

DEVELOPMENT AND INDUSTRY IN WHITECHAPEL, EXCAVATIONS AT 27–29 WHITECHAPEL HIGH STREET AND 2–4 COLCHESTER STREET, LONDON E1

Jon Sygrave

With contributions by Ian Betts, Lyn Blackmore, Anne Davis, David Dungworth, Geoff Egan, Lynne Keys, Christopher Phillpotts and Kevin Reilly

SUMMARY

The site was situated outside the Roman and medieval cities on the south side of what would become Whitechapel High Street. During the 14th century the site was extensively quarried. The quarrying removed the top of the natural sediments and any Roman archaeological deposits. The empty quarry pits were subsequently infilled with nightsoil and refuse, brought from the City, and the area levelled with made-ground. By the beginning of the 15th century a foundry had been established producing copper-alloy objects and several large casting pits were cut into the backfilled quarries. The foundry ceased production by the beginning of the 16th century and was superseded by buildings associated with iron-working waste. There were seven buildings, one of which was half-cellared, and a cobbled courtyard that were part of the first main period of development on the site. The iron working on site ceased in the late 16th century and a large timber building was constructed over the area. Evidence suggests that knacker, butchery, horn working, and possibly tanning took place on the site from the 16th to late 17th centuries. As the site became densely built upon during the 18th century evidence of industry disappears, as do the refuse dumps and pits, apart from several brick-lined cesspits, which continued in use until the 19th century.

INTRODUCTION

The Museum of London Archaeology Service (MoLAS) undertook an archaeological evaluation, watching-brief, and excavation at the site of 27–

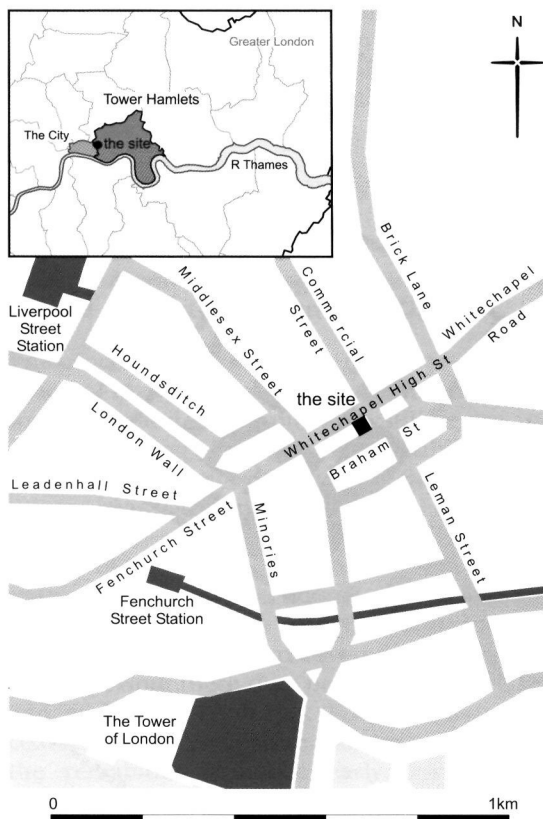


Fig 1. Site location

29 Whitechapel High Street and 2–4 Colchester Street, London E1 (Fig 1). These works, the subsequent reports, and this article were commissioned by Tishman Speyer Properties on behalf of TST Aldgate Holdings, LLC. The archaeological investigations were conducted under the site code WCE01.

An archaeological field evaluation was carried out prior to excavation on a series of evaluation trenches within the existing buildings between 22 and 30 October 2001. The evaluation recorded little evidence of Roman remains but showed that Tudor buildings and large-scale pitting survived under the existing basement slab. After the demolition of the buildings a watching-brief was carried out on the site, as the basement slabs were broken, between 11 and 15 March 2002. The footings of the previous buildings had to be left in place due to their depth (Fig 2). The excavation following on from the watching-brief took place between 18 March and 5 April 2001.

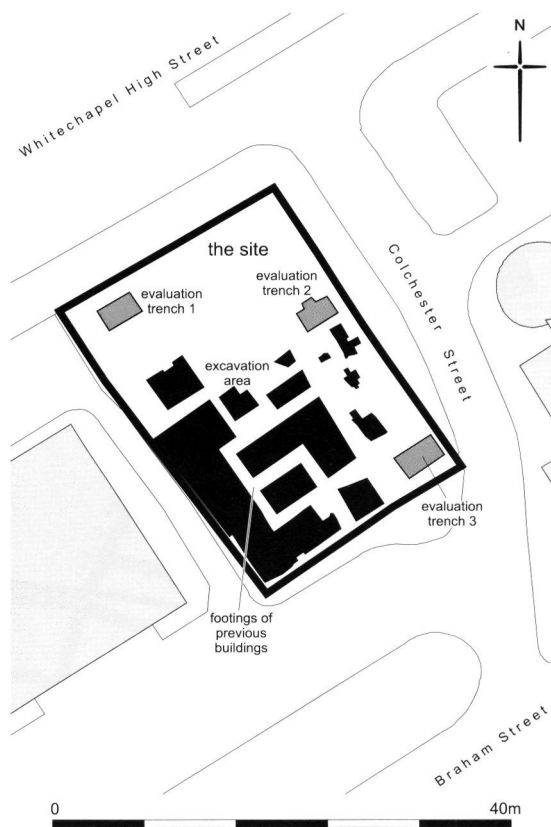


Fig 2. Trench location

GEOLOGY AND TOPOGRAPHY (PERIOD 1)

Natural sediments (Open Area 1) (not illus)

Numerous large quarry pits, which covered the entire site, had affected the presence and levels of natural sediments on the site. The only brickearth recorded *in situ* was in the north-west corner within Evaluation Trench 1 (Fig 2); elsewhere it had been removed, presumably by quarrying. The highest natural brickearth was recorded at 11.13m OD. The highest natural gravel was recorded at 11.07m OD, but was truncated in places to a maximum depth of 8.41m OD.

MEDIEVAL QUARRYING c.1300–1400 (PERIOD 2)

Medieval quarrying, backfilling and made-ground (Open Area 2) (not illus)

In the medieval period the site was situated in the extensive manor of Stepney, which belonged to the Bishop of London. It lay to the east of the Bars across *Algatestrete* which demarcated the limit of the City's jurisdiction. The name *Algate* or *Algatestrete* was originally applied to the whole street extending beyond the City boundary into Whitechapel and Stepney (Harben 1918, 10–11; Lobel 1989, 64; VCHM xi, 9). By the 13th century ribbon development was taking place along the street beyond the Bars and a subsidiary chapel of St Mary Matfelon was built by 1282 to serve these new inhabitants. The chapel lay to the east of the site and was known as Whitechapel by the 14th century, becoming a separate parish church by c.1320 (Sharpe 1889–90; VCHM xi, 3, 17, 67).

By 1300 extensive quarrying was taking place across the majority of the site. Brickearth was removed, and with it any potential Roman archaeological deposits. The underlying gravel was also quarried up to 3m in depth and a large volume of material was removed from the site. It is unclear whether the quarry cuts were separate pits or part of a larger entity but their cutting and backfilling seems to have occurred at roughly the same time. In 1408/9 the lord of the manor received 43s 4d from the profits of a *lompette*, a brickearth quarry, half an acre in extent in *Whytechappellane*. This was part of a 25-acre plot leased out to the south side of *Algatestrete* (PRO SC6/1139/23). This may not relate directly to the quarrying that was recorded on the site but

it shows the exploitation of resources that was taking place in the area at the time. The proximity of the quarry pits to Whitechapel High Street suggests that either the site was quarried of gravel to provide materials for the improvement of the High Street or that the location allowed the easy access and transportation of materials.

Evaluation Trench 1 (Fig 2) lay close to Whitechapel High Street and was the only area to contain *in-situ* natural brickearth. The natural ground in this area may have been protected from quarrying by the ribbon development that had spread eastwards during the 14th century (VCHM xi, 15, 17–18, 20). This suggests that quarrying of the area happened between the 14th and early 15th centuries after the initial development along *Algatestrete*.

The quarries appear to have been backfilled, and made-ground laid over them, in the later 14th century, possibly continuing into the 15th century. The quarries were mainly backfilled with a sterile deposit that has been interpreted as nightsoil, brought out of the City and dumped into the redundant pits. The backfilled quarry pits and made-ground produced few finds. Only 31 medium-sized sherds of medieval pottery and a small assemblage of building material were recovered from the large volume of pit fill and dumps. The pottery assemblage was dominated by coarse Surrey/Hampshire border ware (14 sherds) and Kingston ware (7 sherds) and contained two imported sherds; one of the imported sherds is the base of a jar from the Mediterranean or Near East, and may be North African Magrebhi ware (Fig 12g). All the pottery dates to between the 12th and 15th centuries. The date range may represent the period over which the quarry pits were backfilled, though the assemblage's size limits any firm interpretation.

While there may have been properties from the 14th century along Whitechapel High Street, no evidence was found of them. This is partly due to the high level of truncation along the site's boundary with Whitechapel High Street, the later widening of the road, and the probable timber construction of the properties (Power 1972, 237–8, 241–2, 245). It is likely that the small assemblage of building materials recovered from this period, like the pottery, was brought to the site within nightsoil and refuse. The most notable pieces are a decorated Penn floor tile ([155]<70>, fabric 2894) of 1350–90 and a plain green-glazed Flemish floor tile associated with pottery of a 1350–1500 date. The Flemish tile

measures 116mm in breadth suggesting a 14th- to late 15th-century date, although it has a silty fabric (3246) which is normally associated with later Flemish tiles. The Penn tile, only a corner of which survives, is either design 2230 or 2231 (Eames 1980). Both would probably originally have paved a church or monastic building.

