the working area, and which contained 26 sherds of white ware including one collared flagon rim, provides insights into fuel use during active use. The large well-preserved assemblage contained at least 38 per cent oak roundwood pieces, several with the whole radius or diameter preserved, enabling the age at cutting to be recorded. These young branches or poles were all between 4 and 8 years old when cut, with 5 years dominant (see Table 11). Due to fragmentation, other pieces identified as undifferentiated/mature oak may also have been roundwood. The assemblage of >99 per cent oak also contained a single fragment of Maloideae, a taxonomic group which contains taxa such as hawthorn and apple. Juvenile oak from the sample was dated to 1–130 cal A.D. (1941±24 BP, SUERC-90862).

**Kiln 4**

The ashy basal deposit (2075) in the firing chamber of the earliest, square pottery Kiln 4 (2031) is thought to contain *in-situ* fuel remnants. A smaller total count was achieved than for the other samples, with 68 fragments >2 mm. Of these, 88 per cent were oak, including 8 per cent roundwood pieces, with 4 per cent hazel, 3 per cent birch and 4 per cent unidentifiable. Several vitrified, iron-rich, non-charcoal lumps were present in the sample and much of the charcoal had suffered mineral impregnation (including iron oxides). This kiln is believed on the basis of the excavated sequence to be the earliest of the pottery kilns, and indeed juvenile oak from (2075) yielded a slightly earlier radiocarbon date than the other features, late Iron Age to early Roman 40 cal. B.C.–90 cal A.D. (1964±24 BP, SUERC-90861).

## DISCUSSION

The dates returned indicate activity involving the four kilns took place within a relatively short timespan. All dates correspond closely and are clearly early Roman, with the exception of SUERC-90861 from Kiln 4 which may be a little earlier (late Iron Age–early Roman) (see Table 13, and Hamilton, Ch. 8).

The ability of on-site charcoal analysis to answer the archaeological and palaeo-environmental questions has been reviewed by Barnett (2019) for the wider Silchester Environs project. To summarise, it has been argued (e.g. Théry-Parisot *et al.* 2010; Asouti and Austen 2005; Chabal 1997) that, while wood gathered for fuel tends to be of low species diversity, collection takes place repeatedly and randomly around and close to its point of use, using the least effort required (Shackleton and Prins 1992). It follows therefore that the relative proportions of individual taxa in long-term accumulations of material and in the total site assemblage are a reflection of abundance in the local environment, despite some over-representation of types that create more deadwood. However, there are also functional and socio-cultural factors or filters to be considered (Théry-Parisot *et al.* 2010; Smart and Hoffman 1988). Taxa are sometimes targeted for particular purposes and their presence may hint at the activities represented. For instance, woods used for construction are dominated by the strong and durable (e.g. oak and alder). Their over-representation in certain contexts is likely, but across whole sites, types common in the local woodlands will also occur. Given the nature of this site, a bias in selection towards wood of taxa capable of providing high or sustained burning temperatures, and therefore giving a less clear picture of the wider woodland structure, may reasonably be expected.

The substantial body of evidence provided by the analysis of 1,788 fragments in 26 samples from 21 contexts representing the contemporary, *c.* 40-year Claudio-Neronian/early Flavian (Period 1) phase of activity at nearby Silchester Insula IX, coupled with the results from the preceding Period 0 (Late Iron Age), provide a comparative context for these findings from Little London (Barnett 2018b; 2020a). There, multiple feature types and the activities they represent were examined. Findings by context varied according to those activities, but the total site assemblage provides a good picture of landscape and domestic exploitation of the local tree and shrub resource for both Periods 0 and 1, covering the period from *c.* 20/10 B.C. to *c.* A.D. 85. In contrast, the samples from the Little London tilery represent one restricted group of activities, and are presumed to be solely the fuel from large-scale pottery, brick and tile production. The assemblage from Insula IX included a minimum of 20 woody taxa, Little London only five. There, too, oak was dominant overall, both in terms of percentage of the total assemblage and in species ubiquity, with oak appearing in every context and sample, and forming 75 per cent of the total analysed site charcoal assemblage, 63 per cent being mature or of undifferentiated age, 10 per cent roundwood and 2 per cent twigwood. There is apparently even greater dominance in the tilery fuel remains, with oak (*Quercus* sp.) making up 94 per cent of the total site assemblage, with a minimum of 16 per cent (21 per cent of the oak) being juvenile. As argued by Barnett (2020a), although oak is today (and probably was then) the most common British broadleaf tree type (with oak-dominant forest forming 23 per cent of non-conifer areas (Forestry Commission 2003, table 3)), the percentage of oak described here far exceeds the oak component of typical mixed woodland today (also at *c.* 23 per cent, ibid.). Not only is targeted exploitation indicated, but direct encouragement and management of this taxon.

Absent types at Little London include heathland taxa (rare but present at Insula IX) and, more notably, wetland taxa (relatively common at Insula IX at >3 per cent, alder, willow/poplar). Only taxa of open and closed dry deciduous woodland are represented at the tilery and seemingly a limited range of habitats were exploited. Clearly, with only five taxa represented among the total assemblage of 390 fragments identified and the overwhelming dominance of oak, there was highly targeted exploitation of key taxa to fuel the kilns. Were analysis carried out on a larger scale, the range might prove greater, with rarer/less exploited taxa found in small numbers, but the picture of highly focused resource selection and use is apparent. A contrast is demonstrated between these two geographically close and broadly contemporary sites. Whether the greater species diversity at Silchester Insula IX (Periods 0 and 1) indicates use of a less extensive or regularly cropped woodland management system, or a relative lack of industrial contexts reliant on pre-charred fuel or specifically dense, high calorific types (oak, beech, elm, ash) requiring high temperature burn, is debatable.

The high (minimum) proportion of roundwood at Little London is of note. At Insula IX, the annual growth ring count for the roundwood where the whole radius was visible varied from cut at 3–15 years, but with 5–10 years dominant, whereas at Little London roundwood cut at 4–8 years dominates. The assemblages analysed were fragmentary and it was not possible to get a full age profile or to see whether pieces were long and rod-like, as might be expected from a managed source (Edlin 1949, 70–1), but the prevalence of roundwood pieces cut at 4–8 years with a peak in those cut at 5 years is at least suggestive of use of woodland stands managed by coppicing or pollarding on a short rotation (Rackham 2001, 8–9; Edlin 1949, 155–7).

Recent work conducted as part of the Silchester Environs project provides clearer evidence of rotation cropping and of oak stand management for the late Iron Age to mid-Roman periods in the immediate area of the tilery. Pollen analysis of enclosure ditch sequences at Pamber Forest and the linear monument at Wood Farm shows periods of abnormally high oak flowering that suggest coppiced or pollarded oak stands were established during the Iron Age to early Roman period (Dark in prep.). Mid–late Roman Pit 3020 (located within the footprint of middle Iron Age Enclosure 3) at Pamber Forest (Fulford *et al.* 2017a; Barnett and Fulford in prep.) has been interpreted as a possible charcoal preparation structure. The volume of charcoal recovered was high, with four substantial and distinct layers of charred oak. The base of the feature was formed of a large plank-like piece >30 years when cut, but the three overlying layers contained pieces cut at 15–20 years (Barnett 2019). The preservation of the single-taxon layers by charring without ashing, despite the large quantity of dense highly calorific wood, indicates moderate, controlled temperatures. This, coupled with the form of the feature and the presence of rubified soil and associated encircling post-holes, suggests the presence of a charcoal preparation stack (Barnett 2019). It compares well with the form of the nineteenth- to twentieth-century woodland charcoal-making features described by Edlin (1949, 160–5). A managed source of oak for this charcoal preparation has been interpreted from the presence of the same-age oak pieces.

While highly reflective pieces were not dominant in the Little London assemblage, the charcoal in the rake-out (1140) from the smaller, later tile kiln 2 [1090] of large, mature fragments of oak and mature ash did contain some markedly reflective fragments, and others that were vitrified and glassy. The work of McParland *et al.* (2009; 2010) indicates the reflective pieces were subject to fierce burning temperatures (>850–1000°C) and may have been pre-prepared as fuel charcoal to help achieve those high temperatures for firing the tiles associated with this particular feature.

Of particular relevance in interpreting the results for the Little London kilns is the charcoal analysis of ten samples from kilns, working areas and associated tip lines in colluvium of spent fuel downslope from the kilns undertaken for a late Roman site at Frith End (Barnett 2011), and for two chambers of a substantial contemporary kiln nearby in Alice Holt Forest (Chisham 2008), both sites used for Alice Holt pottery production. Of the 1,550 charcoal fragments identified across the Frith End site, only 29 pieces were of taxa other than oak (hornbeam (*Carpinus betulus*), willow/aspen (*Salix*/*Populus*), Maloideae, holly (*Ilex aquifolium*), ash (*Fraxinus excelsior*) and possible beech (*Fagus sylvatica*)). It was noted that the Frith End kiln structures yielded small, scrappy assemblages, as at Little London, presumably due to regular cleaning out of the fuel waste. The richest, from clamped kiln/oven F116, was dominated by oak at 90 per cent, with lesser (mature) hazel plus a few pieces of Maloideae charcoal, representing possible kindling.

Large quantities of charcoal were deposited beyond the kilns in scoops, hollows and as tip lines of oak-dominated charcoal. The tip lines were interleaved with thick bodies of fast-accumulated (late Roman) colluvium with no apparent stasis horizons developed between and in the context of a series of substantial downslope erosional features dissecting the hill. Barnett (2011) suggested this slope instability indicated substantial local disturbance during the Romano-British period due to local deforestation during the lifetime of the kilns, related to clearance for their construction and/or tree felling for fuel use. However, the preservation of large areas of managed woodland would have been required in the wider area for the long-term operation of the industry. Hollows/scoops 5179 and 5183 were particularly rich in charcoal yet contained only two taxa (oak and hazel) and were dominated by roundwood. 5179 contained 97 per cent oak roundwood while 5183 contained both oak (40 per cent) and hazel (45 per cent) roundwood, the remainder being mature pieces of the two taxa. The volume of roundwood in these two scoops enabled consideration of the age profile. The oak pieces from 5179 were harvested at between 3 and *c.* 32 years of age but dominantly at 5–15 years (*c.* 63 per cent) and 21–26 years (*c.* 22 per cent), while both the oak and hazel from 5183 were cut at 5–25 years (Barnett 2011). Plotting of the age of the roundwood when cut for the site as a whole demonstrated a clear propensity for cutting hazel and oak rods at 5–10 years (see Barnett 2011, table 3, reproduced as Appendix 3, Table 22), though pieces of oak roundwood, up to 25 years old when cut, were common and mature oak timbers were used as well.

A larger assemblage and greater range of taxa were found within the Alice Holt Forest kiln structure, with fuel waste from the last firings apparently not cleaned out. Notably, there was a substantial difference in assemblages between the remains from the north and south flues. Mature oak was common in the north flue, with alder (*Alnus glutinosa*) and hazel roundwood and less common oak roundwood, field maple (*Acer campestre*, mature and roundwood), birch (*Betula* sp.), ash (*Fraxinus excelsior*), willow/poplar (*Salix*/*Populus*) and Maloideae. Oak also dominated the south flue, but at least half of it was young, rod-like pieces of roundwood up to 15 mm in diameter, cut at 2–5 years growth, with most cut at 3 years. Many of the fragments were fissured, reflective and partly vitrified, indicating high temperatures of burn and possibly the use of damp wood in this flue. The south flue also contained willow/aspen and birch, with lesser quantities of hazel, ash, holly and Maloideae. A contrast in the temperatures required/attained, boosted by the use of smaller tinder, including grass and weed stems, is indicated. The findings from both analyses were found to be comparable to a smaller assemblage previously described for nearby waste dump AH5 (Pratt 1979), where roundwood dominated, mostly of oak but with hazel and possible willow also described. An experimental firing of the type of kiln found at Alice Holt found that long, straight (coppiced) poles 20 mm in diameter and 0.6 m long worked best for the main firing in the constricted flues, with finer brushwood being used for producing higher temperatures (Lyne and Jefferies 1979, 13), the diameter consistent with the site findings (Barnett 2011; Chisham 2008).

A pattern of regular management of both oak stands and oak-hazel coppice rotation to produce vigorous straight shoots as a fast-growing crop (e.g. Edlin 1949, 82–4; Buckley 1992) is apparent for the two Alice Holt kiln sites, indicating woodland management employed on a large scale in order to provide a predictable and substantial fuel source for the Alice Holt pottery industry. Different techniques, temperatures and activities are also indicated, with different taxa and maturity of pieces selected accordingly. Due to the poorer preservation of the Little London assemblage, in particular the fragmented nature of the charcoal, such detailed examination of intra-site and intra-kiln activities and techniques has not been possible. The underlying pattern of short rotation cropping (here oak rather than oak-hazel) to fuel the tile, brick and pottery industry is, however, perhaps supported, as is the deliberate encouragement of oak-dominated woodland stands around Little London. This is likely to reflect reuse of the already established local woodland management patterns (see Barnett 2019). The scale of fuel dumping is far less than observed at Alice Holt and with no evidence for major deforestation or new soil instability, it is tentatively suggested that activity at Little London was more restricted and perhaps of shorter duration and/or more rapidly established in response to an immediate need.

## CONCLUSIONS

Charcoal analysis coupled with radiocarbon dating of a limited number of contexts within, and associated with, a short phase of use of tile and pottery kilns at Little London has provided data on woodland management and use of woody resources to fuel the industry. All dates correspond closely and are early Roman, with the possible exception of SUERC-90861 from Kiln 4 (late Iron Age–early Roman), and the tight relative dating provided by the presence of Nero-stamped tiles from this site is notable (see Hamilton, Ch. 8).

Samples from primary kiln contexts proved sparse, presumably due to repeated rake out of spent fuel (fragmented charcoal and ash) before each firing. More substantial assemblages were found in the individual kiln working areas and the dumps into the adjacent quarry pit representing the rake-out.

Only five taxa were found overall, with an overwhelming 94 per cent of the total site assemblage being oak, with small quantities of hazel, birch, ash and a member of the Maloideae. It is suggested that oak was both deliberately encouraged in the local area and targeted for use, as supported by pollen and charcoal data generated by the Silchester Environs project for nearby sites (Wood Farm, Pamber Forest). A single habitat (managed dry woodland) source has been suggested with heathland and wetland taxa entirely absent in the samples analysed for the tilery, in contrast to Silchester Insula IX which exhibited far greater species diversity, though in part due to the scale of analysis with rare or uncommonly selected taxa well represented there.

The assemblages associated with the five kilns excavated at Little London have been described individually, with differences between them presented. Of note is that the large well-preserved assemblage from deposit (2037) in small circular pottery Kiln 3 [2040] with broken *tegulae*, thought to represent the collapsed firing floor, contained a minimum 38 per cent oak roundwood pieces 4–8 years old when cut, with 5 years dominant. A minimum of 16 per cent (21 per cent of the oak) of the total site assemblage was found to be juvenile, with roundwood cut at 4–8 years dominant and a peak at 5 years, but this figure is likely to be an under-representation due to high levels of fragmentation, with the lack of full diameter visibility preventing assessment of age when cut for the majority of pieces. It was not possible to see whether the pieces were originally long and rod-like, as might be expected from a managed source, but the prevalence of young roundwood pieces is suggestive of the use of woodland stands managed by coppicing or pollarding on a short rotation.

The context for this site and analysis is provided by more substantial charcoal and dating analyses as well as pollen work undertaken on early Roman contexts (*c.* A.D. 44–85) for Insula IX (Barnett 2020a; 2020b) and late Iron Age–early Roman contexts at Pamber Forest, Wood Farm and the Little London Linear analysed for the Silchester Environs project (Barnett 2019; Barnett and Fulford in prep.; Dark in prep.), with clearer evidence of rotation cropping, oak stand management and charcoal preparation for fuel use for the late Iron Age to mid-Roman periods in the immediate environs of Little London. It is suggested that the managed woodland and pattern of cropping had already been established during the late Iron Age around Silchester and Little London and was continued or re-established by the Roman tile- and brick-makers.

Comparison has also been made with the detailed evidence from two late Roman Alice Holt kiln sites (Barnett 2011; Chisham 2008), with well-preserved charcoal for which a profile of age when cut could be established, with the archaeobotanical and geoarchaeological findings indicating that woodland management was employed on a large scale in order to provide a predictable and substantial fuel source for the Alice Holt pottery industry. The findings for the Little London tilery are in keeping in terms of targeted exploitation and likelihood of short rotation cropping, but the scale of management and environmental impact is seemingly smaller and the different techniques and temperatures indicated within those Alice Holt sites, with different taxa and maturity of pieces selected for different kiln-related activities, not discernible at Little London.

CHAPTER 7

# THE CHARRED PLANT REMAINS

*By Lisa Lodwick*

## INTRODUCTION

There are few reports on plant macrofossils from tile kilns in Roman Britain. Samples were processed in a modified 'Siraf' flotation tank. Flots were retained on a 0.25 mm mesh and residues were retained on a 0.5 mm mesh and sorted by eye. All plant remains were sorted and identified using a binocular microscope at x10–x40 magnification. Nomenclature follows Stace (2010).

## RESULTS

Charred plant macrofossils were very sparse, especially in contrast to abundant charcoal (Barnett, Ch. 6). Flots contained high proportions of roots, indicating bioturbation and the potential for contamination of the samples from later activity. 29 samples were assessed, and only 15 items were identified, with an average density of 0.03 items/L. The taxa identified are *Hordeum* sp. (barley) grains, a single *Triticum spelta* (spelt) glume base, two *Triticum spelta/dicoccum* (spelt/emmer) grains and one possible *Triticum* free-threshing (wheat) grain. A handful of wild taxa were identified: *Stellaria media* (common chickweed), *Rumex* sp. (docks), *Persicaria lapathifolia/maculosa* (pale persicaria/redshank). These taxa are all common occurrences in the Late Iron Age–Roman phases at Insula IX (Lodwick 2020), other than the possible free-threshing wheat grain.

TABLE 14. THE CHARRED PLANT REMAINS

| **Context** | | **2017** | **2046** | **1112** | **1074** | **1046** | **1061** |
|---|---|---|---|---|---|---|---|
| **Sample** | | **204** | **203** | **115** | **111** | **105** | **107** |
| Feature | | Kiln rake-out/ burning | ditch | ditch | kiln | pit | pit |
| Sample volume/L | | 35 | 40 | NA | 43 | 30 | 4 |
| cf. *Hordeum* sp. | grain | | 2 | | | | |
| *Triticum* cf. *spelta/dicoccum* | grain | | | 2 | | | |
| *Triticum spelta* | glume base | | | | | 1 | |
| *Triticum* cf. free-threshing | grain | | | | 1 | | |
| cf. Cereal indet. | grain | | | | | 1 | |
| Chenopodiaceae | seed | | | | 1 | | |
| cf. S*tellaria media* gp. (L.) Vill. | seed | 1 | | | | | |
| *Persicaria lapathifolia/maculosa* | seed | 1 | | | | | |
| *Rumex* sp. | seed | | | | | | 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| indet. | stem | 1 | | | | | 1 |
| indet. | seed | 2 | | | | | 1 |
| indet. | bud | | | 2 | | | |

## DISCUSSION

The scant archaeobotanical data provide no evidence for the diet of the kiln operators or the agricultural system provisioning them. However, it can be said that there is no evidence for the significant use of crop-processing by-products as fuel in the kilns. This stands in contrast to evidence from pottery kilns where straw and chaff were used as fuels, for example at a first-century kiln at Stowmarket in Suffolk (Plouviez 1989) and Claudio-Neronian kilns at Greenhouse Farm, Cambridge (Gibson and Lucas 2002). Archaeobotanical studies of tile kilns are rare as opposed to charcoal studies, and the only example known to the author is a tile kiln at Coberley villa, Glos., where hawthorn shrub was identified as a fuel in a tile kiln on the basis of fruits and thorns (Wessex Archaeology 2008). At other tileries, such as Great Cansiron Farm, Hartfield, E Sussex, fuel use has been identified on the basis of charcoal, showing the use of birch and oak (Cartwright 1986).

