THE CITY DEFENCES AT ALDERSGATE

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With a contribution by Ken Sabel and specialist reports by Philip Armitage (animal bone), Joanna Bird (decorated samian ware), Wendy Carruthers (charred plant remains), Nina Crummy (leather and small finds), Chris Jarrett (post-Roman pottery), Robert Scaife (pollen), and Penelope Walton Rogers (textiles); Andrew Lacey (crucible analysis), Malcolm Lyne (Roman pottery), and Ken Sabel (ceramic building materials)

SUMMARY

An archaeological excavation, evaluation, and watching brief at Alder/Castle/Falcon House revealed a complex history of the City of London's defences from Roman times to the 17th century. The site investigations revealed a ditch probably associated with the Roman Cripplegate fort and an early city boundary ditch dating from the same period. In the NW corner of the development an early Roman road, previously discovered on the site to the N at 7–12 Aldersgate in 1984 (Egan 1985), was traced. Along the S part of the site the Roman city wall was located with the remains of a probable turret, slightly further to the N than previously believed. The remains of both the associated 3rd-century city ditch and the later, much larger, 4th-century ditch were revealed respectively in section and in a tunnel beneath Aldersgate Street. An important find was the survival of the infilled Saxo-Norman city ditch, with late 11th- and early 12th-century features cut into it, including a narrow gully containing significant numbers of crucible fragments which provide evidence of silver working and refining. Two fragments of the medieval bastion (Merrifield B15) were discovered in the SE corner of the site and within the main area of investigation six phases of medieval and post-medieval city ditch dating from the 13th century to the 17th century were excavated, providing evidence of continual re-cutting and cleaning of the city ditch.

INTRODUCTION

Pre-Construct Archaeology Limited was commissioned by the Argent Group Investments PLC to conduct an archaeological evaluation and excavation within the area formerly occupied by Alder, Castle and Falcon House at 1–6 Aldersgate Street in the City of London. The main phase of excavation and evaluation was undertaken between 3 November 1997 and 17 February 1998. Thereafter a small controlled excavation in new drainage trenches along the NW side of the site was undertaken and an intermittent watching brief was maintained until 14 May 1998 when all relevant groundworks were completed. Finally a watching brief was conducted during the construction of a garden area to the S and E of the site between 16 February and 18 March 1999.

The site lay on the E side of Aldersgate Street and was roughly 'L'-shaped in plan, respecting the historic property boundaries determined by the city wall (Fig 1). The development area was within an important location, being on the boundary of the Roman city, at the junction of Cripplegate fort and the Roman city wall (Fig 3).

The site included three Scheduled Ancient Monuments: County Monument Number 26D the City Wall Bastion, County Monument Number 26R the Roman, Medieval and Post-Medieval City Wall, and County Monument Number 26S the Roman, Medieval and Post-Medieval City Gate and City Wall. The strategic approach to the archaeology of the site was dual purpose: comprising an evaluation of the extent of survival of the city wall, the city gate (Aldersgate), and Bastion 15 along the S and E boundaries of the site, and excavation of limited