A series of poorly made decorated floor tiles was found in a later pit, but dated to the 14th century (Eames 1980, 499). Some lack slip, some have only a partially glazed top surface, while others have a green glaze covering both the decorated and non-decorated area making it very difficult to determine the design present. None show any signs of wear and they were presumably rejected because of their poor quality. At least two designs are present, one of which (Eames 1980, design 2801) is also known from Merton Priory (Betts in prep) and Godstow Abbey in Oxfordshire (Eames 1980, 499) where they paved church or monastic buildings (Fig 12a and b). The location of the tiliary making these tiles is unknown. They are presumably English, although their silty fabric (2850) is not unlike certain Tudor Flemish tiles, so a Low Countries origin cannot entirely be discounted; however it would seem unlikely that such poor quality decorated tiles would have been exported.

LATE MEDIEVAL FOUNDRY PITS c.1400–1500 (PERIOD 3)

Late medieval backfilling of quarries, made-ground and pitting (Open Area 2)

The process of backfilling the quarry pits and the laying of made-ground over them continued for some time and refuse pits were still in use and dumping taking place when the possible copper-alloy casting pits were dug. Areas of made-ground may also represent material created by the excavation of the copper-alloy casting pits.

Most of the site appears to have remained as waste ground with occasional refuse pits and there is little evidence of occupation. Only 22 sherds of pottery were recovered from deposits in this period; these date between the late 15th and early 16th centuries. Four sherds are of coarse Surrey/Hampshire border ware, while the remainder comprise early post-medieval redware (both monochrome and bichrome-glazed types), with one sherd of early Surrey/Hampshire border whiteware. The last is from a lobed cup, while the remainder are from up

to five cauldrons and/or jars in Tudor redware fabrics.

A copper-alloy dress hook and strap end, which dated from the late medieval to early post-medieval period, were also recovered as residual finds in later pits. The strap end <21> formed part of a distinctive series of high-quality girdle accessories current from the late 14th to the early 16th centuries (Egan & Pritchard 1991, 140, 142–3 nos 653–63). The dresshook <31> (Fig 12h) dated from the late 15th to early 16th century and had rectangular bar flanks, an openwork roundel with a central pellet, and radiating *fleurs de lis*. Although both of the items were of cast copper alloy, it is unlikely that they were made on site as small wares like dress accessories are a completely distinct branch of copper-alloy casting from vessel making.

Late medieval copper-alloy casting (Open Area 3)

In the early 15th century four pits were cut in the south part of the site (Fig 3). The pits were substantial features, one pit [166] measuring

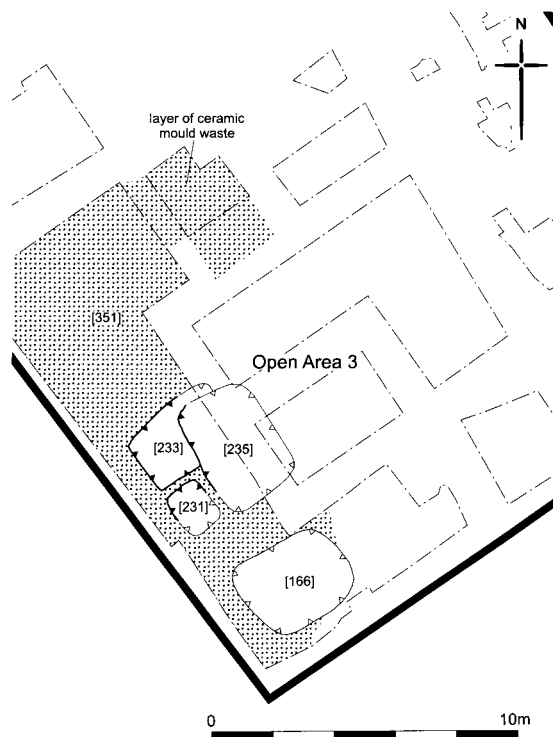


Fig 3. Possible copper-alloy casting pits

c.3.0m by 2.5m by at least 1.0m deep, and were cut from a height of c.10m OD. The pits were backfilled with foundry waste (pieces of the ceramic mould used to cast copper-alloy objects), which gave them a distinct appearance. A small assemblage of pottery from the pits is similar to that found in the later refuse pits and dumps and suggests a backfilling date of c.1480–1500. The pits may have been casting pits, although the lack of *in-situ* mould and burning might argue against this. However the volume of foundry waste recovered from the site suggests that it had not travelled far. An environmental sample taken from the pits suggests that cereal processing took place in the vicinity of the site and that the area contained wild grasses and clover (*Trifolium* spp.), suggesting the area was undeveloped and close to farmland.

The Whitechapel area has a long history of copper-alloy casting, which has been best documented in relation to the production of bells at the Whitechapel Bell Foundry. The foundry is still working today and can chart its history back to a Robert Chamberlain who was active in the Aldgate area from 1420 (Pickford 1994, 1). Documentary evidence implies that the Aldgate area was also a focus for the production of domestic objects during the late medieval period (Tyssen 1929, 195) and that the bell founding industry may have grown out of this. The association between the Whitechapel area and founding may even date back to the mid-13th century (Stahlschmidt 1884, 13) or the late 14th century as a rental of the Stepney manor lists a William Foundour as a tenant holding two cottages on the south side of Algatestrete (PRO SC12/11/31 f7). ‘Bell-making’ waste has been recovered from several sites, such as 2–3 Philpot Lane, London EC3 (site code PPO87) and Albion House, 34–35 Leadenhall Street, 4 Billiter Street, EC3 (LDL88), though much of the material remains unexamined in detail. The assemblage of foundry waste from the site is one of the few of such an early date to be studied in this important area of copper-alloy casting.

Foundry waste

The focus of identifiable mould products amongst the ceramic waste from the entire site, as with other excavated groups in the City, is on food-preparation vessels, such as cauldrons, mortars, and flat-bottomed vessels (some possibly rectangular in outline), though candle holders

are a distinct second possibility. No specific evidence of bell production was found among the total of c.66.5kg of mould fragments. To check whether the more fragmentary mould pieces and dispersed copper slag were evidence of bell making, samples of ceramic mould and copper slag were analysed by David Dungworth of English Heritage's Centre for Archaeology using energy dispersive X-ray fluorescence (EDXRF). EDXRF was used to determine the chemical content of the copper alloys used to cast objects on the site. Many of the samples contain significant levels of arsenic and/or antimony. Such alloys were used in the medieval and early post-medieval period for the casting of domestic vessels (Dungworth 2001; 2002). The alloy used for casting bells is generally a high tin bronze free from arsenic and antimony. The combination of analysis of the mould fragments with the chemical composition of the copper alloy employed has refined the criteria used to suggest bell founding in previous assemblages. On evidence from the assemblage of ceramic mould from the excavation at Baltic Exchange, 14–21 St Mary Axe, London EC3 (BAX95) (Egan 2002), the forms of cope and core rims have been shown to be not necessarily reliable indicators of bell founding.

The content of the assemblage has close similarities to other foundry waste assemblages: the highly friable, lightweight (?) animal-dung and clay fabric of the moulds, fired red (oxidised) on the outer surfaces and blackened (reduced) at the cores and on the casting surfaces; the presence of up to three 'moulding wires' on some fragments, to make parallel, horizontal bands on the outside of the product to give purchase during handling <105>; occasional imprints from straw roping <174> and <129>; the scarcity among the recovered evidence of what must have been universally employed vertical cope seams <102>; and the apparent use of wood as the fuel, judging from occasional survivals of charcoal. Charcoal was also recovered from an environmental sample taken from the casting pits along with charred plant remains, which may have been used as tinder. Cope fragment <156> (Figs 4a and 5a) has the standard profile of the flared rim of a cauldron. There are several mould pieces for single-ribbed feet, one of the signatures of this particular workshop <97> (Fig 4f), and others that may be for the angled handles that characterise the common form of cauldrons <177> and <79> (Figs 4g and

5g). The latter fragment could alternatively be from a decorative, lobed base, perhaps from a candlestick or a salt (*cf* North 1999, for the potential interchangeability of these in pewter manufacturing). Three of the leg pieces have marks cut by blades, two with paired transverse lines <182> (Fig 4b) and one with what looks like a letter 'V' on its side <90> (Fig 4d), both types of cut may have been signs intended to be read as Roman numerals and presumably indicated batches, or something that the mould temporarily obscured, to the foundry's work force. Two fragments <96> and <170> seem to be for a large handle, which appears to be set at a right angle on a straight-sided vessel such as that represented by fragment <136> (Figs 4c and 5c). Other fragments <132> (Fig 4e) and <137> seem intended to serve the same purpose between slightly rounded surfaces, possibly of shallow vessels or candlestick bases (which would have been cast separately from the cupped stems). Still mysterious are some apparent casting surfaces that survive as completely flat fragments.

The kiln furniture is restricted to a single item: a slab of refractory fabric, paralleled at Baltic Exchange (Egan 2002, 51, fig 52). There are also a couple of possible structural furnace fragments, <143> (Fig 4h) and <150>: corner pieces with an apparently non-enclosed channel at one end funnelling out at the other, perhaps conduits for gases or molten metal, or possibly to accommodate tuyères. The absence otherwise of hearth-like structural fragments differentiates this assemblage from others such as Baltic Exchange (Egan 2002). Fig 5 illustrates how some of the recovered fragments may have combined to form a casting mould for a cauldron.