CHAPTER 8

# LITTLE LONDON AND SILCHESTER INSULA IX: RADIOCARBON DATING AND CHRONOLOGICAL MODELLING

*By Derek Hamilton*

Chronological models were constructed using radiocarbon dates from the Little London site and Silchester, Insula IX. The dated material from Little London all comes from the fills of kiln features (e.g. kilns and waster dumps) that are directly related to ceramics and bricks specifically associated with the emperor Nero (A.D. 54–68). Furthermore, the archaeological evidence suggests the site was relatively short-lived, perhaps in use for no more than 15–20 years. The dating evidence from Insula IX focuses particularly on the Period 0 (pre-Roman Iron Age) and Period 1 (Romano-British) remains (Fulford *et al.* 2018a; 2020).

Twenty-four samples were submitted to the Scottish Universities Environmental Research Centre (SUERC) where they were pretreated and measured by accelerator mass spectrometry (AMS) following the methods described in Dunbar *et al.* (2016). There are six results from Little London and 19 results from the two periods at Insula IX. The lab. maintains rigorous internal quality assurance procedures, and participation in international inter-comparisons (Scott 2003; Scott *et al.* 2010) indicates no laboratory offsets, thus validating the measurement precision quoted for the radiocarbon ages.

The results are presented (Tables 13 and 15) as conventional radiocarbon ages (Stuiver and Polach 1977). They have been calibrated using the internationally agreed terrestrial calibration curve (IntCal20) of Reimer *et al.* (2020) and the OxCal v4.4 computer program (Bronk Ramsey 2009). Simple calibrated results are presented at 95% confidence intervals (unless otherwise noted) in plain text and rounded outward to ten years. The italicised dates presented in the text below are posterior density estimates derived from mathematical modelling of archaeological problems and have been rounded outward to five years. These dates can change with the addition of new data or when the modelling choices are varied.

## METHODOLOGICAL APPROACH

A Bayesian approach (Buck *et al.* 1996) has been applied to the interpretation of the chronology of archaeological activity at Little London and Insula IX. Although simple calibrated dates are accurate estimates of the radiocarbon age of samples, this is not, usually, what archaeologists really wish to know. It is the dates of the archaeological events represented by those samples that are of interest. For example, the start and end of activity associated with the pottery production at Little London is of particular interest. The chronology of this activity can be estimated not only by using the absolute dating derived from the radiocarbon measurements, but also by using stratigraphic relationships between samples and the relative dating information provided by the archaeological phasing.

The methodology used here allows the combination of these different types of information explicitly, to produce realistic estimates of the dates of archaeological interest. The posterior density estimates produced by this modelling are not absolute, rather they are interpretative estimates, which can and will change as further data become available and as other researchers choose to model the existing data from different perspectives. The technique used is a form of Markov Chain Monte Carlo sampling and has been applied using the program OxCal v4.4 (http://c14.arch.ox.ac.uk/). Details of the algorithms employed by this program are available in Bronk Ramsey (1995; 1998; 2001; 2009) or from the online manual. The algorithm used in the models can be derived from the OxCal keywords and bracket structure shown in FIGS 126, 128 and 130.

## SAMPLES AND MODELS

The six radiocarbon results from Little London were made on short-life samples of wood charcoal and a single charred nutshell (Ch. 6, Tables 13 and 15). They are considered here within

TABLE 15. RADIOCARBON DATES FROM LITTLE LONDON AND INSULA IX THAT ARE PRESENTED IN THE CHRONOLOGICAL MODELLING

| Lab ID | Context | Material dated | $\delta^{13}C$ (‰) | $\delta^{15}N$ (‰) | C:N | Radiocarbon age (BP) |
|---|---|---|---|---|---|---|
| *Little London* | | | | | | |
| SUERC-90860 | 2037 | charcoal: *Quercus* sp.; <10 years | −25.9 | | | 1904 ±24 |
| SUERC-90861 | 2075 | charcoal: *Quercus* sp.; <10 years | −24.3 | | | 1964 ±24 |
| SUERC-90862 | 2076 | charcoal: *Quercus* sp.; <10 years | −25.3 | | | 1941 ±24 |
| SUERC-90863 | 1029 | charcoal: *Corylus avellana* | −25.9 | | | 1915 ±19 |
| SUERC-90867 | 1098 | charcoal: *Betula* sp. | −27.7 | | | 1903 ±24 |
| SUERC-90868 | 1140 | charred hazelnut shell | −24.0 | | | 1918 ±21 |
| | | | | | | |
| *Insula IX* | | | | | | |
| SUERC-65370 | 10441 | charcoal: *Alnus glutinosa*; juvenile | −25.4 | | | 2020 ±29 |
| SUERC-65371 | 10442 | charred seed: *Olea europaea* stone | −23.6 | | | 2014 ±29 |
| SUERC-65372 | 10442 | charcoal: *Corylus avellana*; twigwood | −27.0 | | | 2038 ±26 |
| SUERC-65374 | 12751 | animal bone: Canis; miniature | −20.2 | 9.9 | 3.2 | 2024 ±30 |
| SUERC-65375 | 15685 | charcoal: *Quercus* sp.; vitrified sapwood | −25.1 | | | 3943 ±29 |
| SUERC-65376 | 12714 | charcoal: *Corylus avellana* | −25.3 | | | 2017 ±29 |
| SUERC-65380 | 11117 | charcoal: *Betula* sp. | −26.6 | | | 2020 ±29 |
| SUERC-65381 | 14653 | charred seed: *Pisum sativum* | −25.4 | | | 2034 ±29 |
| SUERC-65382 | 11602 | charcoal: *Corylus avellana*; knotwood | −26.6 | | | 2038 ±26 |
| SUERC-65383 | 11603 | charred grain: *Hordeum* sp. | −24.9 | | | 1992 ±29 |
| SUERC-66262 | 12117 | charcoal: *Quercus* | −23.9 | | | 2015 ±26 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | sp.; twigwood | | | | |
| SUERC-84812 | 15968 | charcoal: Maloideae; twigwood | −24.6 | | | 1962 ±26 |
| SUERC-84813 | 9520 | charcoal: *Quercus* sp.; twigwood | −24.4 | | | 1900 ±26 |
| SUERC-84814 | 16790 | charred grain: cereal indet. | −22.5 | | | 1996 ±26 |
| SUERC-84815 | 16924 | charcoal: *Quercus* sp.; roundwood | −25.4 | | | 1989 ±26 |
| SUERC-84819 | 14616 | charcoal: *Quercus* sp.; twigwood | −24.5 | | | 1988 ±26 |
| SUERC-84820 | 15328 | charcoal: *Calluna* sp. | −25.9 | | | 1931 ±26 |
| SUERC-84821 | 15366 | charred grain: *Triticum spelta* | −22.9 | | | 1960 ±26 |
| SUERC-93672 | 11193 | human bone: femur | −21.5 | 7.1 | 3.3 | 1945 ±32 |

a simple Bayesian chronological model of the 'bounded phase-type' described in Hamilton and Kenney (2015). This model follows the assumption that the material dated comes from a potential set of samples that represent a relatively uniform deposition process. As such, these results provide an estimated start and end date for the represented activity, with the difference between the two used to calculate the overall span of the activity.

From Insula IX, there are 17 radiocarbon results on macrobotanical remains (short-lived wood charcoal and charred seeds or nutshell) and further results from an animal bone and a human bone sample. Sixteen results were originally modelled and reported in Barnett (2020b).

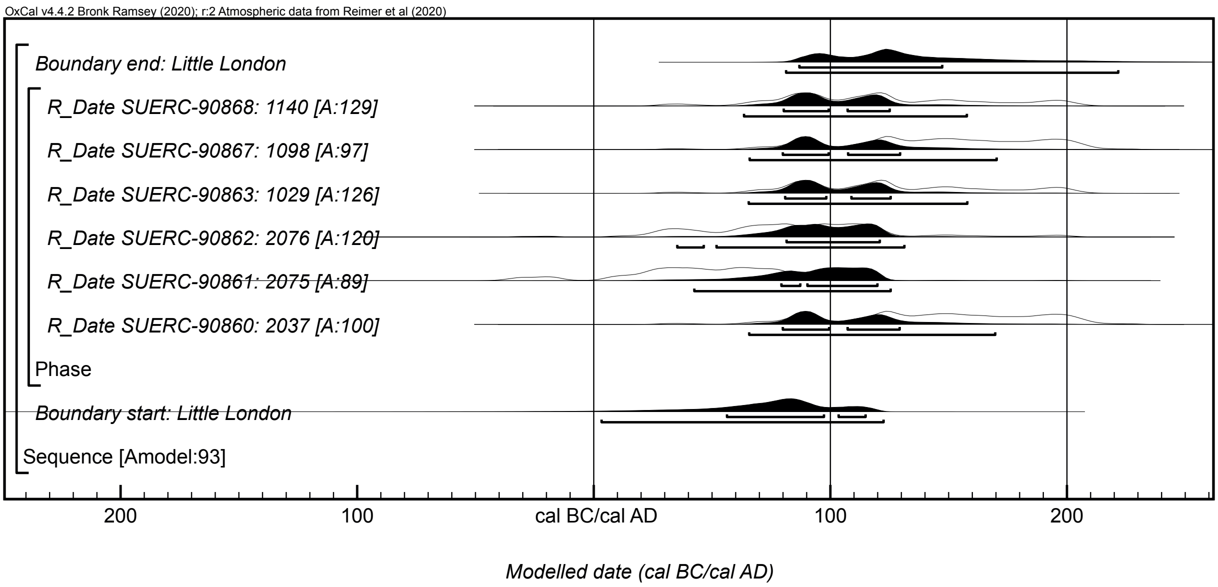


FIG. 126. Chronological model for Little London. Each distribution represents the relative probability that an event occurred at some particular time. For each of the radiocarbon measurements two distributions have been plotted, one in outline, which is the result of simple radiocarbon calibration, and a solid one, which is based on the chronological model used. The other distributions correspond to aspects of the model. For example, '*start: Little London*' is the estimated date that activity began, based on the radiocarbon dating results. The large square 'brackets' along with the OxCal keywords define the overall model exactly

One result from Period 0 (SUERC-65375) was excluded as it is Bronze Age and likely reworked material. The remaining radiocarbon results are placed into two sequential periods of activity, with Period 0 prior to Period 1. The chronological model has then been used to provide a chronology for the overall activity of the two periods, with the transition between the two being equal to the end of Period 0 and start of Period 1 for the purposes of calculating the span of each period. The model follows the same format as the preferred Model 2 of Barnett (2020b), though is updated to account for the release of a new internationally-agreed calibration curve (IntCal20).

## RESULTS

### Little London

The model has good agreement between the radiocarbon dates and the assumption that they are all from a single period of activity (Amodel=93). The model estimates this activity began in *cal AD 1–125* (*95% probability*; FIG. 126; *start: Little London*), and probably in *cal AD 55–120* (*68% probability*). The activity ended in *cal AD 80–225* (*95% probability*; FIG. 126; *end: Little London*), and probably in *cal AD 85–150* (*68% probability*). The total span of the activity is estimated at *1–200 years* (*95% probability*; FIG. 127; *span: Little London*), and probably *1–80 years* (*68% probability*).

The radiocarbon dating and modelling are coarse when compared to the dating framework provided by the typology-derived chronology. However, a primary question was whether the radiocarbon dating might be considered to support the material culture-derived dating. To investigate this, a model was produced that simulated a series of six radiocarbon results from organic material that died in the 15 years between A.D. 54 and 68, to compare the results of that model with the actual radiocarbon-dated results. The simulated results were given an error of ±24 years, to maintain parity with the majority of the originally modelled $^{14}C$ results.

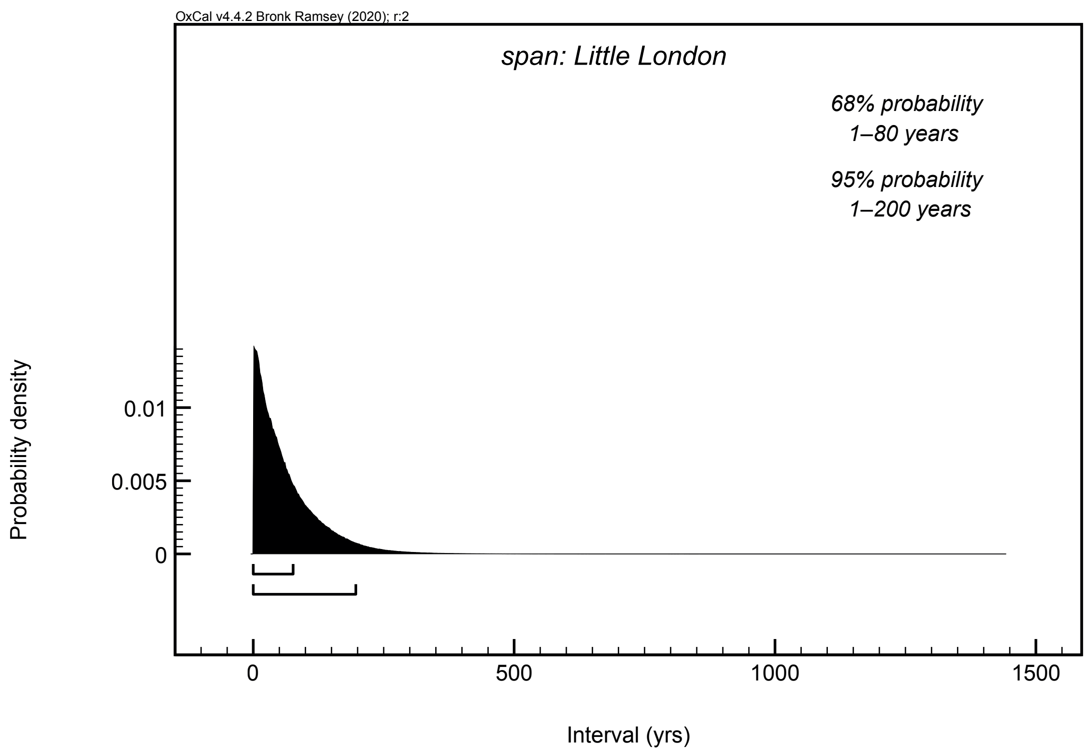


FIG. 127. Span of dated activity as derived from the chronological model shown in FIG. 126

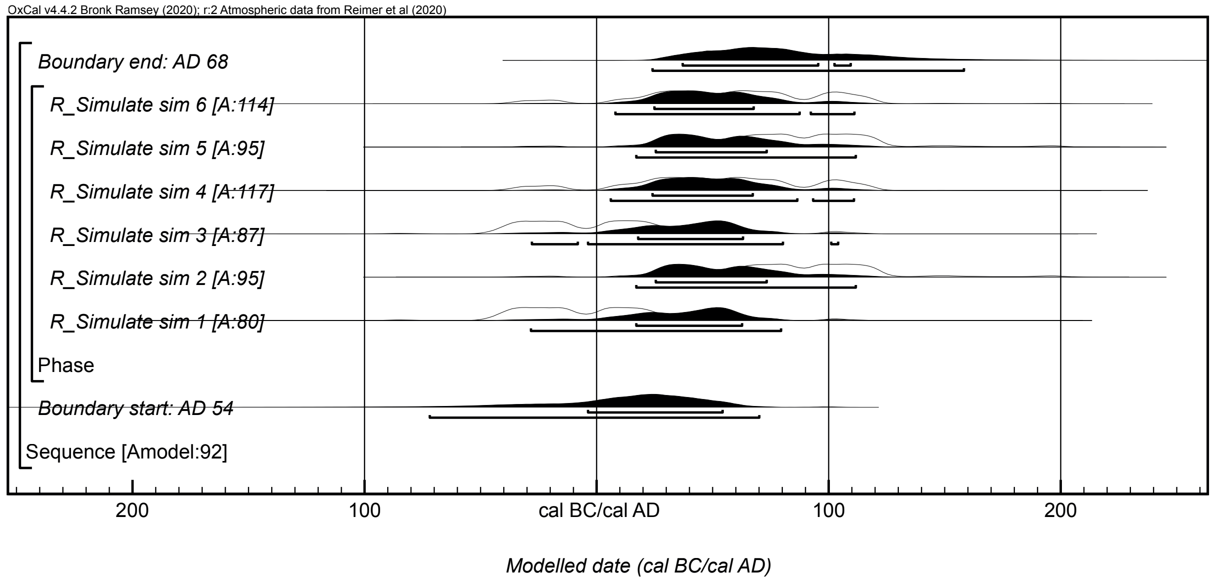


FIG. 128. Chronological model based on simulated dates for the period A.D. 54–68. The model follows the same parameters as in FIG. 126

The simulation model was run 20 times and the results were very similar each time, suggesting that with this number of dates and in this area of the calibration curve robust results can be expected. The final model run is shown in FIG. 128. This version of the model estimates the activity began in *75 cal BC–cal AD 55* (*95% probability*; FIG. 128; *start: AD 54*), and probably in *5 cal BC–cal AD 55* (*68% probability*). The activity ended in *cal AD 25–160* (*95% probability*; FIG. 128; *end: AD 68*), and probably in *cal AD 35–110* (*68% probability*). The overall span of activity, which from the typo-chronological evidence is thought to be 15 years, is estimated at *1–200 years* (*95% probability*; FIG. 129; *span*), and probably *1–90 years* (*68% probability*).

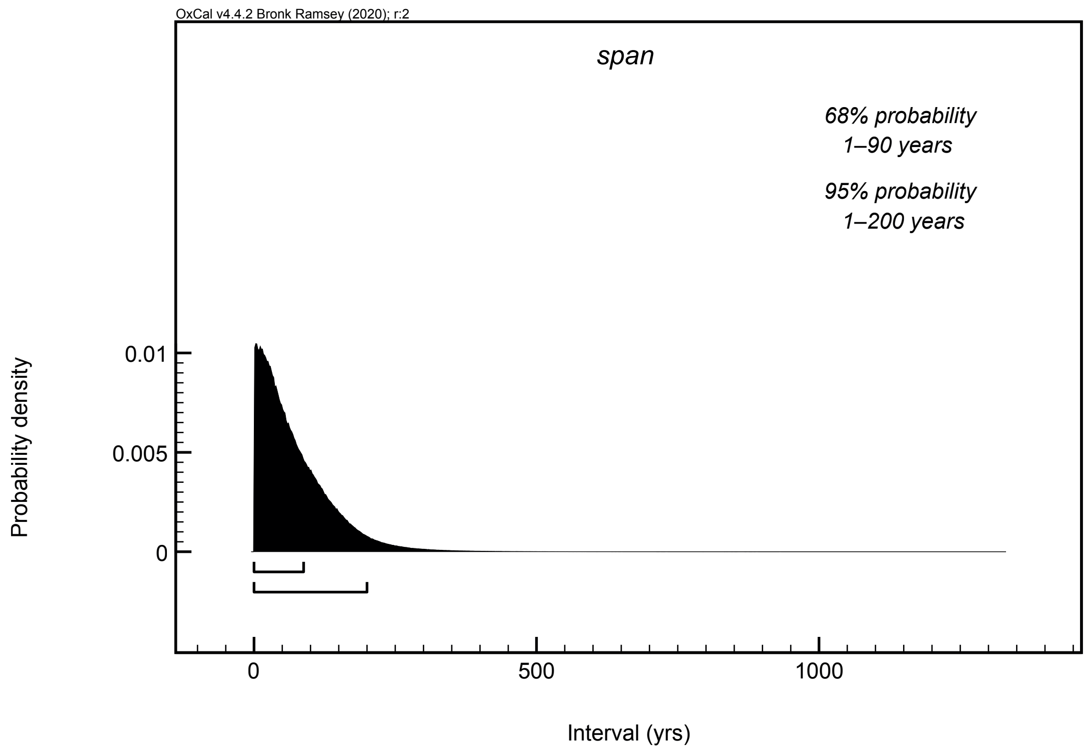


FIG. 129. Span of activity represented in the simulated model in FIG. 128

In simply comparing the start and end probabilities for the two models and the ranges, it would appear that the actual radiocarbon chronology derived from samples of unknown age is slightly later than might otherwise be expected. When comparing the probabilities for the radiocarbon chronology against the calendar dates of the generally accepted typo-chronology, there is only a 23% probability *start: Little London* occurred prior to A.D. 54 and 33% probability it began prior to A.D. 68. Furthermore, the radiocarbon chronology provides a 100% probability *end: Little London* occurred after A.D. 68. This suggests the material remains that were dated by their typo-chronology may have been residual in the contexts from which they were recovered.