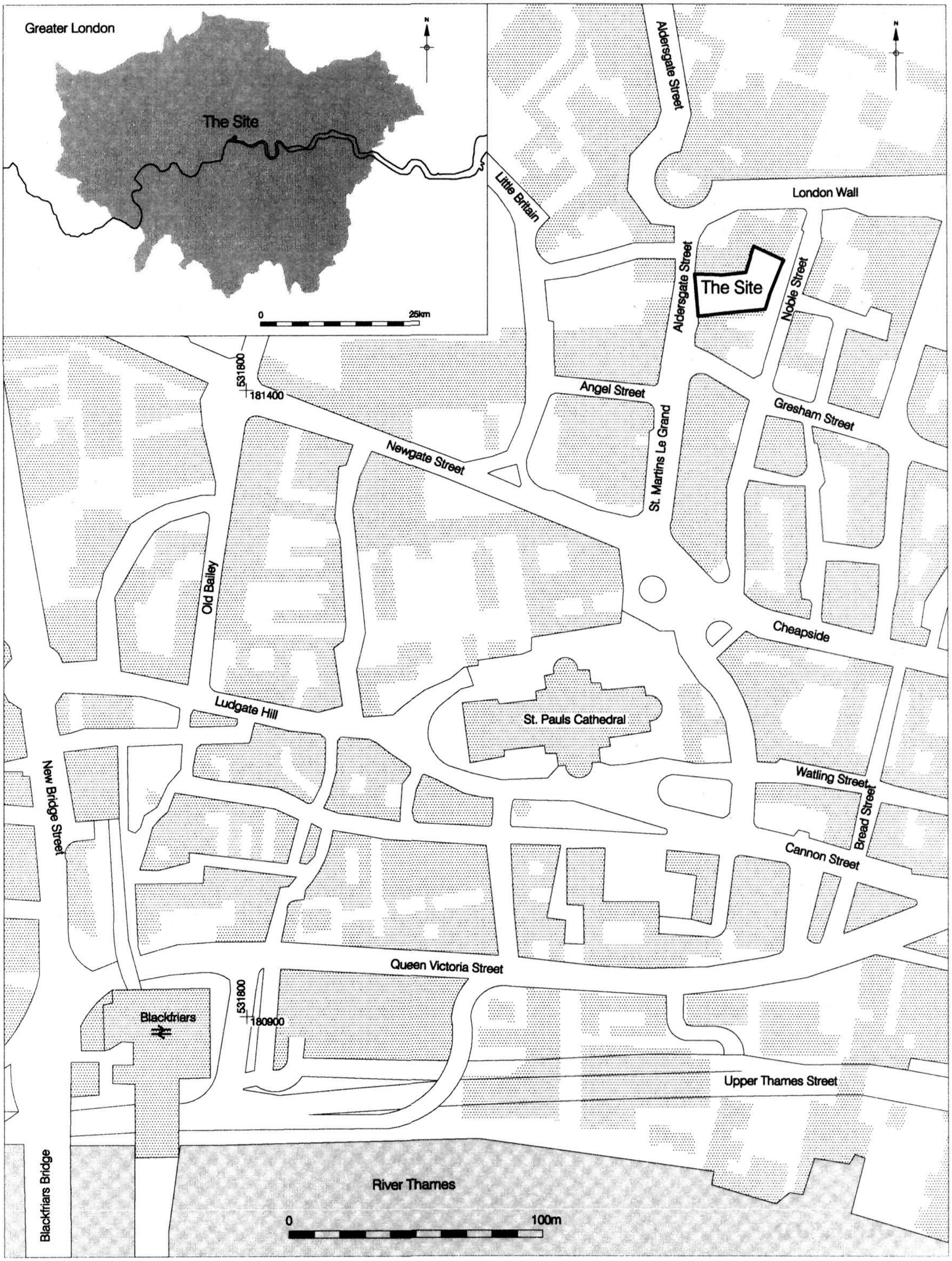


Fig 1. The site location

areas within the city ditch, where planning consent had been given for new lift shafts (Area A), for a sewer heading in the NW corner of the site (Sewer & Area I), and new drainage runs along the NW boundary (Area H) (Fig 2). A watching brief was maintained during the rest of the ground works.

With the exception of the areas where consent for archaeological excavation was given, no medieval or Roman deposits were removed. In the S part of the site in the area of the Scheduled Ancient Monuments the archaeological deposits were recorded in top plan and section where possible. Finds retrieval from these areas was therefore limited, and interpretation of some of the features was far from definite. Once the archaeological investigation of the areas was completed the surviving archaeological deposits were protected with a layer of terram geotextile and sand. Thus, most of the archaeological remains encountered on site were left preserved *in situ* as agreed in the mitigation strategy.

HISTORICAL BACKGROUND (Fig 3)

The fort at Cripplegate was laid out between AD 90 and 120 and was defended by a 'V'-shaped ditch up to *c*.3.00m wide. Between AD 190 and 225 a defensive wall two miles long was constructed, encircling the landward side of the city. The W and N sides of the fort were incorporated into the city wall by adding 1.2m thickness of masonry internally to strengthen the existing walls. The city wall was 2.4m thick and constructed of ragstone and mortar with tile bonding courses at regular intervals and a red sandstone plinth at ground level on its external face. The masonry rested on a foundation of puddled clay and flints. The wall was defended by a roughly 'V'-shaped ditch *c*.4.5m wide and 1.8m deep; the upcast from the ditch was piled up inside the wall to form a rampart about 4.9m wide and 1.8m high (Marsden 1980, 120–1). Some time later a gate was inserted at Aldersgate, perhaps to replace a small postern, which may have served a narrow road recorded to the N at 7–12 Aldersgate Street and dating from the 1st/2nd century (Egan 1985). During the 4th century bastions were added to the E circuit of the wall and the ditch was greatly enlarged to accommodate them (Maloney 1983, 105–11).

The city was largely abandoned at the end of the Roman period, with the Anglo-Saxons preferring to settle in *Lundenwic*, in the Strand/Covent Garden area. In response to Viking raids on London in AD 841, 851, and 871, it would appear that by *c*.AD 890 the Saxons had to a large extent moved from *Lundenwic* on the Strand back within the former Roman walled city (Vince 1990, 20). The Anglo-Saxon Chronicle for 886 states that, 'The same year King Alfred occupied London and all the English, those of them that were free from the Danish bondage, turned to him, and he then entrusted the burgh (fortified place) to the keeping of the ealdorman Ethelred' (Garmonsway 1954). It is more than likely that the city defences would have been repaired and the ditches maintained. The fact that the defences were probably in good order is suggested by the success of London in being able to hold off Danish attacks in 994, 1009, and 1013.