Beyond this largely familiar material, the assemblage includes a small but significant amount of tubular fragments (less than 1% by weight of all the mould recovered). Inner diameters vary between 19mm, <147> (Fig 6a), and c.30mm, <65>, and <167> flares from 27 to 33mm. Among these <147> retains evidence that it was luted on one side into or onto another component. This could be an enigmatic star-like fragment similar to one recovered from Baltic Exchange (Egan 2002, fig 51), which may have supported a small ring of these during firing. Some of the tubes could possibly have acted as ingates, through which molten metal was poured. The similar fabric to the rest of the moulds, however, means they are more likely to have been for casting candlestick stems — they could have

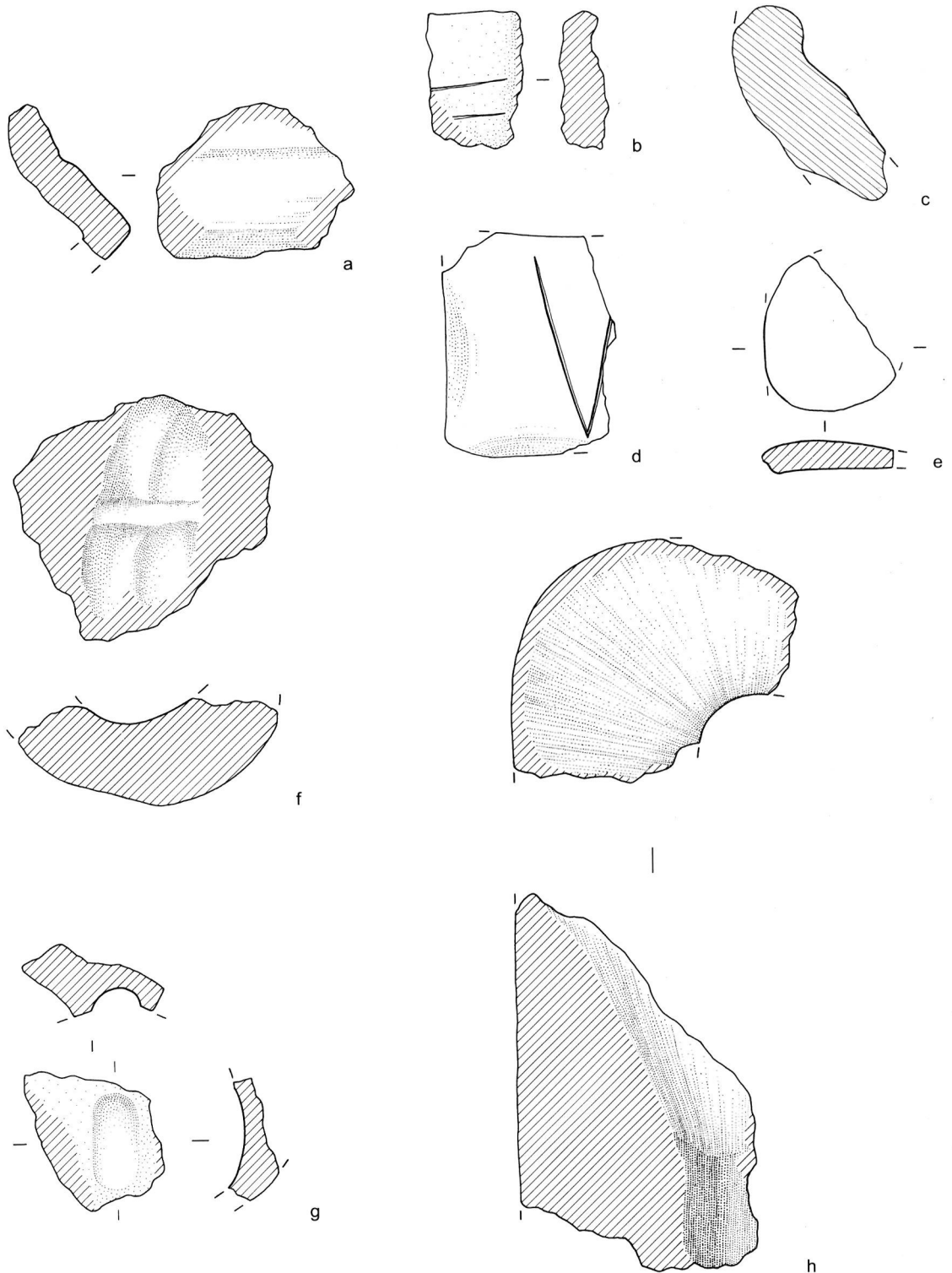


Fig 4. Fragments of ceramic casting mould

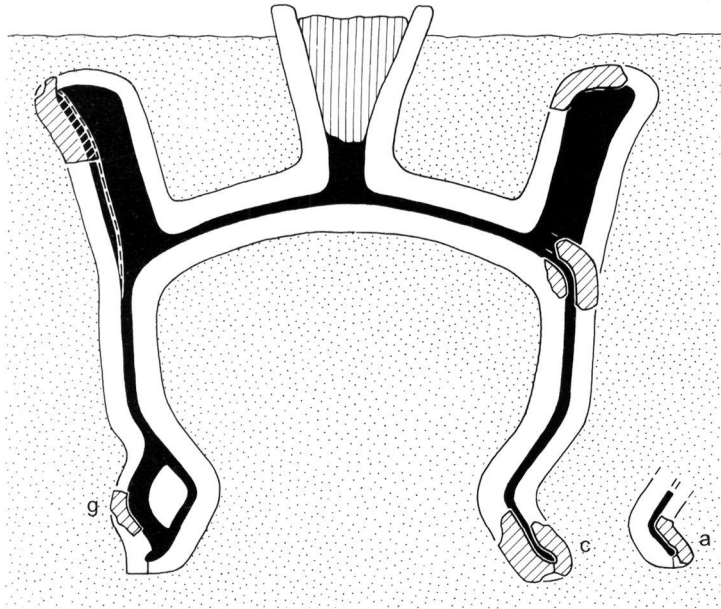





Fig 5. Conjectural cross-section of cauldron casting mould

-  mould fragments
-  metal
-  position of mould

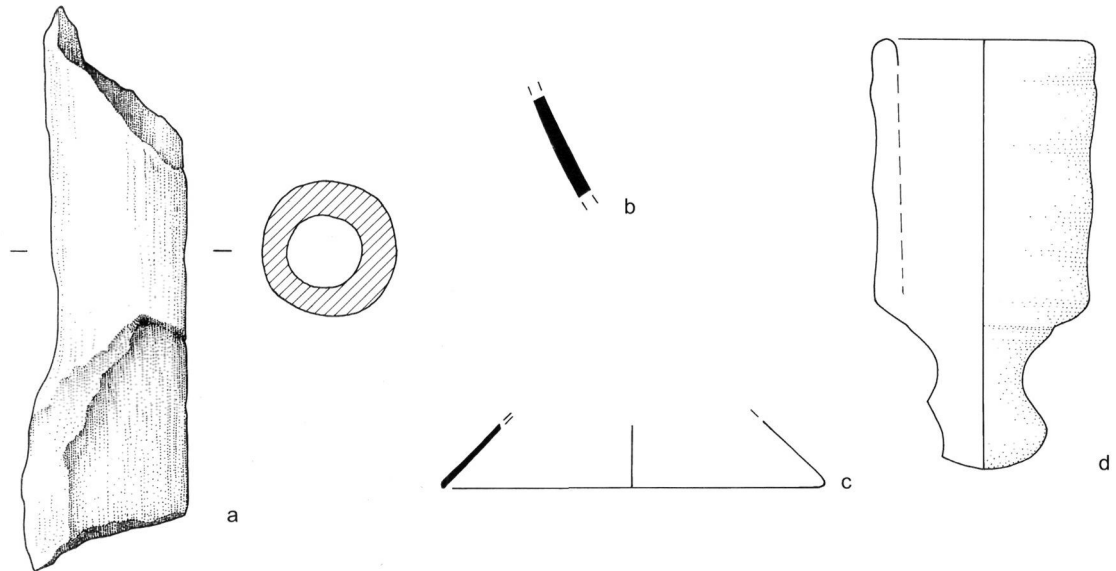


Fig 6. (a) Fragment of tubular ceramic casting mould <147> (perhaps for stem of a candleholder); (b) Fragment of cast copper-alloy vessel <100>; (c) Fragment of cast copper-alloy base <48> (from candleholder or vessel rim); (d) Cast copper-alloy cup <98> (from candleholder)

been slid off the products as found, without the ring breaking. Against this interpretation, their inner surfaces mostly lack the whitish deposit that characterises the casting surfaces of other excavated mould components, the exceptions being <147> (Fig 6a) and <65>. These arguably complement a large candleholder cup <98> (Fig 6d) from the same deposit as the majority of the foundry waste. This suggests that candlesticks might have been a by-product of the industry as was the case at a 14th- to 15th-century foundry at Worcester, where a single candlestick mould and one potential product of this category were found among some 4 tonnes of waste recovered (Taylor 1996, 115–16). Although candlesticks may have been by-products from the ceramic moulding evidence, the very few surviving metal fragments of possible foundry products could suggest a different picture. Registered find <100> (Fig 6b) is a fragment of a vessel, while fragments <98> (Fig 6d) and <48> (Fig 6c) are parts of candleholders. The two fragments thought to be from candleholders together amount to more than twice the weight of the sole item representing vessels. It should be remembered that these figures are derived from just three items, at a very high level of interpretation (the candleholders may not have been products of this foundry). The excavated evidence from other London sites, 72–73 Basinghall Street, EC2 (GYE92) and Riverplate House, 7–11 Finsbury Circus, EC2 (RIV87), for the production of candlesticks, which is slightly later, has in contrast suggested that this took place at separate foundry workshops from those for casting kitchen vessels, at least in the post-medieval period (Egan in prep and 1996, 89–90 fig 5b).