## Silchester Insula IX

The model has good agreement between the radiocarbon dates and the phasing (Amodel=159). The model estimates activity in Insula IX began in *60 cal BC–cal AD 10* (*95% probability*; FIG. 130; *start: Insula IX Period 0*), and probably in *50–1 cal BC* (*68% probability*). The transition to the Period 1 activity occurred in *35 cal BC–cal AD 45* (*95% probability*; FIG. 130; *start: Insula IX Period 1*), and probably in *cal AD 1–30* (*68% probability*). The dated Period 1 activity in Insula IX ended in *cal AD 25–175* (*95% probability*; FIG. 130; *end: Insula IX Period 1*), and probably in either *cal AD 35–50* (*10% probability*) or *cal AD 65–130* (*58% probability*). The modelling estimates the Period 0 activity spanned *1–85 years* (*95% probability*; FIG. 131; *span: Insula IX Period 0*), and probably *1–50 years* (*68% probability*). The Period 1 activity spanned *1–175 years* (*95% probability*; FIG. 131; *span: Insula IX Period 1*), and probably *25–125 years* (*68% probability*).

Despite the new calibration curve, the chronological framework for Insula IX is very robust. The slight differences that can be noted between the model results presented here and those in Barnett (2020b) can likely be the result of the modelling process, with slight variations between model runs almost always being observed.

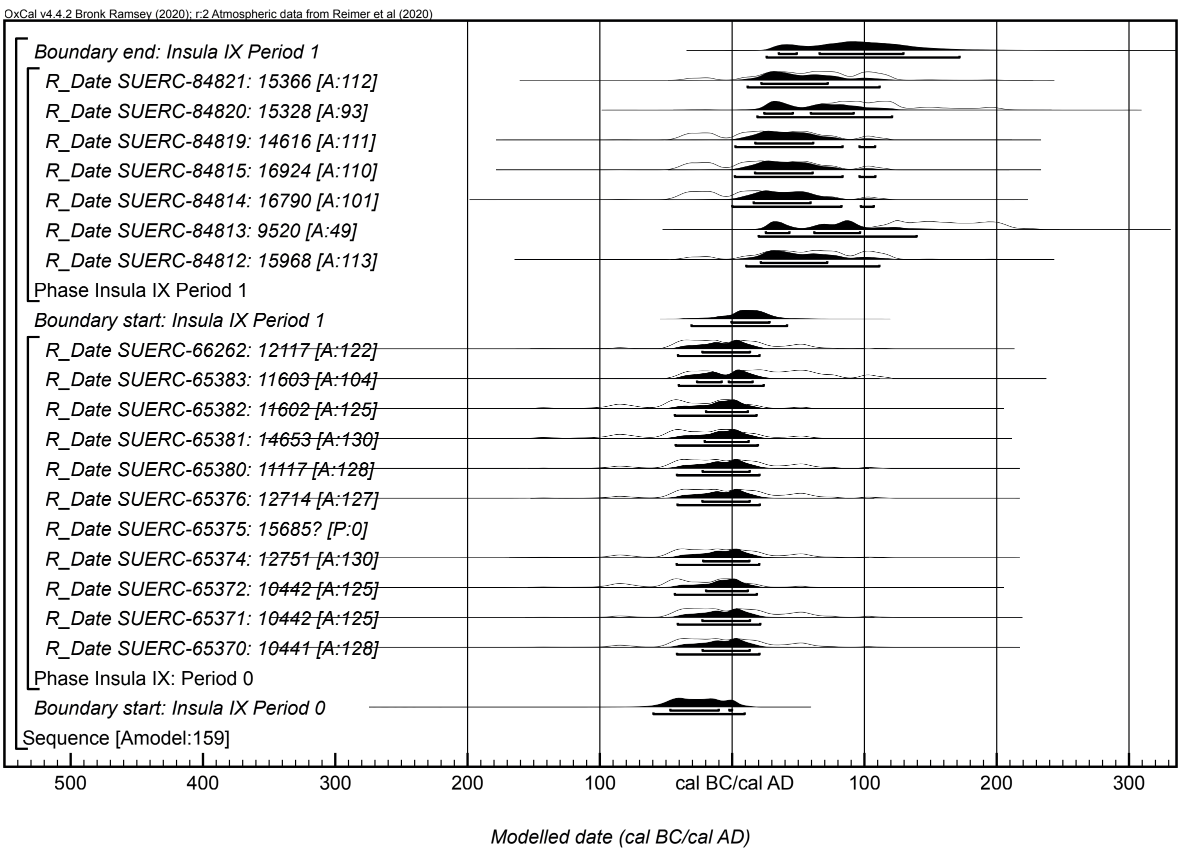


FIG. 130. Chronological model for the activity at Insula IX. The model follows the same parameters as in FIG. 126

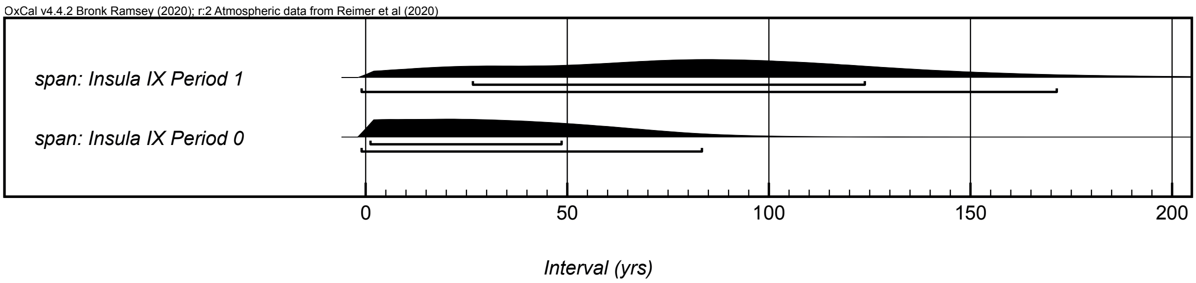


FIG. 131. Spans of activity for Periods 0 and 1 at Insula IX. The spans are derived from the model shown in FIG. 130

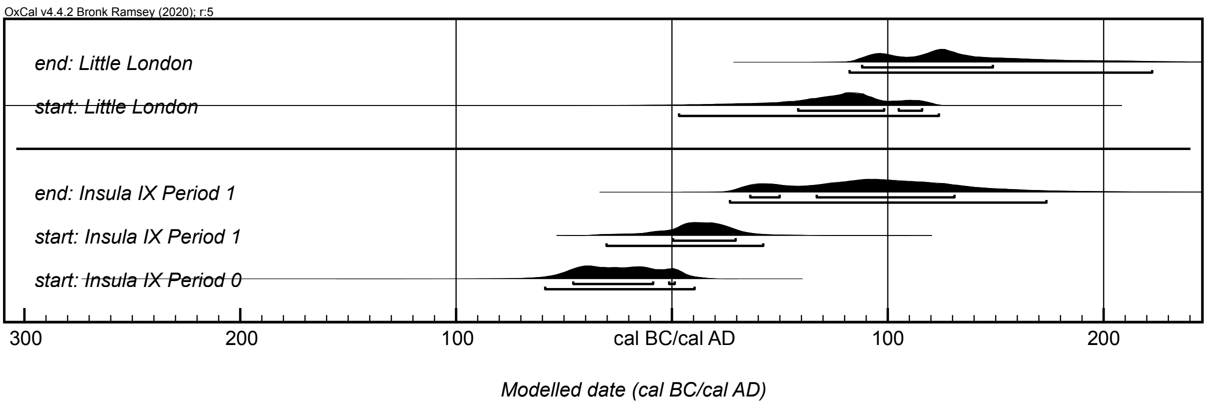


FIG. 132. Comparison of the start and end dates for the modelled activity at Little London and Insula IX. The probabilities are derived from the models shown in FIGS 126 and 130

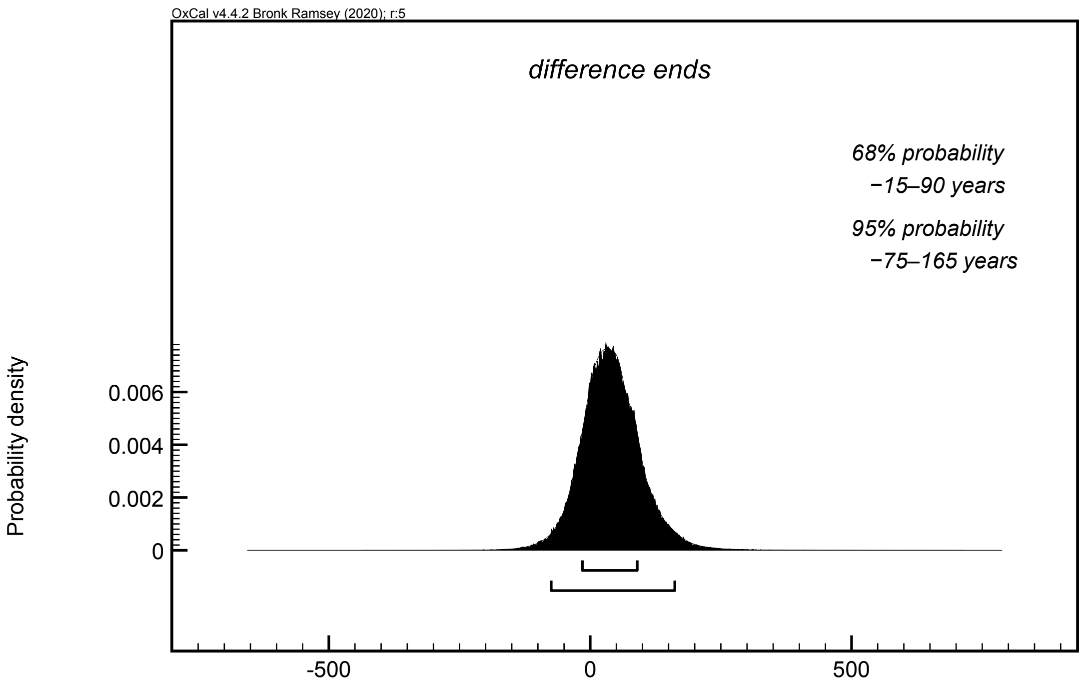


FIG. 133. Difference between the probabilities *end: Insula IX Period 1* and *end: Little London*, shown in FIG. 132

### Little London vs. Silchester Insula IX

A further level of analysis was undertaken, whereby the probabilities from Little London and Insula IX were compared (see FIG. 132 for a graphical visualisation). This comparison results in there being a 94% probability that *start: Insula IX Period 1* occurred prior to *start: Little London*, but only a 33% probability that *end: Insula IX Period 1* occurred prior to *start: Little London*. Furthermore, there is a 77% probability that *end: Insula IX Period 1* took place prior to *end: Little London*. Therefore, the dating supports a narrative whereby Period 1 activity at Insula IX began prior to Little London, but that Little London may have continued on in activity for as many as *165 years* (*95% probability*; FIG. 133; *difference ends*), but probably no more than *90 years* (*68% probability*). Similarly, the modelling does not exclude activity at the two sites from ending at the same time.

CHAPTER 9

# ARCHAEOMAGNETIC INVESTIGATION OF TWO FIRED FEATURES AT LITTLE LONDON

*By David P. Greenwood, Sam E. Harris and Catherine M. Batt*

**SUMMARY**

This report describes the archaeomagnetic investigations of two fired features, interpreted as a small pottery kiln and a brick kiln, recorded during the excavations at Little London, Silchester. A total of 74 specimens were collected from the two features: one sample set of 20 specimens from the small pottery kiln (University of Bradford Sample Register no. 217, Lab Code AM278–LL1); and three sample sets from the brick kiln: one of 20 specimens (Sample Register no. 124, Lab Code AM276–LL2); one of 25 specimens (Sample Register no. 125, Lab Code AM277–LL3); and one of nine specimens (Sample Register no. 126, Lab Code AM279–LL4). All of the specimens had a measurable remanence, indicating that the material sampled contained sufficient magnetic minerals to record a stable magnetic direction.

The magnetic directions obtained from the small pottery kiln (Lab Code AM278–LL1) were too scattered to obtain a date. Analysis of the samples suggested that this was due to either movement within the feature or insufficient heating of the material sampled.

The magnetic directions recorded by the three sample sets from the brick kiln were well grouped and appeared to record the geomagnetic field when last cooled. When calibrated against the current UK archaeomagnetic reference curve (Batt *et al.* 2017) at 95% confidence levels, AM276–LL2 and AM277–LL3 gave single age ranges, AD 882–AD 1065 and AD 835–AD 1023 respectively. AM279-LL4 gave a number of possible age ranges, including AD 469–AD 556, AD 806–AD 886 and AD 933–AD 1111. Combining the archaeomagnetic directions from all three sample sets for the brick kiln gave a single age range of AD 882–AD 1043.

The archaeomagnetic data from the brick kiln show a clear indication of a stable magnetic direction, obtained at the last time of heating. However, the date obtained does not match with the expected archaeological age. Further discussion of the exact contexts sampled is required to ascertain whether there is any possibility of later reheating having affected the structure or whether there has been undetected post-firing disturbance.

An introduction to archaeomagnetic dating can be found in Appendix 5. Detailed magnetic measurements are available in electronic form on request from the Archaeomagnetic Dating Laboratory, University of Bradford.

## SUMMARY OF ARCHAEOMAGNETIC INFORMATION

| **Lab Code:** | **AM278-LL1** |
|---|---|
| Feature: | Small pottery kiln (Kiln 5) |
| Site – latitude: | 51.333° N |
| Site – longitude: | 1.107° E |
| Magnetic deviation: | 2.810° E |
| No. of samples (taken/used in mean): | 20/19 |
| AF demagnetisation applied: | 20mT |
| Distortion correction applied: | n/a |
| Declination (at site): | 355.5° |
| Inclination (at site): | 65.1° |
| Alpha-95 ($\alpha_{95}$): | 8.8° |
| Precision parameter (k): | 15.5 |
| Date range (95% confidence): | undated due to high $\alpha_{95}$ (>5°) |
| Archaeological date range: | Cuts into earlier Romano-British square pottery Kiln 4, *c.* A.D. 50–100 |

| **Lab Code:** | **AM276-LL2** |
|---|---|
| Feature: | Brick kiln (Kiln 1) (Base) – different from AM277 in colour |
| Site – latitude: | 51.333° N |
| Site – longitude: | 1.107° E |
| Magnetic deviation: | 2.810° E |
| No. of samples (taken/used in mean): | 20/18 |
| AF demagnetisation applied: | 20mT |
| Distortion correction applied: | n/a |
| Declination (at site): | 15.4° |
| Inclination (at site): | 64.3° |
| Alpha-95 ($\alpha_{95}$): | 1.9° |
| Precision parameter (k): | 329.0 |
| Date range (95% confidence): | AD 882–1065 |
| Archaeological date range: | *c.* A.D. 50–100 |

| **Lab Code:** | **AM277-LL3** |
|---|---|
| Feature: | Brick kiln (Kiln 1) (base) – different from AM276 in colour |
| Site – latitude: | 51.333° N |
| Site – longitude: | 1.107° E |
| Magnetic deviation: | 2.810° E |
| No. of samples (taken/used in mean): | 25/23 |
| AF demagnetisation applied: | 20mT |
| Distortion correction applied: | n/a |
| Declination (at site): | 15.8° |
| Inclination (at site): | 65.3° |
| Alpha-95 ($\alpha_{95}$): | 1.7° |
| Precision parameter (k): | 310.7 |

| | |
|---|---|
| Date range (95% confidence): | AD 835–1023 |
| Archaeological date range: | *c.* A.D. 50–100 |

| **Lab Code:** | **AM279-LL4** |
|---|---|
| Feature: | Brick kiln (Kiln 1) (walls) |
| Site – latitude: | 51.333° N |
| Site – longitude: | 1.107° E |
| Magnetic deviation: | 2.810° E |
| No. of samples (taken/used in mean): | 17/16 (sub-specimens produced from blocks) |
| AF demagnetisation applied: | 20mT |
| Distortion correction applied: | n/a |
| Declination (at site): | 9.1° |
| Inclination (at site): | 64.1° |
| Alpha-95 ($\alpha_{95}$): | 2.0° |
| Precision parameter (k): | 325.2 |
| Date range (95% confidence): | AD 469–556, AD 806–886, AD 933–1111, AD 1484–1615 |
| Archaeological date range: | *c.* AD 50–100 |

| **Lab Code:** | **AM276-LL2, AM277-LL3 & AM279-LL4 combined** |
|---|---|
| Feature: | Brick kiln (Kiln 1) |
| Site – latitude: | 51.333° N |
| Site – longitude: | 1.107° E |
| Magnetic deviation: | 2.810° E |
| No. of samples (taken/used in mean): | 54/59 |
| AF demagnetisation applied: | 20mT |
| Distortion correction applied: | n/a |
| Declination (at site): | 13.5° |
| Inclination (at site): | 64.8° |
| Alpha-95 ($\alpha_{95}$): | 1.2° |
| Precision parameter (k): | 231.9 |
| Date range (95% confidence): | AD 855–1043 |
| Archaeological date range: | *c.* A.D. 50–100 |
| | |

## SITE AND CONTEXT DETAILS

Samuel Harris, from the University of Bradford, collected archaeomagnetic specimens in four sample sets from two fired features at the site of Little London, Silchester, on 7 September 2017. This study investigates the sample sets from the two fired features: a small pottery kiln (AM278-LL1, sample register no. 217) and a brick kiln (AM276-LL2, sample register no. 124; AM277-LL3, sample register no. 125; AM279-LL4, sample register no. 126) to determine whether the date of last heating can be ascertained.

### POTTERY KILN 5 (AM278-LL1)

This feature was believed to be a small pottery kiln to the south end of the trench (FIG. 134). This small feature cut into an earlier square, brick-built pottery kiln. 20 oriented button specimens were taken from the circumference of the feature, with the most orange-coloured

FIG. 134. Archaeomagnetic sampling of LL1. Specimens numbered from 1 to 20 in clockwise direction starting north-west. Specimens 18, 19 and 20 came from the raised material in south which was either the remaining clay lining or a dump of clay lining. Image taken facing north, 0.50 m scales (Photo: Harris 2017)

FIG. 135. Archaeomagnetic sampling of LL2 (Context 1138) in the centre of the brick kiln. Specimens numbered 1 to 20 consecutively, from left to right, starting at the top of the image. Image taken facing north-west, 0.50 m scale (Photo: Harris 2017)

material targeted. There were a few areas which had cracked and therefore material could not be obtained. The only remaining clay lining for this feature was at the southern end and it was not possible to say whether this was *in situ*.

## BASE OF BRICK KILN (KILN 1) (AM276-LL2)

LL2 comprises 20 oriented tube specimens (FIG. 135) taken from the base of the large brick kiln from a small area of orangey brown silty sand (Context 1138). Markedly different in colour from LL3 (FIGS 135 and 136), this area may represent different firings of the kiln after its initial use.

## BASE OF BRICK KILN (AM277-LL3)

LL3 comprises 25 oriented tube specimens, also from the base of the brick kiln, from a bright red sandy silt (Context 1139); it may therefore represent a different burning event (see FIGS 135 and 136).

FIG. 136. Archaeomagnetic sampling of LL3 (Context 1139). Specimens numbered 1 to 25 consecutively, from left to right, starting at the top of the image. Specimen number 25 sits between specimens numbered 22 and 24. Image taken facing north-west, 0.50 m scale (Photo: Harris 2017)

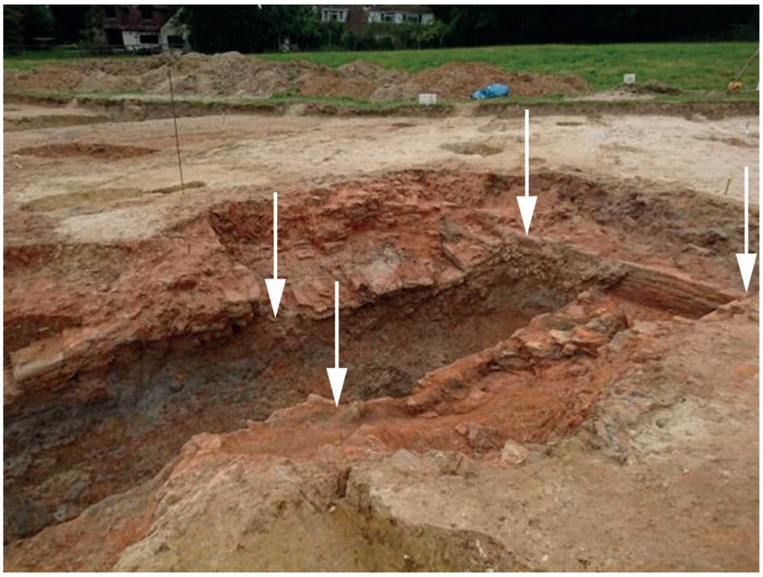

FIG. 137. Archaeomagnetic sampling of LL4. Specimens were taken from around the rim of the kiln (white arrows mark its corners). Image taken facing west (Photo: Harris 2017)

### WALL OF BRICK KILN (AM279-LL4)

In order to obtain a representative set of material from the large brick kiln, nine oriented blocks were taken from around the inside of the kiln using the button method (FIG. 137). Specimens numbered LL4/6 and LL4/7 were from vitrified material at the back of the kiln and may represent some of the highest temperatures from the kiln.

## ANALYSIS

The four sample sets (AM276 to AM279) were consolidated with sodium silicate solution at the Archaeomagnetic Dating Laboratory, University of Bradford. After allowing the specimens time to dry and consolidate, those specimens taken using the button method (AM276-LL1 and AM279-LL4) were cut in order to fit into the magnetometers. A number of buttons had become detached from specimens during transport and trimming. Therefore, sub-samples were created from the larger specimens in order to ensure that there were enough samples to produce meaningful mean measurements (see Tables 16 and 19). Each sample set was then measured using a Molspin fluxgate large sample spinner magnetometer to investigate the natural remanent magnetisation (NRM) recorded in each specimen. The stability of the specimens was investigated through a pilot study of a subset, using step-wise alternating field (a.f.) demagnetisation (progressively in steps from 2.5mT to 100mT). The results of the pilot studies showed a single stable component after 20mT through to the origin. Secondary components (often laboratory viscous overprints) of the magnetisation were removed from the remaining specimens by demagnetisation, leaving the archaeologically significant characteristic remanent magnetisation (ChRM). The mean declination values obtained for each sample set were corrected for local magnetic variation; necessary as the orientation was carried out using a magnetic compass. The magnetic measurements for the NRM, the ChRM and the a.f. field used to remove the secondary components of the magnetisation have been summarised in Tables 16 to 19.

## RESULTS FOR POTTERY KILN 5 (AM278-LL1)

The initial intensity values were low but high enough to be measurable. However, the scatter of NRM magnetic directions was high with an initial $\alpha_{95}$ value of 8.0°, indicating that the specimens may not have been *in situ* when collected, or that they had not all recorded the same magnetic field, or that the scatter may have been caused by viscous magnetic overprints which arise from post-heating changes to the specimens. A stereographic projection of the NRM directions is presented as FIG. 138.

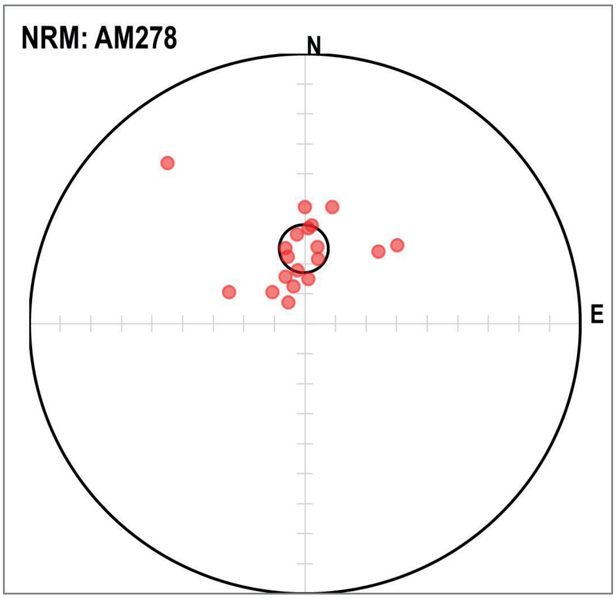


FIG. 138. Stereographic projection of the NRM directions of AM278-LL1. The small black circle represents the a95 angle around the mean direction

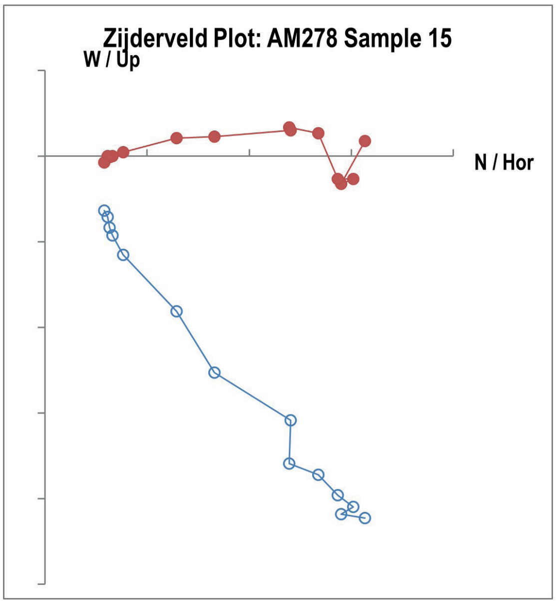


FIG. 139. Representative Zijderveld plot from AM278-LL1 showing the removal of the viscous overprint at 20mT

Three specimens with higher intensity values (LL1/4, LL1/6 and LL1/15) were selected for step-wise alternating field demagnetisation to investigate possible viscous overprint and magnetic stability of the specimens. This reveals the characteristic remanent magnetisation (ChRM), which is the archaeologically relevant magnetisation, shown as straight lines of Zijderveld plots (FIG. 139).

The pilot demagnetisation study showed a viscous overprint, removed at 20mT, and then single component magnetisation. The remaining 17 specimens were demagnetised at 20mT to determine the ChRM directions, however, the scatter of directions increased to an $\alpha_{95}$ value of 8.8°, which strongly suggested that the material was not *in situ* when sampled, or that the specimens had not been heated sufficiently. A stereographic projection of the ChRM directions is shown in FIG. 140.

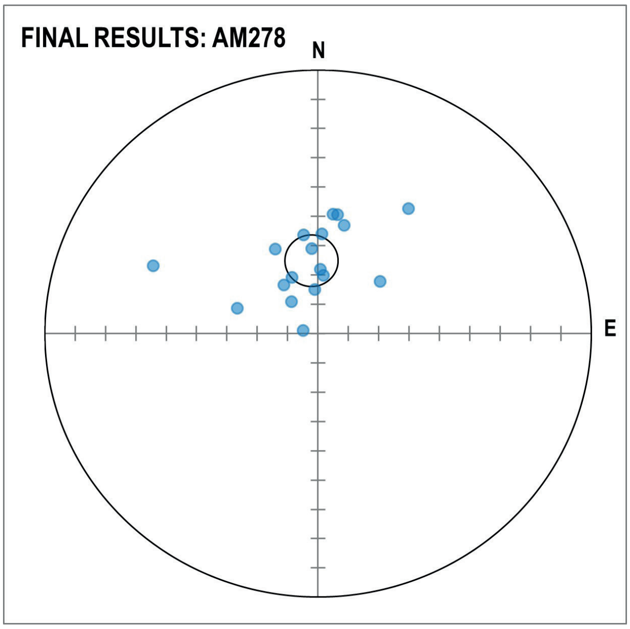


FIG. 140. Stereographic projection of ChRM directions from AM278-LL1. The small black circle represents the a95 angle around the mean direction

The scatter of directions about the mean is too great to use the mean direction and associated $\alpha_{95}$ value (8.8°) to calibrate a meaningful age determination using the current UK archaeomagnetic calibration curve (see Appendix 4).

TABLE 16. Details of the archaeomagnetic analysis of the nrm and ChRM for AM278-LL1 (mean declination values are corrected for local magnetic variation)

| | NRM | | | | ChRM | | | |
|---|---|---|---|---|---|---|---|---|
| **Specimen** | **DEC °** | **INC °** | **Intensity arb.** | **a.f. field** | **DEC °** | **INC °** | **Intensity arb.** | **Comments** |
| LL1/1 | 343.8 | 77.3 | 2.513 | 20mT | 356.9 | 75.7 | 1.011 | |
| LL1/2 | 346.0 | 67.8 | 0.839 | 20mT | 293.3 | 31.6 | 0.289 | |
| LL1/3 | 11.4 | 68.6 | 17.214 | 20mT | 2.9 | 68.9 | 8.355 | |
| LL1/5 | 4.9 | 75.5 | 55.132 | 20mT | 5.9 | 70.8 | 33.300 | Pilot |
| LL1/7 | 323.6 | 81.4 | 0.391 | 20mT | 334.8 | 58.6 | 0.245 | |
| LL1/10 | 352.9 | 72.0 | 29.293 | 20mT | 336.6 | 69.7 | 6.863 | Pilot |
| LL1/10A | 49.8 | 50.3 | 1.190 | 20mT | 35.8 | 38.8 | 0.411 | |
| LL1/11 | 293.4 | 63.9 | 6.012 | 20mT | 288.3 | 62.0 | 1.287 | |
| LL1/12 | 315.2 | 75.4 | 9.593 | 20mT | 326.0 | 70.3 | 1.856 | |
| LL1/12A | 346.5 | 64.7 | 1.804 | 20mT | 321.8 | 76.5 | 0.516 | |
| LL1/13 | 45.7 | 56.3 | 8.105 | 20mT | 49.6 | 63.7 | 6.150 | |
| LL1/14 | 320.2 | 20.7 | 1.424 | N/A | N/A | N/A | N/A | Button detached |
| LL1/14A | 9.1 | 64.5 | 1.277 | 20mT | 13.8 | 52.7 | 0.703 | |
| LL1/15 | 338.2 | 73.9 | 0.624 | 20mT | 282.5 | 85.3 | 0.255 | |
| LL1/16 | 4.8 | 57.6 | 102.288 | 20mT | 352.1 | 56.5 | 60.666 | |
| LL1/17 | 355.4 | 60.7 | 80.803 | 20mT | 2.8 | 56.3 | 47.472 | Pilot |
| LL1/18 | 13.1 | 50.1 | 37.400 | 20mT | 9.6 | 49.0 | 25.364 | |
| LL1/19 | 0.9 | 51.5 | 49.105 | 20mT | 7.4 | 49.4 | 33.164 | |
| LL1/20 | 2.3 | 58.4 | 27.938 | 20mT | 356.2 | 61.5 | 15.938 | |
| **MEANS** | **359.4** | **65.8** | **$\alpha_{95}$=8.0** | | **355.5** | **65.1** | **$\alpha_{95}$=8.8** | |

## RESULTS FOR BRICK KILN (KILN 1) (AM276-LL2, AM277-LL3 and AM279-LL4)

The three sample sets (AM276-LL2, AM277-LL3 and AM279-LL4) produced very similar results. The initial intensities of the samples from the base (AM276-LL2 and AM277-LL3) were considerably higher than those for wall samples (AM279-LL4) (see Table 17), suggesting that the base of the kiln had been subjected to higher temperatures in the past than the area around the inside of the kiln sampled in 2017. However, the intensity values were higher overall than those recorded for the small pottery kiln and the scatter of NRM directions was very small (see Table 17). These initial results suggested that the specimens were *in situ* when collected and that they all recorded the same magnetic field. Stereographic projections of the NRM directions are presented in FIG. 141.

Three specimens from each sample set were chosen for step-wise alternating field (a.f.) demagnetisation in order to reveal the characteristic remanent magnetisation (ChRM), which is the archaeologically relevant magnetisation, shown as straight lines on Zijderveld plots (FIG. 142). All nine specimens showed very similar behaviour with a viscous overprint, and so the remaining specimens were demagnetised at 20mT. A statistical test (McFadden 1982) identified statistical outliers to be removed from the final ChRM results (FIG. 143).

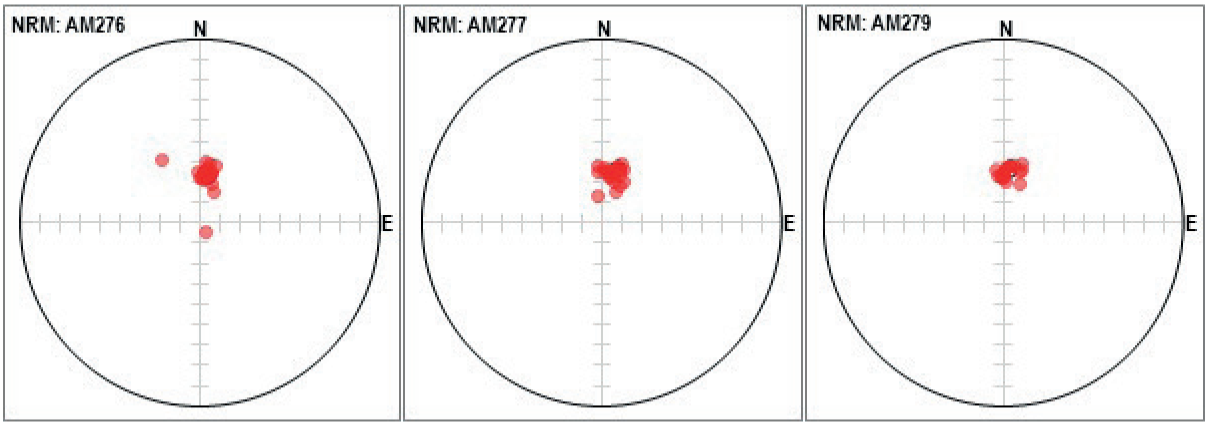


FIG. 141. Stereographic projections of the NRM directions of the three sample sets from the brick kiln

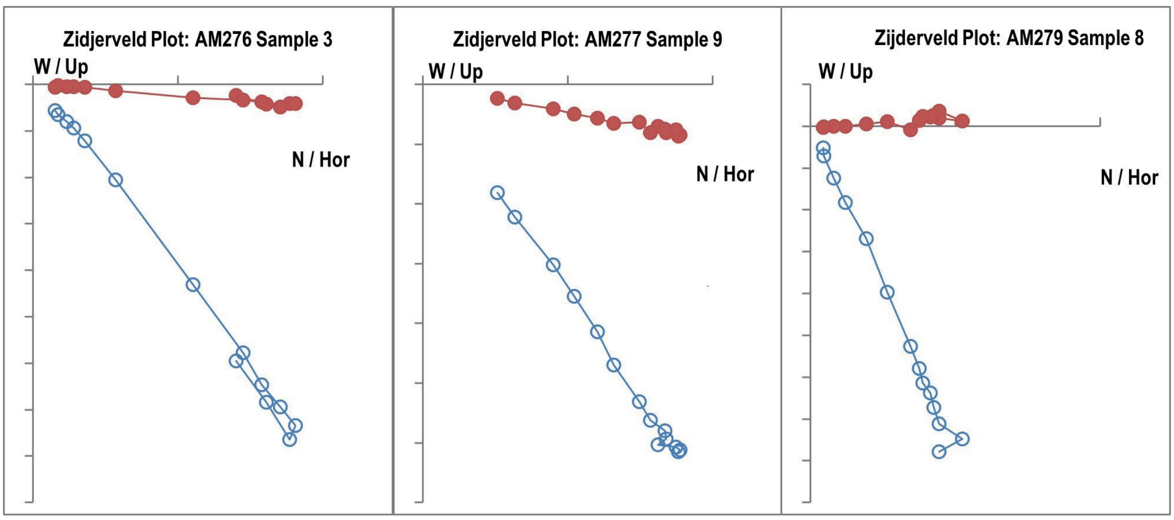


FIG. 142. Representative Zijderveld plots of the three sample sets from the brick kiln

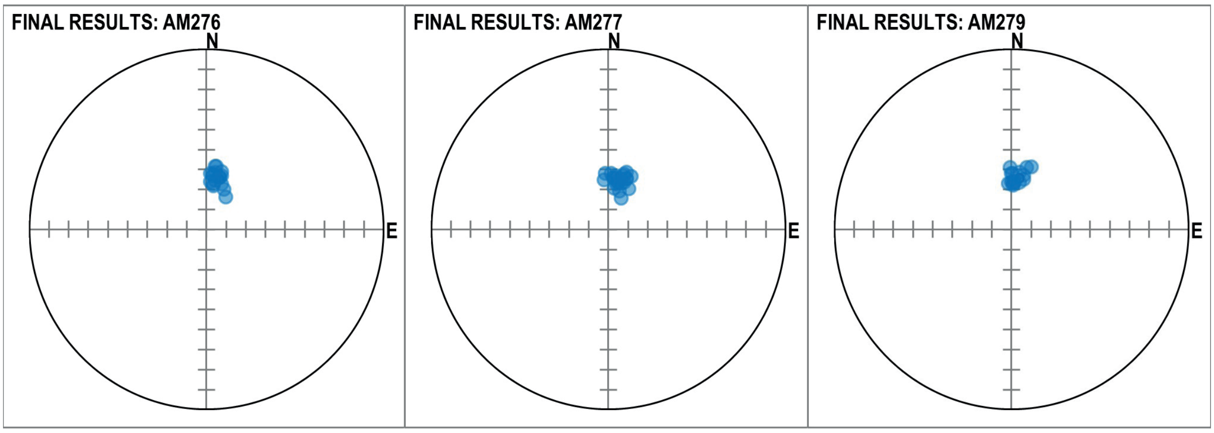


FIG. 143. Stereographic projections of ChRM directions of the three sample sets from the brick kiln