As the casting pits went out of use they were backfilled with the ceramic mould waste and eventually capped with another c.0.25m-thick make-up layer [351] (Fig 3) of foundry waste, which was dated to 1480–1500. This foundry waste layer [351] was a substantial deposit, which covered all the casting pits and sealed the backfilled quarry pits beneath a flue structure and Buildings 1 and 2. Although substantial, the layer of foundry waste [351] was only recorded in the south and west of the site, suggesting that this was the area used for casting.

EARLY TUDOR DEVELOPMENT 1500–1550 (PERIOD 4)

Ribbon development along what would become

Whitechapel High Street had probably begun during the 13th to 14th centuries, prompting the construction of the ‘Whitechapel’ to the east of the site in 1282. The buildings associated with this early development would most likely have been constructed of timber, but no evidence of such early structures was recorded on the site. When the foundry pits were cut in the 15th century they would have been on the edge of farmland, but by the Tudor period the Whitechapel area had become a suburb of the City and increasingly more densely populated. A mark of this was the paving of Whitechapel High Street during the reign of Henry VIII (Weinreb & Hibbert 1983, 983). In the 1590s John Stow commented that, ‘Without the bars both sides of the street be pestered with cottages and allies, even up to Whitechapel Church’ (Stow 1908, 127). The Tudor development of the area is represented on the site by evidence of industry associated with metalworking and butchery and numerous brick and timber buildings. The pottery that was recovered from these features dated to before 1550, and all contexts could date to c.1480–1500. This suggests a date earlier in the 16th century for the development of the site than the traditional building boom that is known to have occurred throughout London in 1570–1580 (Schofield 1995, 26) (Fig 7).

Half-cellarred property (Building 1) and associated brick-built flue (Open Area 4)

Building 1 was constructed over the layer of ceramic waste [351] that sealed the copper-alloy casting pits. The building consisted of a half-cellar, revetted by a line of stakes, with a metalled surface, and a north-east to south-west brickearth and wattle wall (Fig 8). The last is not aligned with Whitechapel High Street but shares a common alignment with Buildings 4 and 9, also on the west of the site (Fig 10). This change of alignment in the west of the site may suggest the presence of a side street.

Six sherds of pottery were associated with Building 1. Four are of Cheam ware and coarse Surrey/Hampshire border ware, while two are post-medieval redwares. One is from the rim of a large, externally sooted bowl in a soft redware that could be from London or Cheam, and is contemporary with the late medieval fabrics. The other, from the rim of a thin-walled jug, is problematic in that the coarse sandy fabric is closer to the post-medieval redware (PMR) that

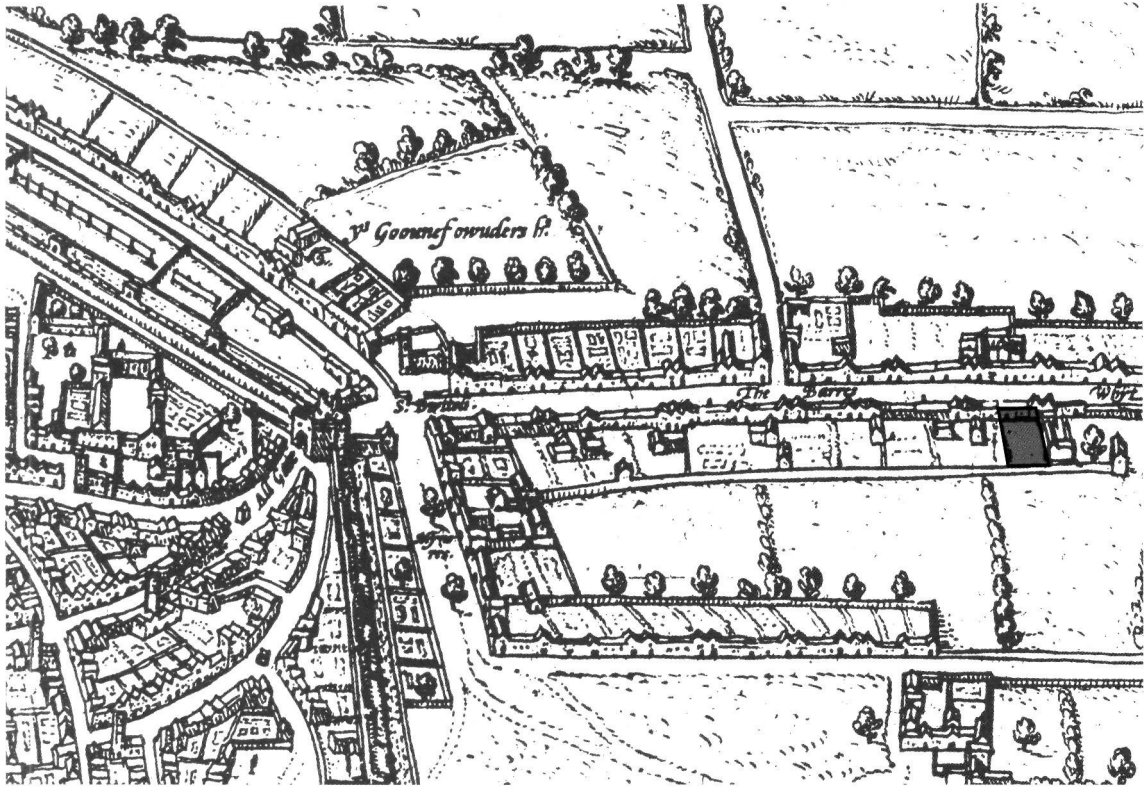


Fig 7. Braun and Hogenburg's map of 1572

developed *c.*1580 than to the early post-medieval redware fabric PMRE. If so, it must be intrusive.

The building appears to be contemporary with the kiln structure to the east, although they have no direct stratigraphic link other than having both been cut into make-up from Period 3 and having their floors at the same level. The metallised floor of Building 1 could also suggest a craft/industrial area, as it appears to be an internal surface. A patch of intense burning was also recorded in three closely grouped hollows in association with Building 1 and close to the kiln structure (Fig 9).

Brick-built flue (Open Area 4)

The history of metalworking on the site continued with iron workshops becoming established in the early 16th century. The copper-alloy casting had ended before the establishment of the workshops and there is no reason to suspect a direct link between the industries. The evidence recovered from the site includes a large quantity of iron slag, hammerscale, and a brick-built

flue. The remains of the flue consisted of two parallel brick walls, the rest having been either truncated by modern footings to the north and east or dismantled in antiquity (Figs 8 and 10). There were other features that may have been associated with the flue structure, including a series of stakeholes and a barrel that had been set into the ground, possibly to hold water. Of the seven sherds of pottery recovered from the backfill of the barrel, six are of late medieval date (coarse Surrey/Hampshire border ware and Cheam whiteware); the other is from a slipped redware dripping dish with clear/yellow glaze that dates to 1480–1600.

There was evidence for blacksmithing across the site in the form of smithing hearth bottoms and hammerscale. Smithing hearth bottoms are formed in a smith's hearth as the result of high temperature reactions between the iron, iron-scale, and silica through the smith's use of silica as a flux. The predominantly fayalitic (iron silicate) material produced by this reaction dripped down into the hearth base during smithing to form the smithing hearth bottom.

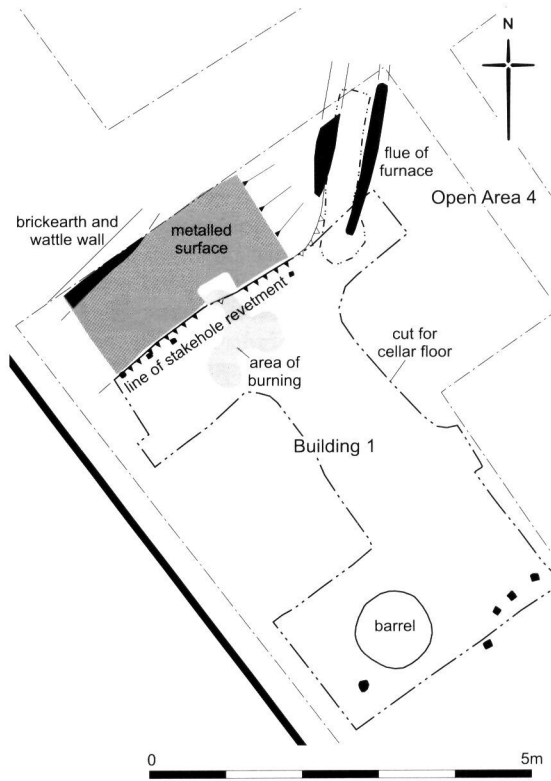
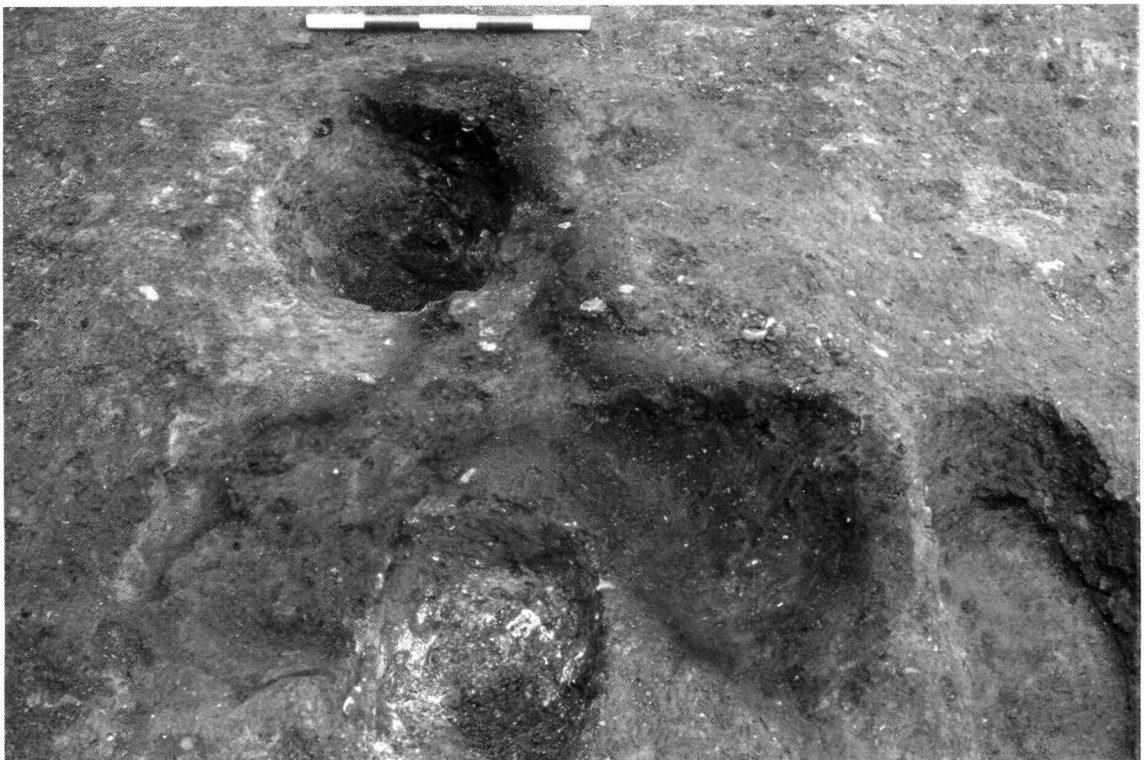