TABLE 17. Details of the archaeomagnetic analysis of the nrm and ChRM for AM276-LL2 (mean declination values are corrected for local magnetic variation)

| | NRM | | | | ChRM | | | |
|---|---|---|---|---|---|---|---|---|
| **Specimen** | **DEC** ° | **INC** ° | **Intensity** | **a.f. field** | **DEC** | **INC** | **Intensity** | **Comments** |
| LL2/1 | 6.5 | 60.9 | 978.335 | 20mT | 9.8 | 58.6 | 671.372 | |
| LL2/2 | 9.6 | 66.6 | 1320.774 | 20mT | 10.0 | 65.0 | 831.836 | |
| LL2/3 | 5.0 | 65.5 | 412.974 | 20mT | 7.3 | 62.7 | 485.659 | Pilot |
| LL2/4 | 5.5 | 65.5 | 1405.179 | 20mT | 7.8 | 63.6 | 806.495 | |
| LL2/5 | 329.2 | 54.0 | 582.578 | 20mT | N/A | N/A | N/A | Outlier |
| LL2/6 | 16.8 | 61.6 | 1260.162 | 20mT | 15.2 | 60.1 | 658.055 | |
| LL2/7 | 359.2 | 65.2 | 1010.529 | 20mT | 4.7 | 62.7 | 697.589 | |
| LL2/8 | 9.7 | 63.6 | 848.080 | 20mT | 9.8 | 61.5 | 548.627 | |
| LL2/9 | 13.3 | 65.7 | 1031.764 | 20mT | 16.9 | 62.4 | 653.429 | |
| LL2/10 | 9.0 | 65.2 | 865.869 | 20mT | 14.6 | 63.5 | 394.736 | |
| LL2/11 | 3.8 | 68.7 | 576.807 | 20mT | 9.7 | 67.3 | 296.780 | |
| LL2/12 | 13.7 | 64.7 | 1423.537 | 20mT | 14.6 | 63.1 | 952.014 | Pilot |
| LL2/13 | 144.8 | 84.5 | 398.858 | 20mT | N/A | N/A | N/A | Outlier |
| LL2/14 | 0.7 | 68.1 | 670.044 | 20mT | 5.5 | 66.3 | 451.541 | |
| LL2/15 | 11.1 | 68.5 | 761.506 | 20mT | 19.9 | 66.5 | 525.096 | |
| LL2/16 | 10.6 | 61.6 | 366.317 | 20mT | 8.7 | 58.9 | 216.404 | |
| LL2/17 | 26.6 | 73.0 | 1183.182 | 20mT | 31.8 | 71.7 | 995.502 | Pilot |
| LL2/18 | 18.8 | 70.6 | 738.794 | 20mT | 24.4 | 68.6 | 443.204 | |
| LL2/19 | 6.7 | 69.4 | 750.799 | 20mT | 9.1 | 68.5 | 453.048 | |
| LL2/20 | 12.6 | 66.0 | 1677.170 | 20mT | 15.0 | 63.6 | 1090.049 | |
| **MEANS** | **10.2** | **67.3** | **$\alpha_{95}$=3.6** | | **15.4** | **64.3** | **$\alpha_{95}$=1.9** | |

TABLE 18. Details of the archaeomagnetic analysis of the NRM and ChRM for AM277-LL3 (mean declination values are corrected for local magnetic variation)

| | NRM | | | | ChRM | | | |
|---|---|---|---|---|---|---|---|---|
| **Specimen** | **DEC °** | **INC °** | **Intensity** | **a.f. field** | **DEC** | **INC** | **Intensity** | **Comments** |
| LL3/1 | 21.6 | 65.1 | 455.370 | 20mT | 19.1 | 65.3 | 360.216 | |
| LL3/2 | 20.3 | 62.6 | 791.299 | 20mT | 16.8 | 62.6 | 465.827 | |
| LL3/3 | 24.3 | 62.9 | 660.523 | 20mT | 24.1 | 61.6 | 355.551 | |
| LL3/4 | 357.6 | 62.4 | 500.637 | 20mT | 357.7 | 62.3 | 294.158 | |
| LL3/5 | 28.1 | 67.6 | 639.595 | 20mT | 27.4 | 67.7 | 498.160 | |
| LL3/6 | 2.8 | 63.3 | 1038.477 | 20mT | 3.8 | 62.8 | 588.980 | |
| LL3/7 | 25.7 | 73.3 | 369.892 | 20mT | N/A | N/A | N/A | Outlier |
| LL3/8 | 3.2 | 65.2 | 706.535 | 20mT | 5.1 | 64.2 | 377.250 | |
| LL3/9 | 26.5 | 70.5 | 322.557 | 20mT | 23.1 | 73.0 | 277.782 | Pilot |
| LL3/10 | 12.2 | 68.0 | 703.559 | 20mT | 10.8 | 67.1 | 533.609 | |
| LL3/11 | 356.8 | 65.2 | 449.169 | 20mT | 355.8 | 65.9 | 394.753 | |
| LL3/12 | 20.7 | 62.2 | 570.374 | 20mT | 20.5 | 63.2 | 468.794 | |
| LL3/13 | 16.0 | 69.2 | 472.383 | 20mT | 16.1 | 70.6 | 349.011 | |
| LL3/14 | 11.2 | 67.6 | 1275.384 | 20mT | 8.0 | 69.4 | 845.913 | Pilot |
| LL3/15 | 14.1 | 65.9 | 586.742 | 20mT | 12.1 | 66.4 | 438.576 | |
| LL3/16 | 12.0 | 65.9 | 393.399 | 20mT | 11.1 | 66.2 | 313.277 | |
| LL3/17 | 20.2 | 63.9 | 650.438 | 20mT | 20.4 | 63.5 | 571.025 | |
| LL3/18 | 15.3 | 63.3 | 728.477 | 20mT | 13.1 | 64.4 | 579.428 | Pilot |
| LL3/19 | 9.8 | 64.0 | 616.169 | 20mT | 7.7 | 64.7 | 482.608 | |
| LL3/20 | 350.9 | 77.3 | 359.328 | 20mT | N/A | N/A | N/A | Outlier |
| LL3/21 | 15.1 | 66.5 | 491.778 | 20mT | 16.1 | 66.5 | 414.929 | |
| LL3/22 | 15.9 | 62.4 | 931.183 | 20mT | 8.8 | 63.2 | 747.109 | |
| LL3/23 | 8.7 | 65.6 | 538.055 | 20mT | 8.6 | 64.5 | 434.335 | |
| LL3/24 | 17.9 | 61.4 | 620.612 | 20mT | 16.8 | 61.0 | 479.652 | |
| LL3/25 | 19.6 | 60.0 | 756.574 | 20mT | 18.4 | 60.1 | 661.913 | |
| **MEANS** | **16.9** | **65.9** | **$\alpha_{95}$=1.9** | | **15.8** | **65.3** | **$\alpha_{95}$=1.7** | |

TABLE 19. Details of the archaeomagnetic analysis of the NRM and ChRM for AM279-LL4 (mean declination values are corrected for local magnetic variation)

| | NRM | | | | ChRM | | | |
|---|---|---|---|---|---|---|---|---|
| **Specimen** | **DEC** ° | **INC** ° | **Intensity** | **a.f. field** | **DEC** | **INC** | **Intensity** | **Comments** |
| LL4/1 | 7.9 | 62.3 | 52.183 | 20mT | 359.9 | 59.8 | 44.413 | |
| LL4/2 | 11.7 | 62.9 | 28.023 | 20mT | 13.0 | 62.4 | 22.651 | |
| LL4/2A | 19.6 | 60.4 | 55.316 | 20mT | 18.8 | 57.6 | 46.007 | Pilot |
| LL4/2B | 18.0 | 64.0 | 27.437 | 20mT | 14.3 | 64.1 | 22.258 | |
| LL4/3 | 4.3 | 64.0 | 20.354 | 20mT | 8.6 | 61.3 | 15.112 | |
| LL4/3 | 6.9 | 62.4 | 26.906 | 20mT | N/A | N/A | N/A | Outlier |
| LL4/5 | 2.2 | 63.5 | 34.815 | 20mT | 0.8 | 62.1 | 31.119 | |
| LL4/6 | 353.7 | 64.4 | 42.701 | 20mT | 1.7 | 62.4 | 29.734 | Pilot |
| LL4/8 | 359.0 | 67.0 | 16.278 | 20mT | 1.4 | 66.0 | 12.712 | |
| LL4/8A | 20.7 | 63.3 | 10.577 | 20mT | 14.6 | 58.8 | 9.396 | |
| LL4/9 | 3.1 | 70.1 | 48.795 | 20mT | 10.4 | 66.4 | 38.323 | Pilot |
| LL4/9A | 2.2 | 68.4 | 16.865 | 20mT | 4.5 | 66.6 | 14.101 | |
| LL4/9B | 0.4 | 66.6 | 29.412 | 20mT | 3.6 | 66.0 | 25.123 | |
| LL4/9C | 359.7 | 68.8 | 12.787 | 20mT | 3.3 | 67.3 | 10.646 | |
| LL4/9D | 358.9 | 66.0 | 14.093 | 20mT | 0.3 | 66.9 | 12.158 | |
| LL4/9E | 24.1 | 69.4 | 7.865 | 20mT | 2.1 | 68.7 | 6.340 | |
| LL4/9F | 353.9 | 67.6 | 10.074 | 20mT | 356.7 | 67.2 | 8.210 | |
| **MEANS** | **9.4** | **65.6** | **$\alpha_{95}$=2.1** | | **9.1** | **64.1** | **$\alpha_{95}$=2.0** | |

## ARCHAEOMAGNETIC DATING

The mean ChRM direction for the small pottery kiln was not datable as the $\alpha_{95}$ value of 8.8° exceeded the 5° normally considered the maximum $\alpha_{95}$ value for dating purposes (Tarling 1983). The mean ChRM directions for the brick kiln all had $\alpha_{95}$ values less than 5° and were therefore dated with the UK archaeomagnetic calibration curve (Batt *et al.* 2017) using a Matlab tool developed by Pavón-Carassco *et al.* (2011), and using the reference location of Meriden (latitude = 52.43° N, longitude = 1.62° W). The date ranges were constrained between 1000 B.C. and present. These ranges (Table 20), calculated at the 95% confidence level, are shown in FIGS 146–149 in Appendix 4.

TABLE 20. Summary of ChRM directions, corrected for magnetic variation, and the calibrated date ranges

| | **DEC** | **INC** | $\alpha_{95}$ | **Date ranges at 95% confidence level** |
|---|---|---|---|---|
| AM276 (LL2) | 15.4 | 64.3 | 1.9 | AD 882–1065 |
| AM277 (LL3) | 15.8 | 65.3 | 1.7 | AD 835–1023 |
| AM279 (LL4) | 9.1 | 64.1 | 2.0 | AD 469–556, AD 806–886, AD 933–1111, AD 1484–1615 |
| AM276-LL2, AM277-LL3 & AM279-LL4 combined | 13.5° | 64.8° | 1.2° | AD 855–1043 |

## DISCUSSION AND CONCLUSION

The sample set (AM278-LL1) from the small pottery kiln at Little London resulted in a scatter of magnetic directions that gave a $\alpha_{95}$ value >5°, and was therefore not datable. The intensity values for this sample set were also very low for a fired feature, which suggests that a sufficiently high temperature had not been reached in the areas sampled.

The brick kiln, on the other hand, had a high and stable magnetisation, which appeared to record the geomagnetic field in the past. The magnetic directions obtained for the floor samples were very similar and yielded similar date ranges. The magnetic directions for the wall samples had a slightly more westerly direction and yielded some overlapping dates but also other possibilities. The intensity values for the wall samples were significantly lower than for the floor samples which might suggest a lower heating temperature. The magnetic directions from all three areas can be combined to give a single date for the feature.

The archaeomagnetic dating results suggest that the brick kiln last cooled at some time between AD 850 and 1050. The date range is larger than would be hoped for with the small associated $\alpha_{95}$ values, and this may be a reflection of the paucity of archaeomagnetic data for this period. It would be possible to improve on these date ranges by combining them with other dating evidence in a Bayesian model. It is also possible that further refinements to the British archaeomagnetic dataset may allow the precision of the date to be improved in the future. The suggested date range is not in good accordance with the archaeological evidence suggesting a Romano-British date. Whilst the inclination of the samples is consistent with this earlier date, the declination rules out that possibility. Further discussion is required to understand whether the discrepancy is due to post-firing disturbance, not visible at the time of sampling, or to a later episode of reheating.

# CHAPTER 10

# CONCLUDING DISCUSSION

*By Michael Fulford*

## INTRODUCTION

With the excavation of one of, potentially, three adjacent brick kiln clusters, the production of Roman ceramic building material at Little London has been confirmed. In addition, the unexpected discovery of three small kilns close by has added pottery to the range of products from the site. Although the manufacture of ceramic building material may have commenced a little ahead of the pottery, it would seem that the two facets of the industry so far identified at Little London continued side-by-side. What is harder to assess is what proportion of the activities carried out at Little London have survived ancient and modern interventions. It is evident from the LiDAR that there are further backfilled clay pits in the south-west corner of the field (FIG. 34). These are similar in size and character to the clay pit partly investigated in Trench 1 and we assume they are probably Roman, but the much larger area in the middle of the field shown as disturbed on the geophysics (FIG. 2) is a more recent intervention and is marked on the 1872 OS map (Truscoe 2017, 96–8, fig. 75). How much structural evidence of early Roman date any of this quarrying may have destroyed cannot be determined, but we should remain open to the possibility that there were more brick kilns and associated workshops than currently survive. For example, there are clay pits similar in size to those in the south-west corner of our field on the west side of the present day Silchester to Little London road (ibid., fig. 76). Even with a sample of over 17,000 pieces we cannot be certain how well it captures the full range of products. For example, Machin has identified tile with relief-patterning of type die 81 as a Little London product (p. 133) but it is not so far represented in the Little London CBM assemblage. In the case of the pottery, it looks from the concentration of waster pottery at the northern end of the ditch in Trench 2, that there was probably at least one further pottery kiln outside the excavated area, notwithstanding the lack of indicative signals from the geophysics.

Pottery from the primary fills of the trackway ditches in Trench 1 points to nearby settlement around the time of the Roman conquest and the imported pottery suggests the inhabitants enjoyed relatively high status. Perhaps the occupants were already engaged in pottery making and this attracted interest in the site and the decision to locate the Roman brick-and-tile- and pottery-making industries here. The earliest definite post-conquest activity is represented by the construction of Kiln 1, including the digging of the post-holes for its roofing structure, and the excavation of the north–south ditch in Trench 2 and construction of the presumed, associated bank. The find of a Nero-stamped tile in the fill of Kiln 1 provides a *terminus ante quem* of A.D. 54–68 for the start of brick and tile production (and a *terminus post quem* for the abandonment of Kiln 1), but we should be open to the possibility that the imperial stamping represented the appropriation of an already existing industry. Pottery-making began shortly after the tile kiln (or kilns) were established and then, intermingled with dumps of brick waste in Trench 1, continued alongside the production of brick and tile.

## THE KILNS

The characteristic rectangular form of Kiln 1 compares well with other tile kilns recorded from Roman Britain, the design of tile kilns remaining essentially unchanged throughout the Roman period (McWhirr 1979b). Indeed, the closest parallel for the roof structure at Little London is that which covered the tile kiln at Crookhorn, Hants., operating in the later third and early fourth century (Soffe *et al.* 1989, fig. 14). The internal dimensions of the tile kiln (Kiln 1) in its first phase (3 by 3.2 m) compare reasonably well with many of those listed by McWhirr (1979b, 104–7, table 6.1), but the majority are not well dated. It is not as large as second-century Eccles (4.9 by 4.7 m), but is closer in size to the larger of the later first-/early second-century military kilns, Brampton 1 and 2, in Cumbria. Of the seven single-flue kilns at the late first-century legionary tilery at Holt all but kilns 2 and 7, which are described as pottery kilns, are considerably larger than Kiln 1 at Little London. The average internal area of the five larger kilns at Holt, at 18.6 m$^2$, is almost exactly twice the size of Little London Kiln 1 (9.6 m$^2$), but Brampton 1 and 2 are only a little larger, averaging 10.98 m$^2$. In its second phase Little London Kiln 1 was reduced by about one fifth (20.6 per cent) to an internal area of 7.62 m$^2$. We can only speculate as to the reasons for the alteration: perhaps a reduction in demand, or a more effective use of fuel to reduce wastage? Kiln 2 was poorly preserved and it is difficult to distinguish where the firing chamber ends and the flue begins but, on the basis of the internal width of 2.26 m, it would seem to be close in size to Kiln 1 in its second phase.

Even smaller is the rectangular Kiln 4 in Trench 2, which was certainly devoted to firing pottery but may have been used occasionally for making brick and tile, perhaps some of the more specialist pieces only required in small quantities. Its internal dimensions of 2 by 1.6 m give it an area of 3.2 m$^2$, almost exactly one third of the internal surface area of Kiln 1. There are parallels, also thought to be for firing pottery, for this size of rectangular kiln from Colchester (Hull 1963, kilns 7, 17 and 31). It is possible that other tile kilns of similar, small dimensions listed by McWhirr (1979b) in table 6.1 were also used in this way. However, even the smaller of the two single-flue kilns at Holt, described as pottery kilns, had a greater internal surface area of 5.04 m$^2$, the other being very considerably larger at 13.52 m$^2$.

## THE KILN PRODUCTS

The range of ceramic building material embraces both the common types, such as the brick used for the string courses, a requisite for building in masonry at this time, and the roofing tile for buildings of both masonry and timber construction, and, more specifically, the specialist range, such as the vaulting tile, flue-tile and *pilae* necessary for the construction of bath-houses and heated rooms. While the commoner types produced find parallels among a range of urban, roadside and rural sites, especially villas, in south-east Britain, there are comparatively few examples of the less common types stratified among such settlements in pre- and early Flavian contexts. An important contribution of Little London is, therefore, the insight that it gives into the range of types of ceramic building material thought necessary for building in masonry, especially bath-houses, in the third quarter of the first century A.D. It is, to date, the earliest brick kiln assemblage to be published from Roman Britain.

The three pottery kilns are all different and we have already commented above on the rectangular Kiln 4. The circular, single-flue Kilns 3 and 5 are well paralleled by the Claudio-Neronian–early Flavian kilns at Duxford, Cambs., with examples of both free-standing (as in our Kiln 5) and projecting 'tongue support' pedestals (as in our Kiln 3) (Anderson and Woolhouse 2016). A kiln with a free-standing support was also found at the earlier, Claudio-Neronian military pottery at Longthorpe, but the great majority of the 28 or 29 kilns recorded there were surface-built and no traces of such structures have so far been identified at Little London (Dannell and Wild 1987).

The range of pottery products finds multiple parallels in Neronian and early Flavian Britain associated both with assemblages from kilns and with site, especially military (fortress), assemblages. More specifically, Timby (Ch. 4) sees Little London belonging to a group of kilns which includes those at Eccles, Little Munden, Brockley Hill and Minety. They produced Roman forms not previously part of the repertoire of potters in the immediate pre-conquest period. In the case of Little London, the commonest forms are collared-rim flagons and curved-wall platters and there are also types with no close parallels from Britain. Timby concludes that the potters were migrants, though some who worked at Little London may have worked previously elsewhere in Britain, rather than coming direct from the Continent. The mortaria, for example, suggest a link with the South-West.