Fig 8. Detail of brick-built flue and half-cellared property (Building 1)

Fig 9. North-west facing view of burnt area within Building 1



The hearth bottoms would have been removed from the hearth and were generally disposed of in the vicinity of the smithy (McDonnell 1986, 47). Hearth bottoms were recovered from across the site: around the flue, to the east of the flue, around a clay floor, and to the far south-east of the site around a feature that was initially interpreted as a kiln or oven but was probably associated with metalworking. After the metalworking on the site ceased the ground around the flue was levelled with large make-up deposits, which were up c.0.5m in depth. These deposits consisted almost entirely of hearth bottoms and other slag and represent waste material produced by the iron industry on the site or nearby.

Hammerscale is a micro-slag produced through the action of a blacksmith hammering a piece of heated iron; it surrounds areas where smithing took place. Hammerscale comes in two forms: hammerscale flakes from ordinary hot working of a piece of iron, or tiny spheres from high temperature welding to join two pieces of iron. Hammerscale is not visible to the naked eye when in the soil but is highly diagnostic of smithing activity, often remaining in the area around the anvil and near the hearth when hearth bottoms have been cleared out of the smithy and dumped nearby. Flake hammerscale in particular is highly magnetic which facilitates its detection in the soil. Hammerscale was found across the site in the areas where hearth bottoms were recovered and in the patch of intense burning near to the brick-built flue and Building 1. Both sphere and flake hammerscale were recovered, suggesting that a range of fabrication techniques were used on the site.

The volume of hearth bottoms and the spread of hammerscale across the site suggest that there were several workshops producing iron objects during the early 16th century. Documentary evidence also suggests the presence of metalworkers in the area around this time, in 1569–1570 John Wale leased out tenement plots on the south side of Whitechapel High Street to a blacksmith and a pewterer (*CAD* iv no A6613; v nos A12194, A12204, A12811, A12910, A12886, A13536). It is unclear whether the tenements lay within the site but the record shows that similar activities were occurring in the vicinity at the time.

Brick buildings (Building 2–Building 7)

Buildings 2, 3, 4, 5, 6 and 7 were fragments of

Tudor brick buildings probably constructed in the early 16th century (Fig 10). Many of the buildings consisted of merely a wall or section of brick floor and have been allocated separate building numbers due to their alignment or lack of relationship to other structures. The bricks that were used in their construction may have been produced locally in the Brick Lane area, which was a centre of brick production in the 16th century (Weinreb & Hibbert 1983, 89). The bricks were handmade and many had indented top margins, which had resulted from the production process. Typical brick fabrics employed on the site were those from Buildings 4 and 5. Red bricks (fabric 3033, 3039) made from London brickearth deposits were used for the wall and floor of Building 4, and measured 209–224 by 99–109 by 46–61mm. The red bricks (fabrics 3033, 3042, 3046) used in the construction of Building 5 are similar to those used in Building 4, although a number are slightly larger: they measure 219–229 by 105–113 by 44–55mm. The brick floor from Building 5 also incorporated a reused Flemish-type yellow brick (fabric 3031) of 14th- to mid-15th-century date.

A number of tiles dating to the early 16th century were also recovered from later pit fills and dumps across the site. Although they have no direct connection with these buildings, they may once have been part of their internal furnishings, which were discarded when the properties were demolished. A Spanish *arista* floor tile (<44>, fabric 2292) with an elaborate decorative design in white, brown, green, purple, and blue (Fig 12c) was recovered from a pit fill. This design has not previously been found in London and would have been laid as part of a four-tile pattern. Such tiles are rare in London having only been found in any quantity at All Hallows church and 30–35 Botolph Lane (Betts in prep). The All Hallows and Botolph Lane tiles were made in Seville between 1500 and 1550, and this is probably the source of the Whitechapel example; Seville floor tiles were exported widely during the first half of the 16th century to the Low Countries, Italy and the New World, as well as England (Ray 2000, 367).

Of similar date are a number of late 15th- to 16th-century glazed Flemish tiles. These later Flemish tiles are distinguished by their larger size and silty fabric (types 2320, 2850, 2063); one complete brown-glazed example measures 194–197mm square by 26mm in thickness and

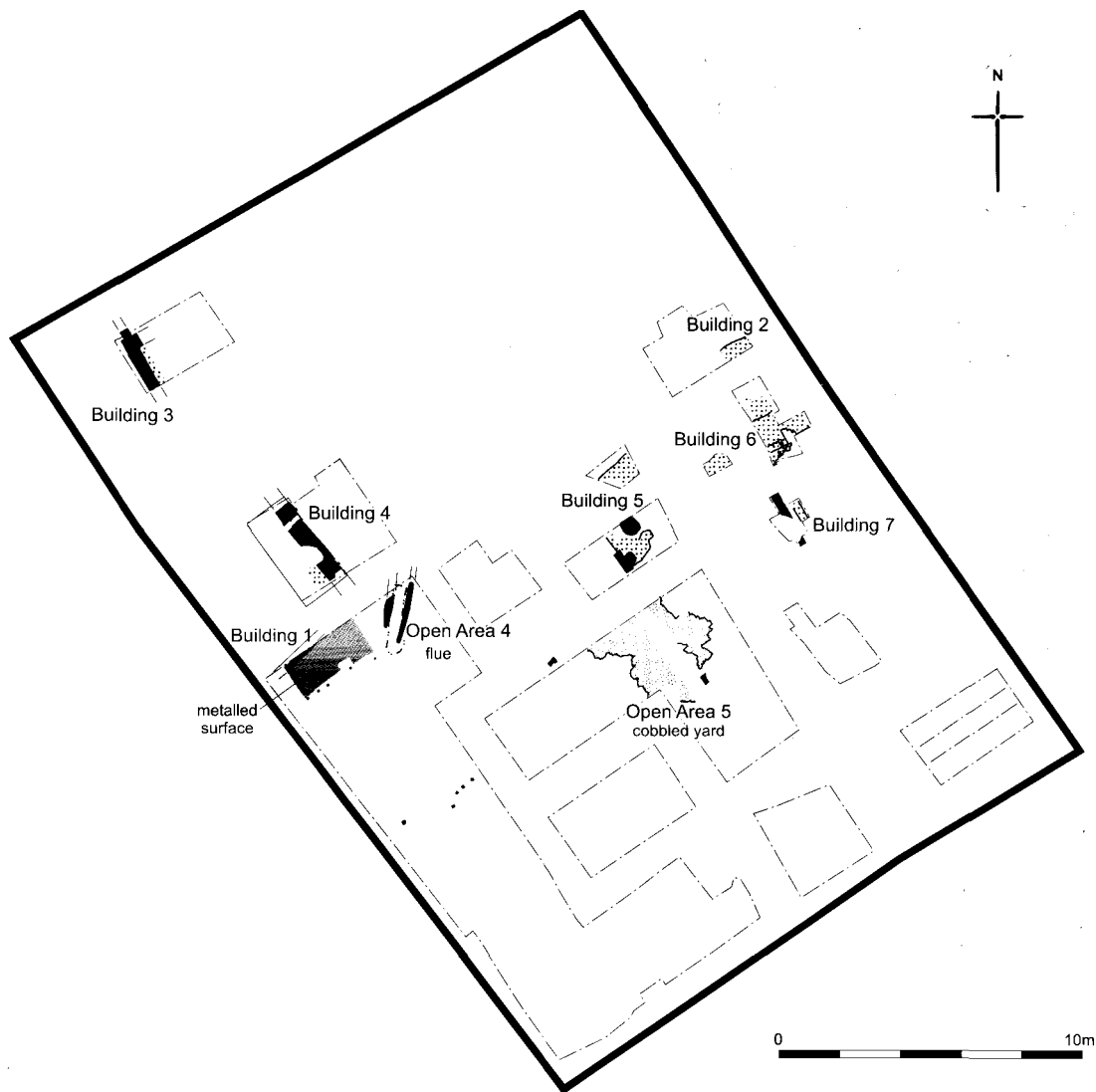


Fig 10. The Tudor buildings

another half complete light green tile is 208–209mm in breadth by 32–33mm in thickness. Both were recovered from a pit fill.