In the case of the brick and tile, while some of the commoner forms, such as flat bricks and roofing tile, see little change over time, there are some characteristics of the assemblage, such as the thinness and scoring of the flue-tile, which are closely paralleled elsewhere in Britain in pre-Flavian contexts (Ch. 5). This means that, while there can be no doubt of Claudian/Neronian–early Flavian production, there remains the possibility that the production of the commoner forms, which account for two thirds of the wasters, could have continued for longer.

## CHRONOLOGY

To help us determine the length of production at Little London we have four sources of evidence to consider: the typology of the pottery produced; other datable pottery; a suite of radiocarbon dates; and archaeomagnetic dating. There is also the evidence to be reviewed from *Calleva* itself where most of the Little London production was probably consumed. The date range of the pottery produced at Little London fits within a Neronian–early Flavian span; the absence of ring-necked flagons suggests that pottery-making ceased no later than the early Flavian period. Of the other types of datable pottery, the small assemblage of samian, mostly from the uppermost fill of the north–south ditch in Trench 2, is predominantly of Neronian–early Flavian or of Neronian–Flavian date. There are, however, two later sherds: one of early-to-mid-Flavian date from the fill of the stokehole of Kiln 3, the other probably Trajanic from the top of the ditch in Trench 2. Two sherds of second-century Dorset BB1 were also recovered from the base of the ploughsoil in Trench 2.

There is also the archaeomagnetic dating to consider (Ch. 9), which suggests an early medieval date (A.D. 850–1050) for the last firing of Kiln 1. This is completely at odds with the dates derived from the material culture and the radiocarbon dating, including from Kiln 1, and should be set aside. However, is it just possible that the kiln was accidentally discovered between the ninth and the eleventh century — the floor of the combustion chamber perhaps collapsing and drawing attention to the kiln's existence — and a fire lit within it?

Derek Hamilton's modelling of the radiocarbon dates (Ch. 8), the samples taken from a representative range of contexts from across both trenches (p. 148, Table 15), supports a period of production of 1–200 radiocarbon years at 95 per cent probability or 1–90 radiocarbon years at 68 per cent probability. This is quite similar to what he has calculated for Silchester Insula IX Period 1 (*c.* A.D. 44–85): 1–140 years at 95 per cent probability, or 15–110 at 68 per cent probability. This would suggest that the period of production at Little London was of similar duration to the Period 1 occupation of Insula IX, approximately 40 calendar years. While it is to be expected that the radiocarbon start date of Little London would be later than that for Insula IX Period 1, it is surprising that its end date is later. This would imply that production of both ceramic building material and pottery continued later, towards the end of the first century, longer than has been estimated on the basis of the samian and the typology of the pottery produced at Little London. One possible explanation for the difference is that, with only one certainly late sample, the Insula IX radiocarbon samples largely comprised charcoal fragments from early or mid-range contexts in the Period 1 sequence (Barnett 2020b, 533), while all but one of the Little London samples derive from the latest firings of the kilns. And, as Hamilton concludes 'the modelling does not exclude activity at the two sites from ending at the same time' (p. 154).

From *Calleva* itself we find evidence from the samples retained from the excavations of the forum-basilica and of Insula IX that the Little London CBM fabrics (SILCBM3 and 4) are most abundant in the pre- and early Flavian phases of both sites, their representation residual thereafter and declining over time as a proportion of the assemblage (Machin 2018, 222–5). Recent and continuing excavation of *Calleva*'s bath-house, long thought to be early in the development of the town on the basis of its skewed orientation with the Roman street grid and the proxy evidence of a Nero tile from a nearby pit, has confirmed that bricks in the Little London fabric were used exclusively in the façade of the pre-Flavian structure (Fulford *et al.* 2018b; 2019). Timby has identified pottery in Little London fabrics from Insula IX from its Period 1, Claudio-Neronian and early Flavian phase. Classified as oxidised or cream sandy wares, they belong to her 'miscellaneous sandy wares', and account for less than 1 per cent of the group, the small quantity perhaps an indication of a short-lived production (Timby 2020, 325–6; 372–3). To conclude, pottery and brick and tile production at Little London appears to have been limited to a short span of some 30 or 40 years, *c.* A.D. 50/60–*c.* A.D. 80/90.

## THE CONTEXT OF PRODUCTION

We need now to consider what might have prompted the establishment of the industry and the possible context of the imperial appropriation. One of the distinctive products of Little London are the 'diamond and lattice' relief-patterned flue-tiles (FIG. 96). Examples in the Little London fabrics have been found not only at Silchester, but also at a range of locations from Cirencester to the north-west to Chichester and Winchester to the south. Because, historically, only unusual brick and tile, such as relief-patterned fragments, was retained from excavations for permanent archiving, it is not possible to assess the overall contribution of Little London building materials to those places and potential projects where examples of its relief-patterned tile have been found. It is reasonable, however, to assume that the loads delivered included a significant proportion of the types in greatest demand such as bricks and roofing tile, as well as the more specialised types such as flue-tile and *pilae* for bath-house and heated room construction. Similarly patterned flue-tile to that produced at Little London has been found in quantity in London, but also in smaller amounts at a number of locations across southern Britain, for the most part south of the Fosse Way. Its production is attested at Minety, Wilts., also alongside the production of pottery, and Minety brick was also found associated with Little London material in pre- and early Flavian contexts in Silchester Insula IX (Machin 2020).

A possible context for the quite widespread production of the materials necessary to construct bath-houses and heated rooms was the need to provide accommodation, usually described as *mansiones* and *mutationes*, along the major roads of the province. There is a parallel from Thrace, a Roman province since A.D. 46, for the construction of such road stations (there termed *tabernas et praetoria*) in Nero's reign, from an inscription dated A.D. 61–2 (*CIL* III.2.6123; Fulford and Machin 2021). The location of the Little London brickworks is close to Latchmere Green, where the road leading south from *Calleva* divides, with one route leading to Chichester, the other to Winchester. We can only speculate that its positioning was determined so that it could more easily serve demand to the south as well as *Calleva* itself, although, as we have seen, its products are also found at a distance to the north-west as far as Cirencester.

The above pattern of distribution can be compared with those of other industries operating in the pre-Flavian period. Betts has mapped the findspots of products which he attributes to a workshop at Eccles, Kent. They are distributed along or close to Watling Street from Canterbury west to London and then north-east from London through Chelmsford to Colchester (2017, 371, fig. 17.3). There is a similar linear distribution of a north Kent red-tile fabric, whose place of manufacture has yet to be identified. In this case it is limited to a scatter along or close to Watling Street between Canterbury and London with one outlying findspot at Gosbecks, Colchester (ibid., 372, fig. 17.4). Finally, there is a later first-century fabric, another instance where the location of the workshop has yet to be discovered but is thought to be in West Sussex, probably near Chichester and Stane Street, whose distribution extends from Chichester to London with a further findspot beyond at Barking on the Colchester road (ibid., 373, fig. 17.5). The reach of the above industries, supplying locations up to about 100 km from their presumed places of manufacture, is very reminiscent of that of Little London (and Minety). We should also note the distribution of relief-patterned box-flue tiles in MOLA fabric 3069 along Watling Street between London and Verulamium and to rural settlements in the countryside west of the Roman road. Although not securely dated, this production is likely to be broadly contemporary with Little London and Minety (ibid., 375–6, fig. 17.8).

The one road along or beside which we have, as yet, little clue as to the possible early sources of brick and tile is the Devil's Highway between London and Silchester; and the former is the one major town within potential striking distance of Little London where material attributable to this workshop has not yet been found nor, for that matter, systematically searched for. If we consider the relief-patterned tile, there are examples of die 66 from Isleworth, close to the road in west London and of die 104 at the crossing of the Thames at Staines (*Pontes*). The only other site in east Berkshire with a record of relief-patterned tile is Old Windsor, also not far from the road, with an example of die 46. While die 66 has been found in London and Verulamium, but mainly on sites in Surrey, die 104 has only otherwise been recorded on multiple examples from Verulamium. Die 46 has so far been found only in Essex at Chelmsford, Colchester and the villa at Great Tey (Betts *et al*. 1997). Although we do not know whether or not examples of the same die were being produced in the same workshop and where these were located, including whether there were tileries close to London on the west side, as a working hypothesis we suggest these tiles came from workshops either close to London or via London from sources to the north, east or south, but not from the west, not from the direction of Silchester.

When did the manufacture of brick and tile begin in Roman Britain? It is certainly documented during the lifetime of the legionary fortress at Colchester and was well established to serve the development of the *colonia* established on the site of the fortress in A.D. 49 (Crummy 1992b). Pre-Boudican consumption of brick and tile is also attested in *Londinium*, which was founded by A.D. 50 (Betts 2017, 368; Pringle 2007). At Verulamium, a *municipium* by A.D. 60 according to Tacitus, the picture is less clear: Frere found a tiled floor in the Period 1 buildings in Insula XIV destroyed A.D. 60 (1972, 15), while pre-Flavian thin-walled tiles were noted at the Insula XIX baths (Niblett and Thompson 2005, 85). Pre-Flavian production is attested in the Neronian–early Flavian proto-palace period at Fishbourne, W Sussex (Cunliffe 1971, 43), as it is at Silchester, both by virtue of the Nero tiles, and by the presence of ceramic building material in pre-Flavian deposits, as in the forum-basilica and Insula IX (Timby 2000; Machin 2020). Nero gives a certain *terminus post quem* of A.D. 54–68 for production at Little London, but does not exclude the possibility of production as early as (late) Claudian times. Until there is evidence for brick and tile production at or near Silchester before A.D. 54, it would seem very probable that it started there a few years later than it did in and around London and Colchester. This would explain why Little London products did not spread east to London because demand there was already being satisfied.

One puzzle over dating remains: why, if, in almost every aspect, the types of brick and tile present in the Little London assemblage can be paralleled in pre-Flavian contexts elsewhere, relief-patterned tile is not so far similarly represented in such dated assemblages, especially in *Londinium*, where very many examples have been found. Perhaps it is only a matter of time, or is there an element of circularity here? As it has been widely accepted as starting only from *c.* A.D. 70, since Black's paper on dating (1985), has any deposit excavated since the mid-1980s containing relief-patterned tile automatically been regarded as post A.D. 70?

Returning to the context of the establishment of Little London and Minety, if it was part of a project to set up road stations west of London in Nero's reign, it is odd that no Nero-stamped tile has yet been found at any location other than Silchester and Little London. If other stamped or otherwise marked tile was routinely being looked for among the excavated assemblages of ceramic building material and then kept, particularly since the publication of Lowther's corpus of 1948 drew attention to relief-patterned tile, it might be expected that Nero-stamped tile would also have been spotted had it been there in the first place, for example during the large-scale excavations which took place in the 1960s and 70s in Chichester, Cirencester and Winchester. Its absence may, of course, simply reflect its scarcity; only one clearly stamped piece has been found among the large assemblage of brick and tile reported here, but that rarity might be because stamping in this manner was short-lived and only aimed at material supplying projects at *Calleva* itself. Certainly, Nero-stamped tile has now been recognised in every major excavation within the town since the conclusion of the Society of Antiquaries work in 1909. From the time when major excavations began again in 1980, examples have been found from across the town, in Insulae III, IV, IX and XXX as well as from the baths in Insula XXXIII.

The Silchester Nero tiles (*RIB* 2.2482; Appendix 1) have no obvious predecessor or parallel in Roman Britain. They are the earliest official tile stamps from Britain and the circular form recalls the brick stamps of Rome and the Tiber valley. There are instances of circular stamps from later in the first or second century, for example on a *stilus* tablet from London (*RIB* 2443.2) and on *Classis Britannica* tiles (*RIB* 2481.89–99), but procuratorial and legionary stamps on tile of later first- and second-century date were contained exclusively within a rectangular, ansate or oblong frame (*RIB* 2459–63; 2485). Twentieth-century commentators simply referred to the Nero tiles, if at all, as evidence of early urban development supported by an imperial-owned tilery (e.g. Richmond 1963, 168; Frere 1967, 288). More recently Frere has re-interpreted the tiles as evidence of the take-over by the emperor of an estate belonging to a *princeps* of the Atrebates, perhaps as a result of the forcible recall of loans under Decianus Catus, the procurator of Britain at the time of the Boudican rebellion, or earlier, when the supporters of Caratacus were eliminated and Cogi-/Togidubnus' principality was established (1999, 283).

While there is no other evidence at this time of this practice of stamping in the north-western provinces, there are Nero-stamped tiles from north-eastern Italy and Dalmatia (e.g. Pellicioni 2012). They were produced on estates formerly belonging to C. Vibius Pansa, which were probably confiscated by the triumvirate after his death in 43 B.C., though imperial-marked tile only appears certainly to begin with Tiberius, then continuing through his successors to Vespasian. Unlike the circular Little London/Silchester stamps, these are in a rectangular frame and expressed as, for example, NER. CAES. PANS; NERONIS CLA. PAN. Compared with the widely distributed Italian stamps, Little London stamped tiles have only been found in Silchester.

An alternative interpretation to that suggested by Frere (above) presents itself: according to Tacitus, Nero despatched his trusted freedman, Polyclitus, to hold an inquiry in the aftermath of the Boudican rebellion (*Annals* 14, 38–9). With Colchester, London and Verulamium destroyed, *Calleva*, a communications hub with roads leading to significant destinations in all directions, only 40 miles west of London, but distant from the heartland of the rebellion, would have been a suitable place to set up his headquarters and a base for the vast retinue (*ingenti agmine*) which Tacitus, almost certainly exaggerating, tells us Polyclitus brought with him. *Calleva* would also have been a good temporary base for Classicianus, the newly appointed procurator of the province. Polyclitus would have found *Calleva* little changed from how it was before the conquest and one could easily conceive of a reason for him to divert existing production at Little London to provide the materials to initiate or develop an existing building programme in *Calleva*, the provision, or completion, of a bath-house probably being the highest priority. Acting on the emperor's behalf, one can see a context for him to use the stamp of imperial authority. Indeed, given the parallel for circular stamps from Rome, it is possible he brought a tile-maker with him. We do not know when Polyclitus arrived in Britain, nor how long he stayed, but he may well have spent several months, including the winter of A.D. 60/61, on the island. While it is unlikely that all the projects initiated by him were completed during his time in the province, they were evidence of a continued commitment to Britain. An intervention in A.D. 60/61 of a relatively short duration might well account for the small number of stamps recovered and their concentration only in *Calleva* (cf. Fulford *et al.* 2020, 3–9, 596–7; Fulford 2021, 58–61). Perhaps the listing of *Calleva* as the starting or end point of three itineraries in the later *Antonine Itinerary* enshrines a distant memory of the role played by the town in the aftermath of the Boudican rebellion (Rivet and Smith 1979, 166–7).

Timby has remarked on the scarcity of flagons and mortaria in the Claudio-Neronian and early Flavian pottery assemblage from Silchester Insula IX and the production of these forms at Little London would have served to remedy this deficiency (if that was how it was perceived) (Timby 2020). It seems strange that, given *Calleva* was being well supplied with a range of wheel-thrown pottery from Alice Holt, that industry did not also make flagons and mortaria in the pre-Flavian period. Was the pottery-making at Little London a very short-lived affair established to meet the sudden demands of an imperial-sponsored retinue arrived from Rome and/or a garrison of reinforcements from Germany? In this regard it is important to note that the pottery kilns are located next to a substantial V-profiled ditch whose original excavation seems to be only just ahead of the start of brick and tile and pottery production. This feature was not further investigated in 2017 but it remains a high priority to see if more of its course can be located and to determine the nature of what it contained — if, indeed, it was, as seems likely, part of an enclosure. It is, of course, tempting to see this as a section of a fort or fortress defence, but the closer parallel is provided by the enclosure ditches (Yards 1 and 2) 400–500 m distant from the Longthorpe fortress, where the great majority of the Claudio-Neronian kilns were distributed along and respected the northern edges of the ditches, a situation very reminiscent of the arrangement of the three pottery kilns at Little London (Dannell and Wild 1987, figs 2 and 4). The pre- and early Flavian Duxford kilns were, for the most part, also located outside a succession of contemporary substantial ditched enclosures (Anderson and Woolhouse 2016, fig. 3). Neither Longthorpe nor Duxford has produced evidence of brick production, but it is important to note the separation of activities at Little London. The brick kiln and the two adjacent kiln clusters, likely also to be brick kilns, are set some 60 m west of the pottery kilns.

The Nero tiles make it clear that there definitely was an official input into the development of Little London and a unit of the army would have been the most likely agency to deliver the project. While Timby's analysis reveals some of the complexities in finding an origin or origins for the types of pottery made there, there is at least one element, the antefix, in the brick and tile assemblage, which has a very strong military association, while the assemblage as a whole, but not the kilns and their dispositions, is best paralleled at the late first-century legionary pottery and tilery at Holt. The character and distribution of the kilns at Little London recalls the patterns at Duxford and Longthorpe, a far cry from the organisation of kilns, workshops, baths and barracks at Holt.

While the typology of the pottery made at Little London indicates a short period of production, beginning no earlier than *c.* A.D. 50 (and, possibly, as late as A.D. 60/61) and ending in the 70s, and probably no later than *c.* A.D. 80, the radiocarbon modelling hints that some production, more likely ceramic building material than pottery, may have continued until towards the end of the first century. Why did production stop? If the tilery's brief was to provide materials for the building of road stations between (and including) *Calleva* and its nearest equivalent neighbours, places which were to become the *civitas* capitals of Cirencester, Chichester and Winchester, this was a task of limited scope: once all the necessary building was completed, the production of ceramic building material and pottery could stop. We can only speculate whether, had there been a continuing private demand for these materials, production might have been allowed to continue to meet it, but the evidence from *Calleva* itself suggests that it was not until the mid-80s and the establishment of the *civitas Atrebatum* that demand picked up again and a new tilery, now exploiting the London Clay rather than the Windlesham Formation and its location not known, was established to meet it (Machin 2018; Fulford *et al.* forthcoming a).

## ENVIRONMENTAL IMPACT

It is important to return to a consideration of the impact of the industry at Little London on the local environment. A very striking outcome of Barnett's analysis of the charcoal (Ch. 6) is the extraordinarily high representation of oak — over 90 per cent of the assemblage, a percentage which far exceeds the oak component (about 23 per cent) of typical mixed woodland today. There is also a relatively high incidence of 4–8-year-old oak roundwood. Although at 75 per cent oak is the dominant taxon within the town from the late Iron Age through to the early Flavian period, other species of wood are present and the proportion of roundwood less. While the character of the urban assemblage argues for management by coppicing of the local woodlands, Little London indicates even more clearly both targeted exploitation and direct management by pollarding and coppicing on a short rotation of the woodland.

A similar situation in terms of a very high, also over 90 per cent, representation of oak seems to have been the case at the legionary tilery at Holt, Denbighs., but the sample analysed was small (Hyde 1930). Barnett also notes a similar privileging of oak at kilns associated with the Alice Holt pottery industry, some 15 miles south-east of Little London. On the other hand, that a very high representation of oak was not necessarily always the case is indicated at the late first-/early second-century rural tilery at Great Cansiron Farm in the Weald of East Sussex where oak was second to birch and supplemented by hazel (Cartwright 1986).