Building 2

Building 2 was a fragment of brick floor recorded in Evaluation Trench 2 (Fig 10). The floor fragment was not recorded in association with any walls and its alignment is unknown.

Building 3

Building 3 was recorded in Evaluation Trench 1 and was the only building on the site to have fronted onto Whitechapel High Street (Fig 10). It consisted of a wall fragment running south-east to north-west, perpendicular to the High Street, and a connecting wall fragment running south-west to north-east, forming two rooms, the southern room containing a brick floor.

Building 4

Building 4 consisted of a north-west to south-east aligned wall fragment, with a brick floor to the west (Fig 10). The building lay to the south-east of Building 3 and seemed to be on the same alignment as Building 1 and later Building 9 (Period 5). This suggests that there could have been an alley or road off Whitechapel High Street onto which it fronted. Two sherds from redware cauldrons/pipkins were found in the brick wall/floor of Building 4; one is of early post-medieval redware, while the other is of bichrome glazed ware.

Building 5 and associated cobbled yard (Open Area 5)

Building 5 may have been associated with Open Area 5, which was recorded to the south-east (Fig 10). The building consisted of a wall fragment aligned perpendicular to Whitechapel High Street and two brick floor fragments. The southerly of the two floor fragments had a square brick-lined inset in the floor, probably in the corner of the room, possibly a space to place a bowl to scrub water into for cleaning purposes.

Building 6

Building 6 comprised a collection of floor fragments constructed of brick and cobble (Fig 10). The floor fragments were of a similar build and did not seem to be associated with any of the neighbouring buildings.

Building 7

Building 7 consisted of two parallel wall fragments, aligned perpendicular to Whitechapel High Street, and an associated soakaway (Fig 10). A total of 37 sherds of pottery was found in the floor/wall of Building 7, but 29 of these are from a Tudor greenware lobed cup (*cf* Pearce & Vince 1988, fig 127, no. 593 for general profile). The others are from cauldrons/pipkins in late London ware and early post-medieval redware.

Open Area 6 (not illus)

As the buildings developed during the early 16th century, backyards and areas of external activity were created where refuse disposal and industry occurred. The heavily truncated nature of the site allowed the identification of separate

buildings, but the backyards and other open spaces were more difficult to define and were combined as Open Area 6. A make-up layer and a pit fill contained single sherds of coarse Surrey/Hampshire border ware, and the latter also contained a sherd of early post-medieval redware.

The alignment of several of the buildings in the western part of the site suggests that there may have been an alley leading from Whitechapel High Street onto which properties fronted. Most of the buildings on the site are aligned perpendicular to Whitechapel High Street or Red Lyon Street, the precursor of modern Colchester Street, but Buildings 1 and 4 and later Building 9 (Period 5), which are located in the western part of the site, are on a different alignment. Buildings 1 and 4 date to the early 16th century while Building 9 dates to the early 17th century, suggesting that the alley to which they were aligned continued in use until at least the 17th century. Documentary and cartographic research supports the notion of an alley running down the west of the site, which is probably to be identified with Winsor Alley, renamed Swan Alley in the late 17th century and Red Cow Inn in the 18th century.

LATER TUDOR DEVELOPMENT 1550–1600 (PERIOD 5)

During the later Tudor period the industrial activity on the site changed and metalworking appears to have come to an end. As metalworking ceased new industries revolving around animal products took its place. These changes occurred over a very short time span and the majority of buildings on the site remained the same. This is shown through the date range of the pottery recovered from features in Period 5, all the sherds, apart from two associated with Building 8, coming from Open Area 6. Out of a total of 148 pot sherds, 112 were recorded as post-medieval. Of the post-medieval sherds, early post-medieval redware amounts to 62%, while the bichrome glazed ware and slipped ware variants comprise a further 10%. This period is dated to after 1550 by the presence of Surrey/Hampshire border whiteware (2 vessels), but the other wares are all typical of the period 1500–1550. Imported wares comprised scattered sherds of green-glazed Beauvais ware, Dutch redwares, Raeren stoneware, South Netherlands maiolica, Italian tin-glazed ware, and Spanish green-glazed ware, one with unusual slip decoration (Fig 12f).

Timber structure in west of site (Building 8)

Building 8 consisted of 7 large postholes, a cut for a timber screen, and an area of brickearth floor (Fig 11). A small sherd of Raeren stoneware and another from a jug or flower vase in Italian tin-glazed ware were recovered from the posthole fills. Some of the postholes were cut through the metalled floor of Building 1 (Period 4) and are on a different alignment to the brickearth and wattle wall of Building 1, being perpendicular to the High Street. Building 8 was also too close to the flue structure (Open Area 4) to have made it practical for the two to be contemporary. The flue structure (Open Area 4) must therefore have gone out of use by this period.

The timber structure would have been substantial yet appeared to stand for only around 50 years. By the early 17th century the timbers had been removed, apart from one *in-situ* post, and the area levelled. Two sherds of pottery from the make-up deposits were of a Spanish green-glazed ware, one with slip decoration (Fig 12f) and the other in a fine red fabric.

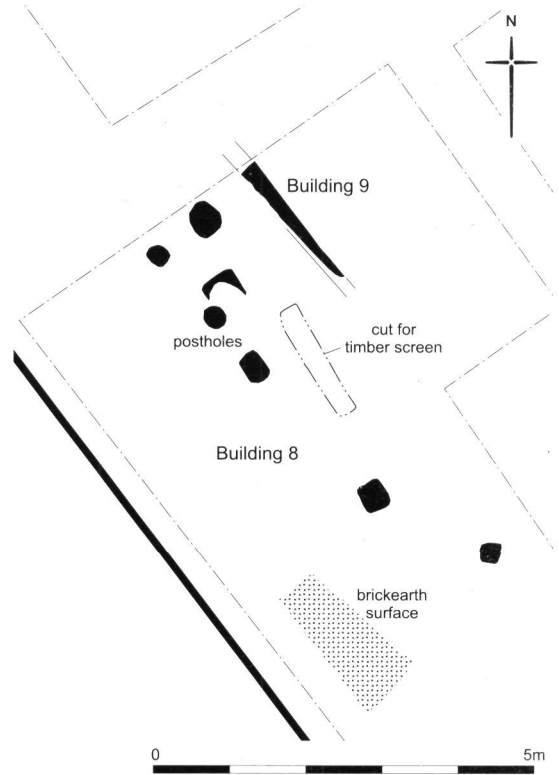
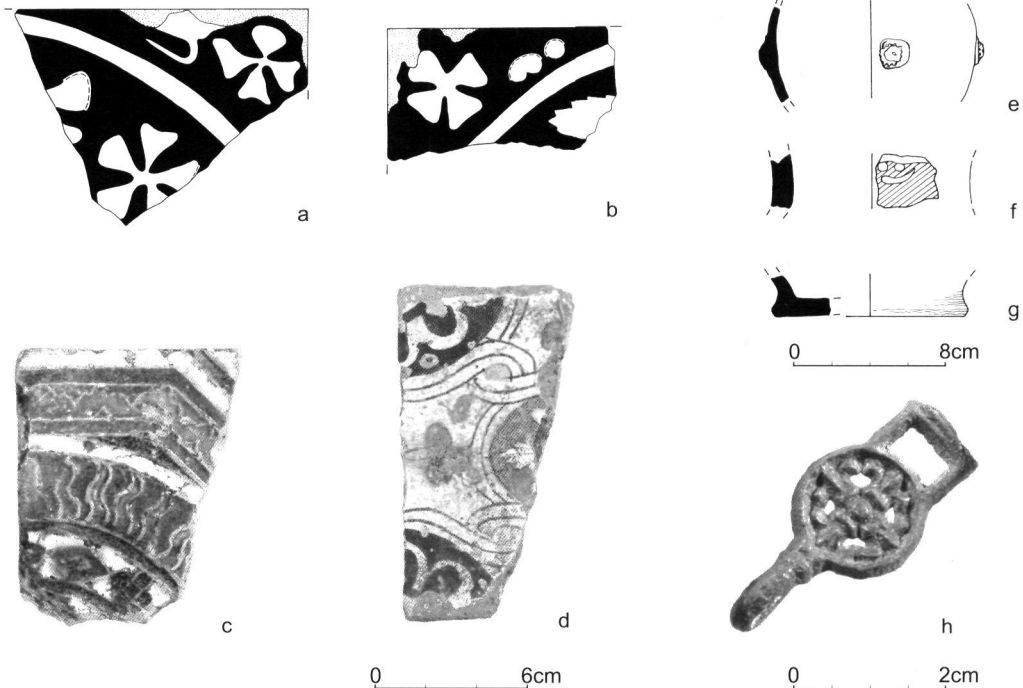


Fig 11. Detail of timber building (Building 8) and brick building (Building 9)

Fig 12. Finds from the excavation



Building 9

Building 9 was stratigraphically later than the other buildings in the western part of the site and superseded Building 8 (Fig 11). Building 9 consists of a single south-east to north-west aligned brick wall. The building was built on the same alignment as earlier Buildings 1 and 4 (Period 4) and shows a continuation of the possible side street into the 17th century.

Butchers, knackers yards, and horn workers (Open Areas 5 and 6)

In the centre of the site a large cobbled courtyard (Open Area 5) (Figs 10 and 13) was well constructed on a bedding layer of sand and had a series of surface drain-runs created by the arrangement of the cobbles. It is not thought to be a road because buildings recorded to the north and north-east would have blocked access to Whitechapel High Street and the predecessor of Colchester Street. A tile dump that sealed the courtyard was dated to 1550–1600. The

courtyard may represent part of the knackers or slaughters yard intimated by the animal bone record on the site.

During Period 5 new external activities took place in Open Area 6, although dumping and refuse pits continued. Several pits contained large amounts of animal bones, such as horse heads (Fig 14) and horn cores, which have been interpreted as by-products of industrial processes such as knacking, butchery, and horn working or tanning.

The site also appears to have been in an area of butchers and those who worked animal products. One of the earliest references to such trades reports the fining of a butcher in Whitechapel High Street in 1526 (PRO SC2/191/64). On the site the first evidence of such activity comes in the late 16th century and relates to pit fills, which contained numerous animal bones (Fig 15). The fill of one pit [210] was largely composed of horse bones, which would appear to comprise the disarticulated remains of a minimum of five individuals. Certain skeletal parts, such as the skulls, are better represented than others and it



Fig 13. North facing view of cobbled courtyard (Open Area 5)



Fig 14. South-east facing view of a pit [210] with a large quantity of horse bone

can be supposed that other parts were disposed of elsewhere. Each of these animals is relatively old and many were suffering from pathologies (Spondylosis deformans and spavin) which may be age or work related. While the aetiology of this condition is little understood (Baker & Brothwell 1980, 129), it can be stated that other archaeological examples, from London sites, tend to be concentrated amongst individuals of advanced age. The height and stature of these animals are comparable to the great majority of horses recovered from other late medieval to early post-medieval sites in London (Rackham 1998; Cowie & Pipe 1998). There would appear to be a small collection of more gracile, possibly riding, animals amongst these other collections (Rackham 1998, 172), but no comparable individuals were represented at this site.

The bones recovered from the pit [210] showed no obvious butchery marks, while those from a contemporary make-up dump [147] had clear cuts. One of the femurs had been chopped through at the proximal end,

while the other is, unfortunately, broken just below this articulation. These bones may well belong to one of the individuals from the pit [210], deposition of body parts occurring across the site. Comparisons can be made with the situation found at Elverton Street (Cowie & Pipe 1998), where all the horses had clearly been dismembered prior to disposal.

It is probable that the horse bones in this area represent animals which have been skinned and possibly dismembered, if not defleshed. Their age would suggest they are the remains of knackered animals. Of interest is the obvious lack of poleaxe damage to the skull recovered from the pit [210], which shows that if they were killed at some nearby knackers yard, the method of slaughter did not imitate that generally used with cattle. Notably the various horse skulls at Elverton Street showed a similar lack of frontal damage (Cowie & Pipe 1998).

The animal bone evidence clearly suggests the presence of various processing and craft workshops in the general vicinity of this site



Fig 15. Pits containing animal bone

from the late 16th century. It is possible that the local butchers may also have acted as knackers, however the concentration of horse bones strongly suggests the presence of a specialist establishment.

As well as the horses there were the fragmented remains of four cattle skulls, largely represented by relatively complete maxilla, the posterior half of one skull, and the posterior articulation (occipital condyles). None of these showed cut marks, which is surprising considering the extensive butchery noticed on cattle bones from later periods.

By the 17th century other industries associated with butchery and slaughter appear on the site; of particular interest was the discovery of large collections of cattle horncores. Horncores formed the major part of the fill of one pit [158] and the lining of another [112], both in the south of the site. Unfortunately, it was not possible to lift more than a token quantity from the fill of the pit [158] due to their fragility. A small number of cattle horncores, which had been sawn through at about the midshaft, was also recovered from another pit [136] (Fig 15). These various collec-

tions account for the two main types of horncore waste, including the large scale deposition of cores from which the sheaf has either been soaked, rotted, or cut off, and the less frequently found horncores where the horn was obviously divided while still attached to the core.

Though they are incomplete, it was possible to extrapolate length categories (following Armitage 1982) from the available measurements using comparative data taken from West (1995, 28). This analysis showed that each of the cores was at least medium-horn in size (length between 220 and 360mm), while two were clearly from long-horned individuals (length greater than 360mm). Such sizes are comparable to the majority of horncores recovered from nearby contemporary sites, this probably signifying a certain level of choice (the larger the core the greater the quantity of horn) as well as the availability of long-horned cattle. There is undoubtedly a greater proportion of such horncores amongst post-medieval compared to medieval sites in London. It should be noted that one of the largest medieval horncore collections, from Angel Court, provided few or probably no horncores larger than 200mm in length (Clutton-Brock & Armitage 1977, 95).

There is certainly compelling evidence for horn working activities, with the evidence at this site comparable to major contemporary collections of cattle horncores from Spitalfields Market (Liddle 2002), Aldgate (Armitage 1984, 133), Cutler Street (Armitage 1989, 209), Gardiner Corner, Mansell Street (*ibid*, 210), 8–10 Crosswall (*ibid*), and, somewhat further afield, from the Royal Mint (West 1995). Amongst these collections, it is notable that dumps of horncores, rather than their use as a lining, are restricted to this site and Aldgate. It could be supposed that such dumps may be a better indication of the proximity of hornworking establishments, assuming that waste items would either have been dumped close by, or, if used as a building material, that they would have been transferred to a particular location. It is perhaps of interest, in this respect that there are historical documents of the 17th and 18th centuries which refer to the presence of horn workers in the vicinity of Aldgate (Armitage 1984, 134).

The nearby knackers yard also seems to have still been in operation during the 17th century as horse limb bones from the remains of at least three individuals were recovered from the fill of a pit [158] (Fig 15). Horse bones were also recovered from another pit [133],

comprising a skull from an aged stallion and a scapula, which displayed skinning cuts and either dismemberment or defleshing marks respectively (Fig 15). The sizes of these animals are comparable to other horses found within late medieval to early post-medieval London sites.

Butchery along the south side of Whitechapel High Street continued into the 18th century and the area appears to have become well known for it. Strype remarks that they ‘drive a considerable Trade, and kill excellent Beef, Veal, Mutton and Lamb; lying conveniently for driving and carrying Cattel from Rumford Market’ (Strype 1720, I, ii, 27).

POST-MEDIEVAL DEVELOPMENT 1600–1850 (PERIOD 6)

Backyards and open spaces between buildings (Open Area 6)

The site continued to develop in the late post-medieval period, becoming fully built on by the mid-18th century (Fig 16). Pits containing

animal by-products and refuse continued until the mid-17th century but as the site became more built up and space was at a premium, they disappeared. In the early 17th century, brick-lined cesspits began to appear and these continued in use until the early 19th century when they were succeeded by modern drainage and backfilled. The pottery recovered from this period shows the curtailing of domestic dumps in the later post-medieval period. The largest amount of pottery recovered from the site was from this period, with 415 post-medieval sherds, and 24 of medieval date. Although a large assemblage was recovered, little dates to the later post-medieval period, most dating to the late 16th to early 17th centuries, with smaller amounts of later 17th- and 18th-century material.

The pits and dumps did, however, produce some interesting sherds of pottery and pieces of ceramic building material. Within the pottery assemblage was a 16th-century Spanish green-glazed jug with plastic decoration (Fig 12e). The building material assemblage also produced two tiles of particular significance. Firstly, a