## SUBSISTENCE

While the presence of tiles impressed with animal footprints has been taken as evidence of tile-making going hand-in-hand with agricultural activities (e.g. Cram and Fulford 1979, 208; cf. Peacock 1979, 6), all we can say with confidence is that it provides only limited evidence for a modest degree of animal husbandry and this is consistent with the almost total lack of crop-processing debris from across the excavated area (Ch. 7). The Little London tile assemblage shows that the incidence of animal-foot impressions is very low and that the range of animals whose presence is captured on the tile does not correlate closely with the range of skeletal evidence from *Calleva* itself, most notably in the absence of the prints of pig, one of the commoner sources of meat in the town. It is also skewed towards younger animals generally whose weight would not completely destroy a tile. On the other hand, there is over-representation of young red and roe deer compared with the assemblages from the town. Together the number of deer prints slightly exceeds those of cattle and sheep or goat. It may be that the workforce could take advantage of the woodland environments from which they sourced their fuel to supplement their diet with wild game. Only a few tiny fragments, none identifiable to species, of animal bone were found at Little London to compare with the evidence of the footprints. There are also very few finds other than waste pottery and ceramic building material to help us characterise life in the pottery- and tile-works. In contrast with contemporary pottery production in the east of England where crop-processing waste was used as fuel (p. 146), the lack of such material in the carbonised assemblages, combined with the negative faunal evidence, suggests that agricultural activity played little part in the life of the workforce at Little London, the scale of production of both tile and pottery allowing no time for it.

## WORKFORCE

Two tiny glass beads, one from a kiln, the other from Ditch 2101 in Trench 2 hint at the possibility of a female presence in the workforce (Appendix 2).

## CONCLUDING REMARKS

To conclude, we might consider how we might characterise the Little London industries and how they relate to the modes of brick and tile production first proposed by Peacock in 1979 and then further developed in his *Pottery in the Roman World: an Ethnoarchaeological Approach* (1982). For brick and tile he proposed five modes: household production, the small rural brickyard, the nucleated brickyard complex, the estate brickworks and, fifth, municipal production, a category which included procuratorial and imperial ownership, as here at Little London. This last category was subsequently developed to include military production (ibid., 11, 136–51). Except where there were opportunities to exploit transport by water, a broad assumption, reinforced by ethnographic parallels from eighteenth- and nineteenth-century Britain, was that bricks rarely travelled more than 5–10 miles from source (Peacock 1979, 6). Peacock noted exceptional examples of the long-distance movement of military-produced brick in Germany along the Rhine and in Britain of brick produced for the *Classis Britannica* in the Weald transported across the Channel to the fleet-base at Boulogne (1982, 145–6).

Peacock also noted that the great majority of tile kilns reported from Roman Britain were more than 20 km distant from any town and favoured an interpretation that they were essentially estate kilns (1982, 8). He was puzzled by the scarcity of kilns close to towns but did note the official RPG-stamped tile produced next to the *colonia* at Gloucester (ibid., 9). The distribution of these tiles is largely local to the city and sites close by, but with an exceptional presence at the defended roadside settlement at Kenchester, 45 km to the north-west of Gloucester (*RIB* 2486–8). Little London clearly fits into the category of production by an official organisation, but it challenges the assumption that brick did not travel far by road. If the 10 per cent presence of Minety tile at Silchester (p. 134), some 100 km distant from the kilns, can be used as a proxy, Little London tile may well account for a similar proportion in the reverse direction at Cirencester, where so far its presence is only evidenced by a few retained finds of distinctive, relief-patterned tile. While Little London products certainly account for the great proportion of pre-Flavian brick and tile consumed at Silchester, it is reasonable to suppose that their presence at towns like Chichester, Cirencester and Winchester was more than a token one. We just need a greater focus on the characterisation and quantification of assemblages of ceramic building material from these and the other places where relief-patterned tile in Little London fabrics has been found to get a better grasp of the range and scale of consumption. It is also clear from the work done in *Londinium* that the pattern of extended distribution from Little London is not unusual in the first century A.D. (above, p. 170). We have already noted pre- and early Flavian Minety tile at Silchester and the overall distribution of the stamped tile attributed to Minety in the second century may well reflect the overall situation in the first (cf. Warry 2017). In *Londinium* small quantities of tile provenanced from Eccles, Kent, and from, as yet, unlocated tileries in north Kent and near Chichester in West Sussex also demonstrate that the long distance movement of ceramic building material by road was far from exceptional at this time (Betts 2017, 368–75). Tile from Eccles has also been noted from as far away as Silchester but not necessarily in the first century (Machin 2018, 121–2). One of the drivers for the establishment of the tilery at Little London may have been to contribute to the construction of public buildings, especially road stations, and the additional cost of transporting cart loads of brick and tile long distance may have been absorbed by the procurator or managed through the imposition of local levies on transport.

Little London is also not unusual as an industry in the pre- and early Flavian period in its conjunction of pottery and brick and tile production. As we have seen, this has also been found at Eccles, Kent and at Minety, Wilts., and it is a reasonable hypothesis that the two went together at pre- and early Flavian Colchester, Brockley Hill and the workshops along Watling Street supplying pre-Flavian London and Verulamium. With the only very recent recognition of pottery production at Little London, it is not surprising that it has not been widely identified elsewhere. *Calleva* was probably its major market, but the stamped mortarium has matches from a site on the Thames near Reading (p. 60) and Timby has, since 2017, identified further sherds, including of a disc-mouthed flagon and a drop-flanged bowl, of Little London ware from a site at Hartshill Copse, Thatcham, W Berks. (Timby forthcoming). Whether the pottery was distributed as far as the brick and tile remains to be seen.

## FUTURE WORK

Even though much of the Little London complex has been destroyed by historic quarrying, much remains to be investigated. Our trenches investigated a total of 850 m$^2$, approximately 10 per cent of the area in the south-west of the field where the geophysics has indicated good survival of extensive below-ground archaeology. All of the kiln structures excavated in 2017 were backfilled intact. Long may they and all the surviving archaeology at Little London be preserved!

APPENDIX 1

# THE NERO TILE-STAMPS FROM LITTLE LONDON AND SILCHESTER

*By Peter Warry*

*The Roman Inscriptions of Britain* II.5 (*RIB*) published in 1993 lists five tiles with circular stamps of the emperor Nero, four were found at Silchester and the fifth at Little London. Since then a further sixteen stamped tiles have been found (three at Little London and thirteen at Silchester) and these, together with the original five, are listed in Table 21. *RIB* suggested that all five of the original tiles were probably stamped with different dies; however the additional stamped tiles allow these dies to be reappraised and it is now proposed that dies 2481.3 and 2481.5 are probably the same as 2481.1 and 2481.2 is probably the same as 2481.4. Now, two further dies can be identified from the new stamped tiles.

The detail of the drawing of die 2481.1 in *RIB* differs from the actual tile (Greenaway 1981); in particular the G of Germanicus is wrongly positioned and the N of Nero is wrongly shaped. If these points are adjusted then die 2481.3 can be seen to be a part of 2481.1. Die 2481.5 neatly, and pretty much exactly, fills in the missing CAE of Caesar and also includes part of the central rosette. Small find no. 41 (see FIG. 144) confirms parts of this reconstruction and adds a ligatured E to the R of GER[MANICUS]. Die 2482.4 is probably the same as 2482.2 because the diameters of the dies match as does the spacing of the letters, however the letters themselves have been drawn 25 per cent larger. Small find no. 796 confirms the accuracy of the 2482.2 lettering.

Two new dies (3 and 4) have been identified as illustrated below. Neither of these dies has been found with the stippled texture that is normal for dies 1 and 2 which is attributed to the end grain of the wood into which the dies have been cut showing through. Although some of the impressions are too poor to rule out the possibility that they may have been made by other dies, it is probable that only the four dies illustrated in FIG. 144 have been used for all of the stamped tiles.

Most of the recent finds have been on probable *tegulae* with the stamp positioned typically 2 cm from the base of the tile and the die orientated to place Nero's name either at the bottom or the top of the stamp (FIGS 144–145).

TABLE 21. TABLE OF ALL KNOWN NERO TILE STAMP DIES

| ***RIB* no.** | **Site no.** | **Context** | **Type** | **Position (cm from base), Nero orientation** | **Die** |
|---|---|---|---|---|---|
| 2482.1 | Little London | topsoil | tile | n/a | Die 1, possible stippling |
| 2482.2 | Silchester | baths | brick | n/a | Die 2, stippled |
| 2482.3 | Silchester | basilica | brick | n/a | Die 1, possible stippling |
| 2482.4 | Silchester | basilica | brick | n/a | Die 2?, stippled |
| 2482.5 | Silchester | basilica | brick | n/a | Die 1, not stippled? |

| SF no. | | | | | |
|---|---|---|---|---|---|
| 7912 | A2000.20 | 2478 | *tegula*? | 2, bottom | Die 1, stippled |
| 5688 | A2006.50 | 7054 | *tegula*? | 2.5, n/a | Die 1?, stippled |
| 5678 | A2009.20 | 10607 | *tegula*? | 4, n/a | Die 2?, stippled |
| 543 | A2014.41 | 30324 | *tegula*? | 1.5, left | Die 2?, stippled |
| 609 | A2014.41 | 30050 | *tegula*? | 1, bottom L | Die 4, not stippled |
| 796 | A2014.41 | 30410 | *tegula* | 2, bottom | Die 2, stippled |
| 904 | A2014.41 | 30411 | *tegula*? | n/a | indecipherable |
| 1430 | A2016.70 | 34003 | brick? | n/a | Die 3, not stippled |
| 4 | A2017.51 | 1031 | brick? | n/a | indecipherable |
| 8 | A2017.51 | 1069 | brick? | n/a | Die 3, not stippled |
| 12 | A2017.51 | 1091 | *tegula*? | 3, bottom | Die 1?, not stippled? |
| 40 | A2017.50 | 5087 | *tegula*? | 3, top R | Die 1, too poor for stippling |
| 41 | A2017.50 | 5087 | *tegula*? | 2, bottom | Die 1, stippled |
| 42 | A2017.50 | 5087 | *tegula?* | 3, top | Die 4, not stippled |
| 44 | A2017.50 | 5087 | *tegula*? | n/a | Die 4, not stippled |
| 458 | A2017.51 | 2025 | *tegula*? | n/a | indecipherable |

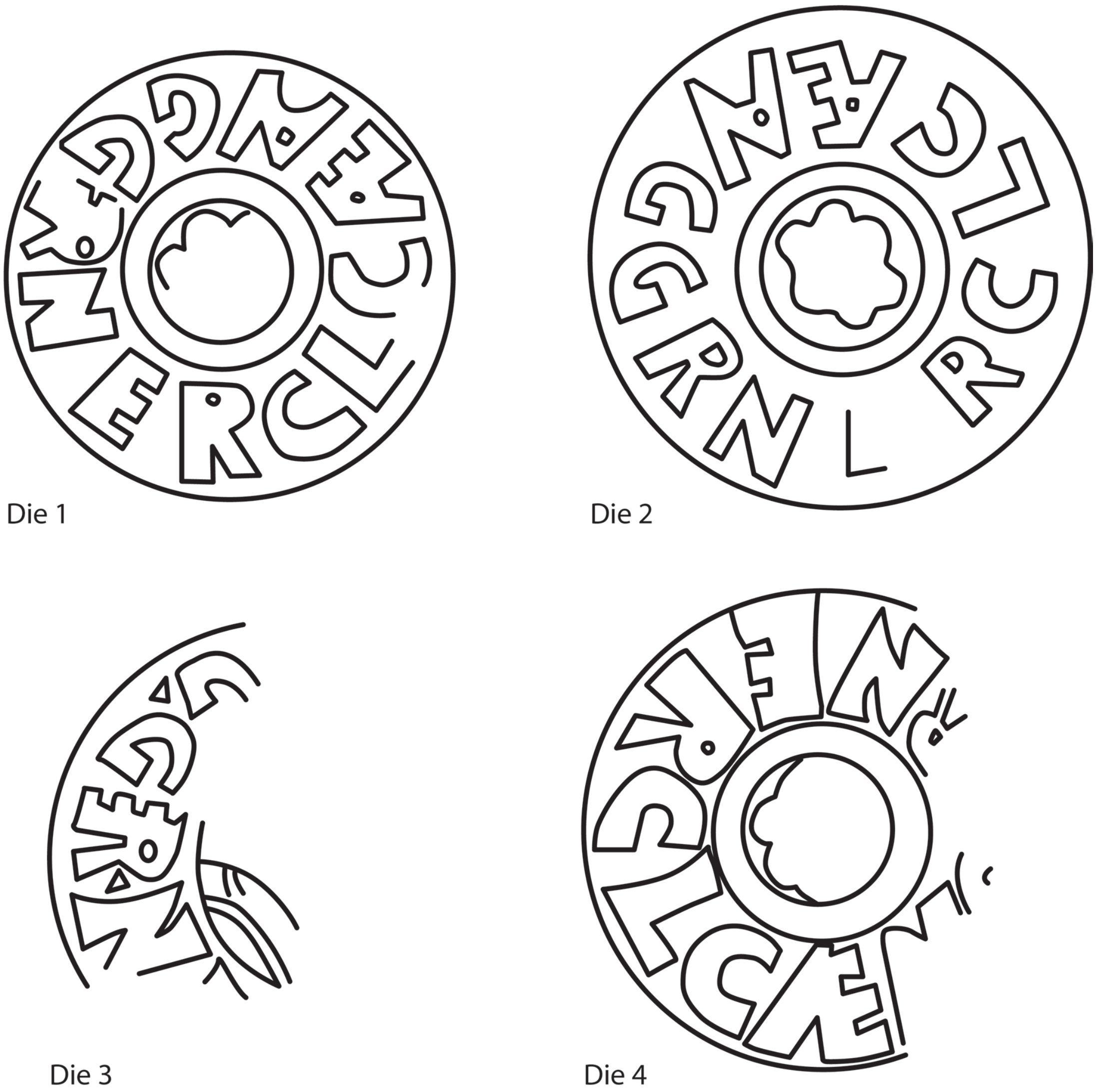


FIG. 144. Nero stamp dies full size


FIG. 145. Photographs of the better Nero tile stamps (approximately actual size)

## APPENDIX 2

# OTHER FINDS

### **INTRODUCTION** *By Michael Fulford*

Finds other than pottery and ceramic building material were very rare. As with the non-kiln pottery, the great majority of artefacts were recovered from the north–south ditch 2101 in Trench 2. Apart from one very corroded possible coin from Trench 1, there were no other objects of copper alloy from the entire excavation. Iron is represented by part of an iron knife (below) and a few corroded nails. The great majority of these were found in the upper fills (five contexts) of the north–south ditch in Trench 2, with one in a lower fill. Two nails were associated with Kiln 3 in Trench 2 and two were found in Trench 1. A small fragment of colourless vessel glass was found associated with Kiln 3 and further small fragments including of a square bottle in the upper fill of Ditch 2101. There were a very few fragments of unidentifiable animal bone. Whether the rarity of animal bone is a reflection of soil conditions or represents the actual situation is not known.

### **CATALOGUE** *By Nina Crummy*

There are only three objects requiring further comment. One, part of an iron knife, appears to be of Manning's Type 9 (1985, 113, fig. 28), with a back that angles downwards to the point and to the end of the rod handle (SF 202). Examples from London are probably from early post-conquest deposits in the Walbrook (ibid.). An early context also suits a tiny colourless glass spacer bead from kiln rake-out (SF 214), and one of opaque black glass from the fill of slot [2060] (SF 218). Spacer beads of this size are rarely recovered, and consequently are missing from Guido's classification for Roman Britain (1978) and from Cosyns' classification of black glass beads, where the term spacer bead is used for much larger forms than SF 218 and the smallest beads do not include any of hexagonal section (2011, 106–7). Nevertheless, SF 214 may be set in the context of first-century colourless vessel glass (Cool and Price 1995, 36–8, 42–3; Cool 2020, 315), and SF 218 in that of black glass game counters found in the first-century legionary fortresses at Usk and York, and in Claudian-Neronian contexts at Colchester (Cool and Price 1995, 129–30; Cool *et al.* 1995, 1650, nos 5839–42, fig. 764; Crummy 1983, 92; 1992a, 220).

SF 202. (2028), fill of slot [2043]. Iron knife blade fragment with a curved back at its highest just before the junction with the handle. The line of the edge is obscured. Part of an integral handle remains, square in section and curving downwards to continue the line of the back. Total length 85 mm, surviving width approximately 30 mm.

SF 214, Sample 226. (2069), flue rake-out. Tiny clear glass spacer bead with rounded sides. Length 1 mm, diameter 2 mm.

SF 218, Sample 216. (2049), fill of slot [2060]. Tiny hexagonal opaque black glass spacer bead. Length 1 mm, width 2 mm.

## APPENDIX 3

# AGE OF ROUNDWOOD WHEN CUT ALICE HOLT KILNS, FRITH END

*By Catherine Barnett*

TABLE 22. AGE OF ROUNDWOOD WHEN CUT (WHERE DISCERNIBLE), FRITH END ROMANO-BRITISH AND LATE ROMANO-BRITISH CONTEXTS (Barnett 2011, table 3)

| **Sample** | **Species** | **Age when cut** | **Total no. pieces** |
|---|---|---|---|
| 59790 Colluvium (F081) <2> | *Quercus* sp. | 16 | 4 |
| W3481 Pot fill 1004 sf 2002 (1084) <3006> | *Corylus avellana* | 5–10 | 55 |
| | *Ilex aquifolium* | 5 | 1 |
| 59790 Colluvium F082 (F083) <3> | *Quercus* sp. | 5–6 | 6 |
| W3481 Pot fill 1007 sf 2001 (1009) <3002> | *Quercus* sp. | 20–22 | 5 |
| 59790 Colluvium F086 (F085) <5> | *Quercus* sp. | >6–10<br>12 | 4<br>2 |
| 59793 Pot production feature 5179 (5174) <3203> | *Quercus* sp. | 3<br>5–10<br>11–15<br>16–20<br>21–26<br>*c.*32 | 1<br>19<br>18<br>7<br>13<br>1 |
| 59793 Scoop rel. to pot production 5183 (5184) <3204> | *Quercus* sp. | 5–10<br>15<br>16–20<br>25 | 3<br>2<br>3<br>1 |
| | *Corylus avellana* | 5–10<br>11–15<br>16–20<br>21–25 | 3<br>0<br>7<br>2 |