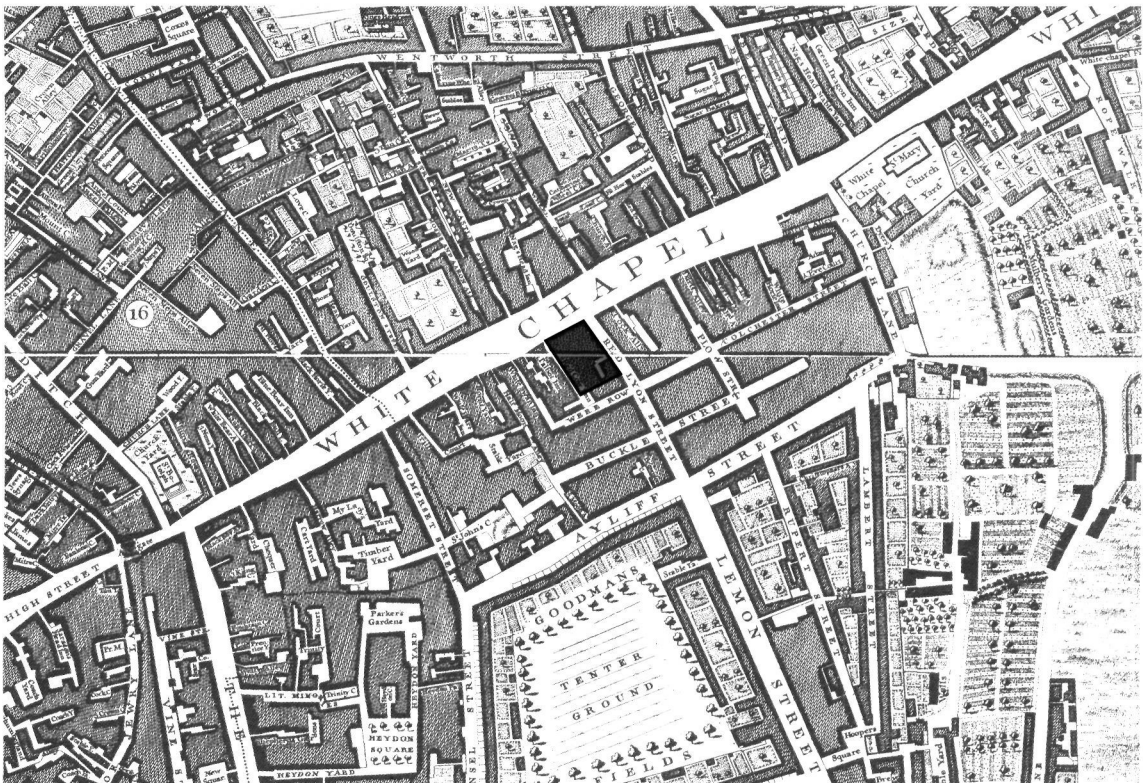


Fig 16. Rocque's map of 1746

polychrome tin-glazed tile (<75>, fabric 2187) with a complex interweaving strapwork pattern (Fig 12d). The only other tile known with this design, which shows a slightly different part of the pattern, came from Bevis Marks, London (BEV80). There are no obvious Dutch parallels for this design so both are probably the products of the same London delftware factory, which would date them to the late 16th to mid-17th century. The second tile (fabric 3064 near 3067) of interest is a small corner fragment of blue on white tin-glazed wall tile found in the backfill of a cesspit [106] (<71>). This has a landscape or biblical scene with a distinctive barred ox-head corner motif similar to that found on Dutch tiles dated to the period 1680–1700 (Pluis 1997, 553, C.07.00.34). It probably came from a fireplace, washstand, or kitchen area.

CONCLUSIONS

Evidence from the excavation has shed new light onto the development of Whitechapel High Street and the industries that became associated with it. Whitechapel High Street was a thoroughfare bringing people and animals into the City and seems to have been an area where smelly or dangerous industries took place. To the present day, Whitechapel's name is synonymous with casting bells, the ancestry of which lies, in part, with the casting pits recorded on the site. The development of the area during the Tudor period saw a new industry emerge between the newly constructed houses of brick and timber, producing iron and fashioning objects in smithies. Whitechapel's association with livestock and its accompanying industries of butchery, horn working, and knackerage was also shown on the site. Such industries helped bring people and commerce to an area that had previously only been used for farming, quarrying, and the dumping of nightsoil.

ACKNOWLEDGEMENTS

MoLAS would like to thank Tishman Speyer Properties, and in particular Craig Colclasure, for commissioning the field work, post-excavation assessment, and this publication. Thanks also go to the demolition contractors J F Hunts, and especially Ronnie, for their assistance on site and the construction managers MACE. MoLAS would also like to thank Nick Truckle of the English Heritage Greater London Archaeological Advisory Service for his advice and support.

The author would like to thank all the MoLAS evaluation and excavation team who worked on the site: Ryszard Bartkowiak, Julian Bowsher, Chiz Harward, Richard Hewett, Isca Howell, Will Johnston, Jim Marsh, Natasha Mills, Dave Sankey, Simon Stevens, Chris Trip, Johanna Vuolteenaho, and Mark Wiggins. Thanks to the geomatics team who surveyed the site and prepared the drawings for use in the reports and this article: Duncan Lees, Phil Frickers, Dave Mackie, Anthony Sibthorpe, and Joseph Severn. Thanks also to Maggie Cox for the on site photography, Andy Chopping for the finds photography, Faith Vardy for the finds illustrations, and Peter Hart-Allison for the site illustrations. The author would also like to thank all those who helped in the post-excavation process and the final production of this article: Ian Betts (building materials), Lyn Blackmore (post-Roman pottery), David Bowsher (editor), Anne Davis (botanical remains), David Dungworth (copper-alloy waste research), Geoff Egan (registered finds), Christopher Phillpotts (documentary research), Lynne Keys (iron slag), and Kevin Reilly (animal bone). The evaluation, watching-brief, and excavation were supervised by the author. Finally thanks to Chris Thomas (Project Manager) for his help and support throughout the project.

BIBLIOGRAPHY

- ARMITAGE (1982), P L Armitage 'A system for ageing and sexing the horn cores of cattle from British post-medieval sites (17th to early 18th century) with special reference to unimproved British Longhorn cattle' in B Wilson, C Grigson & S Payne *Ageing and Sexing Animal Bones from Archaeological Sites* BAR British Series 109, 37–54
- ARMITAGE (1984), P L Armitage 'The faunal remains' in A Thompson, F Grew & J Schofield 'Excavations at Aldgate 1974' *Post-Medieval Archaeology* 18, 131–44
- ARMITAGE (1989), P L Armitage 'Gazetteer of sites with animal bones used as building material' in D Serjeantson & T Waldron (eds) *Diet and Craft in Towns*
- BAKER & BROTHWELL (1980), J Baker & D Brothwell *Animal Diseases in Archaeology*
- BETTS (in prep), I M Betts 'Ceramic building material' in I Blair & D Sankey *Excavations at Monument House and Eastcheap, London*
- BETTS (in prep), I M Betts 'Ceramic and stone building material' in P Miller & D Saxby *Excavations at the Priory of St Mary Merton, Surrey*
- CLUTTON-BROCK & ARMITAGE (1977), J Clutton-Brock & P L Armitage 'Mammal bones from Trench A' in T R Blurton 'Excavations at Angel Court, Wallbrook, 1974' *Trans London Middlesex Archaeol Soc* 28, 88–97

- COWIE & PIPE (1998), R Cowie & A Pipe 'A late medieval and Tudor horse burial ground: excavations at Elverton Street, Westminster' *The Archaeological Journal* 155, 226–51
- DUNGWORTH (2001), D Dungworth *Seventeenth-Century Copper Alloy Working from Head Street, Colchester, Essex* Centre for Archaeology Report 53/2001
- DUNGWORTH (2002), D Dungworth *Sixteenth and Seventeenth-Century Bronze Casting from Cowick Street, Exeter, Devon* Centre for Archaeology Report 19/2002
- EAMES (1980), E S Eames *Catalogue of Medieval Lead-glazed Earthenware Tiles in the Department of Medieval and Later Antiquities British Museum*
- EGAN (1996), G Egan 'Some archaeological evidence for metalworking in London, c1050 AD–1700 AD' *Historical Metallurgy* 10.2, 83–94
- EGAN (2002), G Egan 'Medieval industry' in E Howe *Roman Defences and Medieval Industry* MOLAS Monograph 7, 48–62
- EGAN (in prep), G Egan *Material Culture in an Age of Transition*
- EGAN & PRITCHARD (1991), G Egan & F Pritchard 'Dress Accessories' in *Medieval Finds from Excavations in London 3*
- HARBEN (1918), H Harben *A Dictionary of London*
- LIDDLE (2002), J Liddle 'The animal remains' in C Thomas, R Aitken, D Bowsher, A Daykin, C Harward, N Holder, M McKenzie, K Pitt & P Thrale *280 Bishopsgate and the Spitalfields Ramp – A Post Excavation Assessment Report*
- LOBEL (1989), M D Lobel (ed) *The British Atlas of Historic Towns iii The City of London from Prehistoric Times to c 1520*
- MAXWELL-LYTE (1890–1915), H C Maxwell-Lyte (ed) *A Descriptive Catalogue of Ancient Deeds in the Public Record Office*
- MCDONNELL (1986), J G McDonnell 'The study of early iron smithing residues' in I Scott & H Cleere (eds) *The Crafts of the Blacksmith*, 47–52
- NORTH (1999), A North *Pewter at the Victoria and Albert Museum*
- PEARCE & VINCE (1988), J Pearce & A Vince *A Dated Type-Series of London Medieval Pottery Part 4: Surrey Whitewares* Trans London Middlesex Archaeol Soc Specialist Paper 10
- PICKFORD (1994), C Pickford *Whitechapel ... Where the History of British Bellfounding Lives On*
- PLUIS (1997), J Pluis *The Dutch Tile: Designs and Names*
- POWER (1972), M J Power 'East London housing in the seventeenth century' in P Clark & P Slack (eds) *Crisis and Order in English Towns 1500–1700*
- PRO Public Record Office
- RAY (2000), A Ray *Spanish Pottery 1248–1898*
- RACKHAM (1998), D J Rackham 'Appendix: skeletal evidence of medieval horses from London sites' in J Clark (ed) *The Medieval Horse and its Equipment. Medieval Finds from Excavations in London, 169–74*
- SCHOFIELD (1995), J Schofield *Medieval London Houses*
- SHARPE (1889–90), R R Sharpe *Calendar of Wills in the Court of Husting, London i–ii*
- STAHLSCHMIDT (1884), J L L Stahlschmidt *Surrey Bells and London Bell-Founders*
- STOW (1908), J Stow *A Survey of London*
- STRYPE (1720), J Strype *A Survey of the Cities of London and Westminster by John Stow (1633)*
- TAYLOR (1996), G Taylor 'Medieval bronze founding at Deansway, Worcester' *Historical Metallurgy* 30.2, 111–15
- TYSSEN (1929), A D Tyssen 'The History of the Whitechapel Bell Foundry' *Trans London Middlesex Archaeol Soc* 5, 195–276
- VCHM, Victoria County History *A History of the County of Middlesex* Vol 11
- WEINREB & HIBBERT (1983), B Weinreb & C Hibbert *The London Encyclopedia*
- WEST (1995), B West 'The case of the missing victuals' *Historical Archaeology* 29(2), 20–42