APPENDIX 4

# CALIBRATED AGE RANGES USING THE UK ARCHAEOMAGNETIC CALIBRATION CURVE

*By David P. Greenwood, Sam E. Harris and Catherine M. Batt*

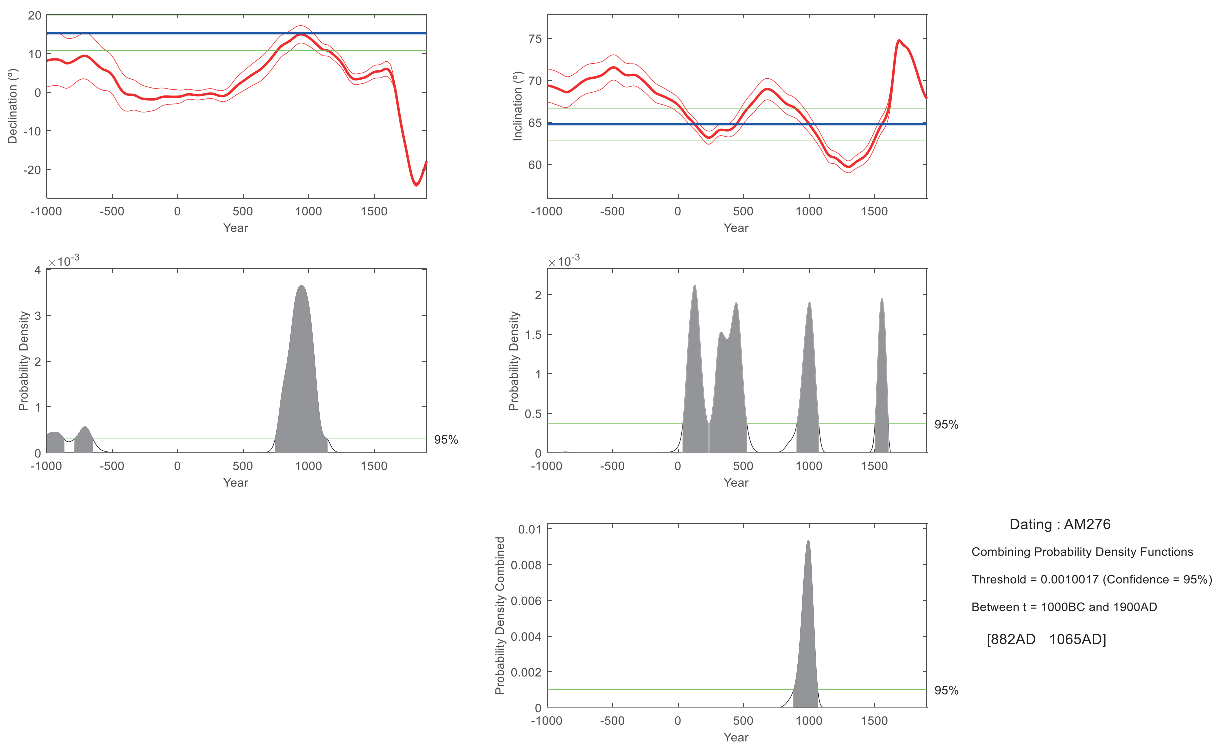


FIG. 146. Constrained and calibrated date ranges for AM276 (LL2) using UK geomagnetic field model ARCH-UK.1. Top row shows master secular variation curves for the observation site (red bold curves with red error bands) of the declination and inclination with the archaeomagnetic directions (blue line) and associated scatter (green lines). Middle row shows the individual probability density functions for the declination and inclination – the green line indicates the 95% probability threshold. Bottom row shows the combined probability density marked with the green line of 95% probability, and the archaeomagnetic age range

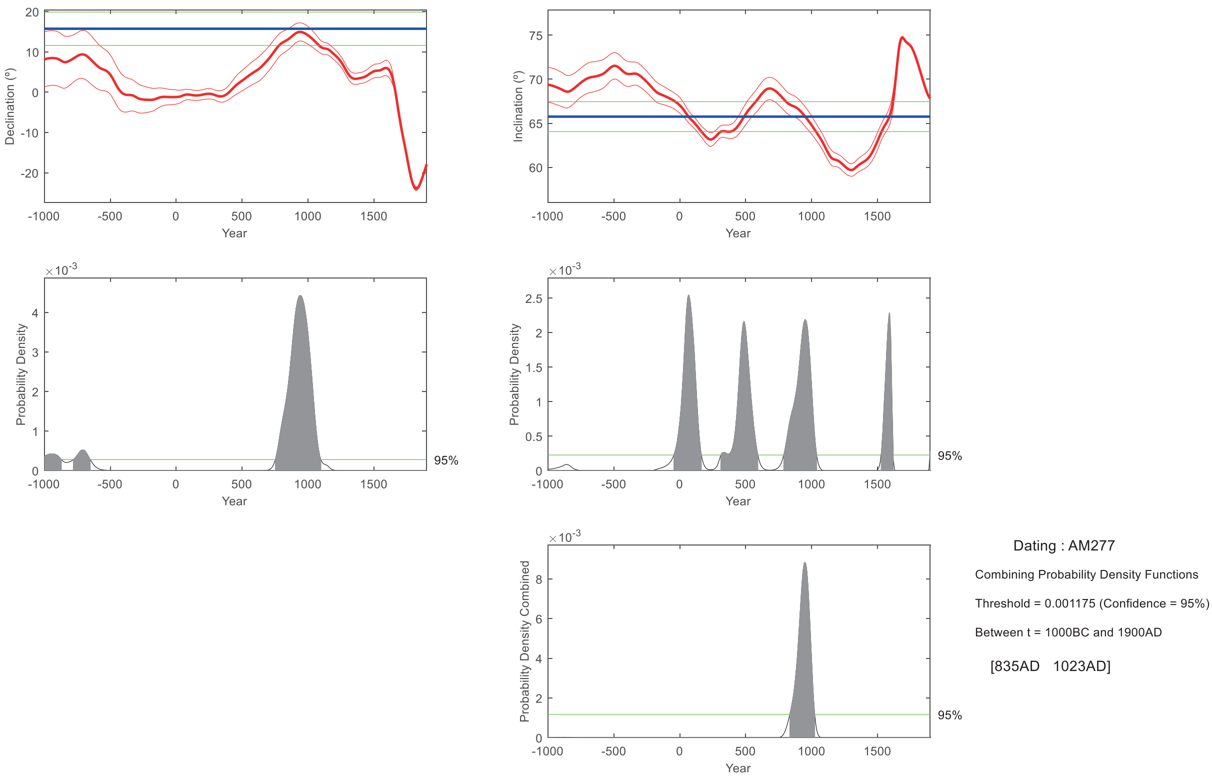


FIG. 147. Constrained and calibrated date ranges for AM277 (LL3) using UK geomagnetic field model ARCH-UK.1. Top row shows master secular variation curves for the observation site (red bold curves with red error bands) of the declination and inclination with the archaeomagnetic directions (blue line) and associated scatter (green lines). Middle row shows the individual probability density functions for the declination and inclination – the green line indicates the 95% probability threshold. Bottom row shows the combined probability density marked with the green line of 95% probability, and the archaeomagnetic age range

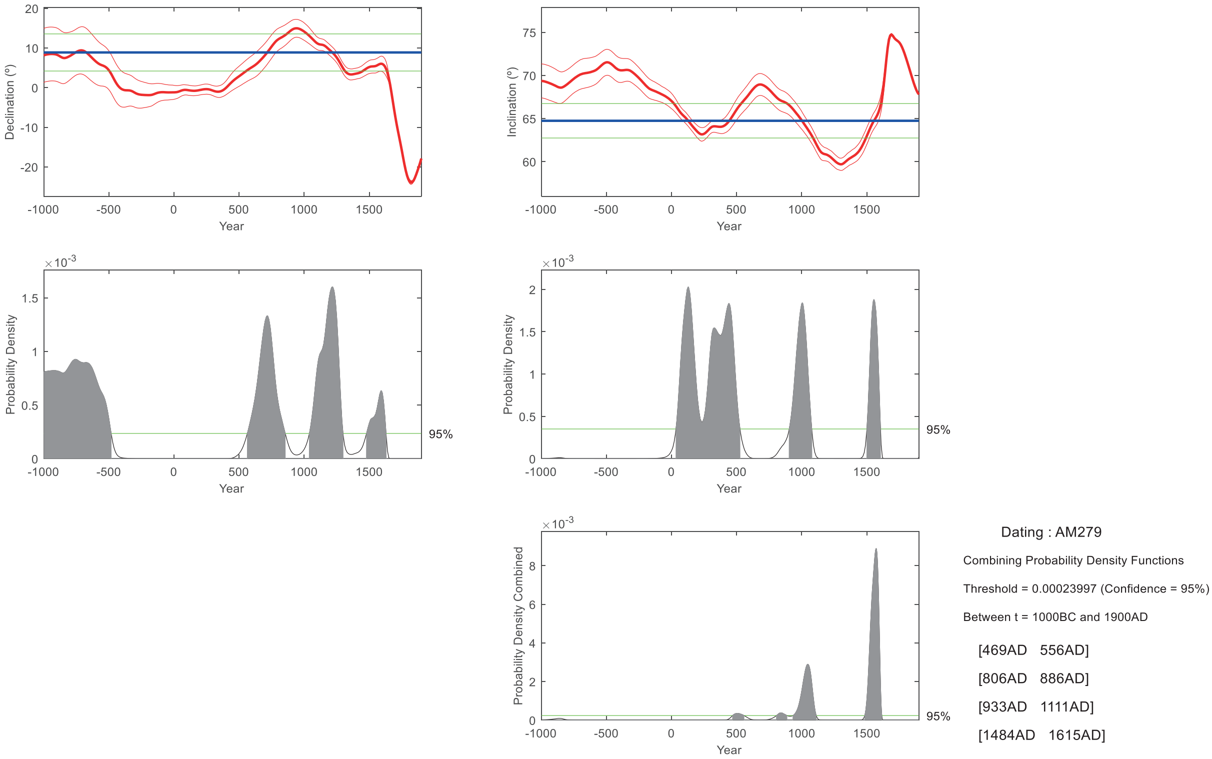


FIG. 148. Constrained and calibrated date ranges for AM279 (LL4) using UK geomagnetic field model ARCH-UK.1. Top row shows master secular variation curves for the observation site (red bold curves with red error bands) of the declination and inclination with the archaeomagnetic directions (blue line) and associated scatter (green lines). Middle row shows the individual probability density functions for the declination and inclination – the green line indicates the 95% probability threshold. Bottom row shows the combined probability density marked with the green line of 95% probability, and the archaeomagnetic age ranges

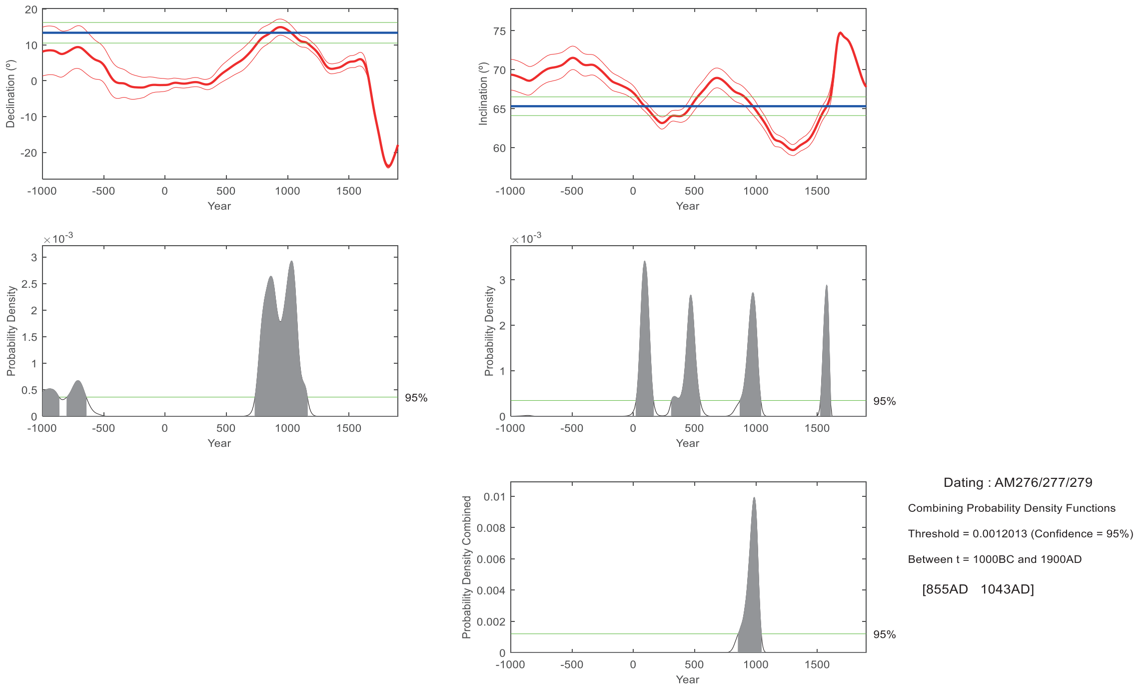


FIG. 149. Constrained and calibrated date ranges for AM276, 277 and 279 combined using UK geomagnetic field model ARCH-UK.1. Top row shows master secular variation curves for the observation site (red bold curves with red error bands) of the declination and inclination with the archaeomagnetic directions (blue line) and associated scatter (green lines). Middle row shows the individual probability density functions for the declination and inclination – the green line indicates the 95% probability threshold. Bottom row shows the combined probability density marked with the green line of 95% probability, and the archaeomagnetic age ranges

APPENDIX 5

# AN INTRODUCTION TO ARCHAEOMAGNETIC DATING

*By David P. Greenwood, Sam E. Harris and Catherine M. Batt*

## PRINCIPLES

Archaeomagnetic dating is a derivative dating method, based on a comparison of the ancient geomagnetic field, as recorded by archaeological materials, with a dated record of changes in the Earth's field over time in a particular geographical area. The geomagnetic field changes both in direction (declination and inclination) and in strength (intensity) and archaeomagnetic dating can be based on either changes in direction or intensity or a combination of the two. Dating by direction requires the exact position of the archaeological material in relation to the present geomagnetic field to be recorded, and so the material must be undisturbed and sampled *in situ*. Dating by intensity does not require *in-situ* samples but is less precise and experimentally more difficult. The laboratory at Bradford uses archaeomagnetic dating by direction.

## SUITABLE MATERIALS FOR DATING

For archaeological material to be suitable for dating using magnetic direction it must contain sufficient magnetised particles and an event must have caused these particles to record the Earth's magnetic field. Many geologically derived materials, e.g. soils, sediments, clays, contain sufficient magnetic minerals. There are primarily two types of archaeological events which may result in the Earth's magnetic field at a particular moment being recorded by archaeological material: heating and deposition in air or water.

If materials have been heated to a sufficiently high temperature (>400°C) they may retain a thermoremanent magnetisation (TRM), which reflects the Earth's magnetic field at the time of last cooling. Suitable archaeological features would include hearths, kilns and other fired structures.

Sediments may acquire a datable detrital remanent magnetisation (DRM) from the alignment of their magnetic grains by the ambient field during deposition. Such an effect allows deposits in wells, ditches and streams to be dated. However, this aspect of archaeomagnetic dating is still under development, as factors such as bioturbation and diagenesis, can cause post-depositional disturbance of the magnetisation.

Archaeomagnetic dating can be applied to features expected to date from 5000 B.C. to the present day, as this is the period covered by the calibration curve. However, as discussed below, the precision of the date obtained will vary according to the period being dated.

## SAMPLING

Samples of robust fired materials are taken by attaching a 25 mm flanged plastic reference button to a cleaned stable area of the feature using a fast-setting epoxy resin (Clark *et al.* 1988).

The button is levelled, using a spirit level, and held in place with a small bead of plasticine while the resin sets. The direction of north is then marked on the button using a magnetic compass, sun compass or gyrotheodolite, and the button removed with a small part of the feature attached to it. Samples are trimmed and consolidated in the laboratory with a solution of 10% polyvinylacetate in acetone, or sodium silicate solution. Sediments and friable fired materials are sampled by insertion of a 2 cm diameter plastic cylinder, onto which the direction of north is marked. Magnetometers used are sufficiently sensitive for only small samples (*c.* 1 $cm^3$) to be required; approximately 15 samples are needed from each feature and it may be possible to select the sampling location to minimise the visual impact if the feature is to be preserved.

## LABORATORY MEASUREMENTS

In the laboratory a spinner magnetometer is used to measure the remanent magnetisation of each sample (Molyneux 1971). The measurement indicates the relative strength and direction of the magnetic field of the sample. The stability of this magnetisation is then examined by placing the sample in alternating magnetic fields of increasing strength (2.5 to 100mT) and removing the magnetisation step-by-step. The demagnetisation measurements allow removal of any less stable magnetisations acquired after the firing or depositional event, leaving the magnetisation of archaeological interest. It can also be used to indicate the magnetic mineralogy of the samples using information relating to the field required to reduce the intensity to half its original value, known as the median destructive field (MDF); higher values are indicative of harder magnetic minerals such as haematite (Sternberg *et al.* 1999). The results of measurements of the direction of magnetisation of a group of samples are represented on a stereographic plot, which shows declination as an angle measured clockwise from north and inclination as a distance from the perimeter.

## STATISTICAL ANALYSIS

The magnetic directions from a number of samples expected to have the same date are combined to find a mean direction, the precision of which is defined using Fisherian statistics (Fisher 1953). The alpha-95 ($\alpha_{95}$) represents a 95% probability that the true mean direction lies within a cone of confidence around the observed mean direction, and would be expected to be less than 5° for dating purposes. A value larger than this indicates that the magnetic directions of the samples are scattered and therefore do not all record the same magnetic field.

Samples observed to be discordant from the mean directional value are assessed using a statistical test defined by McFadden (1982) which shows that given the observed grouping of the $N$ concordant observations, with resultant vector of length $R$, there is a probability $P$ that an outlier from the same distribution will exceed an angle $\gamma_{(1-P)}$ from the mean of the concordant group, where

$$cos\gamma_{(1-P)} = 1 - \frac{(R+1)(N-R)}{R}\left[\left(\frac{1}{1-(1-P)^{1/(N+1)}}\right)^{1/(N-1)} - 1\right]$$

Thus, with $P = 0.05$, if the outlier lies further than $\gamma 0.95$ from the mean of the other $N$ observations then it may be concluded with 95% confidence that the outlier is discordant with the other observations and therefore can be removed from the analysis.

## CALIBRATION OF DATES

Once the mean ChRM direction has been obtained this is dated by comparing it with a calibration curve showing changes in the Earth's field over time. As the variation of the Earth's magnetic field is not predictable (Batt 1997), the pattern of change has to be established by independent dating, typically historical records, radiocarbon or dendrochronology. The UK calibration curve is compiled from direct measurements of the field which extend back to

A.D. 1576 in Britain, and from archaeomagnetic measurements from features dated by other methods. As the geomagnetic field changes spatially, data for the calibration curve can only be drawn from within an area approximately 1000 km across and all magnetic directions must be corrected mathematically to a central location (Noel and Batt 1990). There is a single calibration curve for England, Scotland and Wales and directions are corrected to Meriden (latitude = 52.43° N, longitude = 1.62° W).

British archaeological dates are calibrated using the secular variation curve developed by Batt *et al.* (2017), using a Matlab tool developed by Pavón-Carassco *et al.* (2011). Additional global secular variation curves can also be used, such as ARCH3k.1 and CALS3k.3 datasets (Korte *et al.* 2009). The secular variation curves differ in terms of the datasets that have been used to construct them, for example: the ARCH3k.1 curve is a global database of archaeomagnetic data only, while the CALS3k.3 curve is also a global database of archaeomagnetic data but incorporates lake sediment magnetic data. This results in subtly different calibrated age ranges being produced for the same magnetic directions.

## PRECISION OF DATES

There are a number of factors that will influence the error margins of the dates obtained:

- Differential recording of the field by different parts of the feature.
- Disturbance of the material after firing/deposition.
- Uncertainties in sampling and laboratory measurements.
- Error margins in the calibration curve itself.
- Uncertainties in the comparison of the magnetic direction with the calibration curve.
- Spatial variation of the geomagnetic field.

The precision of the calibration curve varies according to the archaeological period and so the precision of the date obtained will depend on the archaeological dates. As the geomagnetic field has occasionally had the same direction at different times, it is also possible to have two or more alternative dates for a single feature. In most cases the archaeological evidence can be used to select the most likely of these.

Given the number of different factors it is not possible to give a general feature for the precision of archaeomagnetic dates but there will be an error margin of at least ±50 years. It is important to note that since the method relies on the reliability of previously dated sites the calibration curve can be improved as more measurements become available. Features that cannot be dated or given broad age ranges now, may be datable in the future.

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