During the medieval period the walls and ditch were continually repaired and maintained (Grimes 1968, 80–1, 86; Maloney & Harding 1979, 350–3). It would appear from the archaeological evidence that bastions were added to the W circuit at this time, including Bastion 15 at the junction of the city wall and the former Cripplegate fort (Grimes 1968, 71–6). Stow mentions repairs to the walls being undertaken in the reigns of John, Henry III, Edward III, Richard II, and Edward IV (Stow 1598, 41–2). Stow records that 'the ditch ... was begun to be made by the Londoners in the year 1211, and was finished in the year 1213, the 15th (year) of King John. This ditch being then made of 200 feet broad'. Thereafter it was 'cleansed' in 1354, 1379, 1414, and 1477. Regular 'cleansings' were recorded until the end of the 16th century. However, much of the circuit of the ditch had been infilled by the second half of the 16th century to satisfy the constant need for more space within the cramped city (Maloney & Harding 1979, 354).

The limit of the Great Fire of 1666 passed along the N boundary of the site. By the date of Ogilby and Morgan's map (1676) the site was occupied by the Falcon Inn and its premises. An inn or hotel of that name occupied at least the W part of the site until the 1890s (OS map 1894–96). In 1673 the property was known as 'The Castle and Falcon' (Letters & Papers Charles II, 15.384), in 1720 as the 'Castle Inn' (Strype 1720), and in 1750 as the 'Castle and Falcon Inn', under which name it was known on Richard Horwood's map of 1813. On the Ordnance Survey maps of 1869–70 and 1894–6

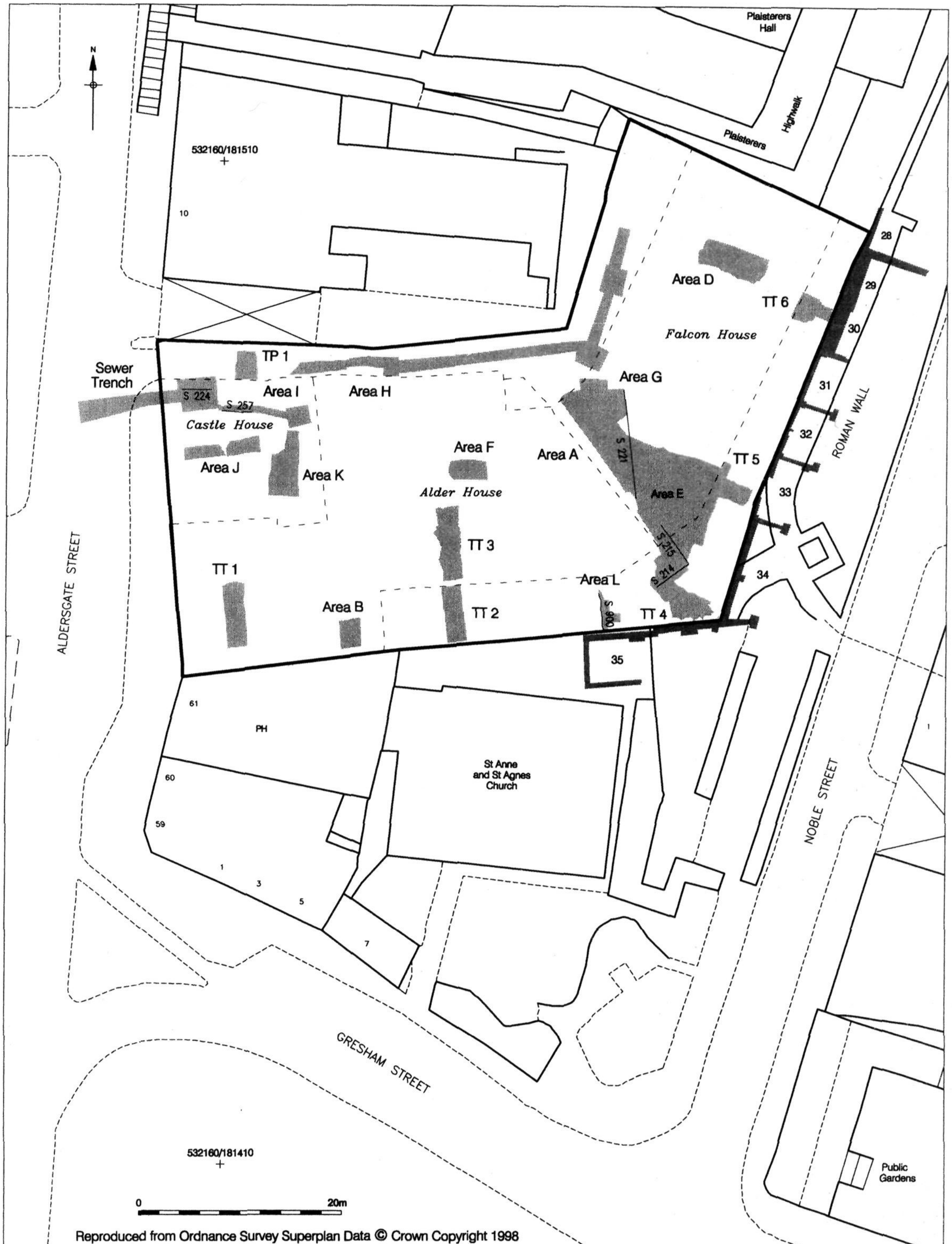


Fig 2. Location of areas of archaeological investigation

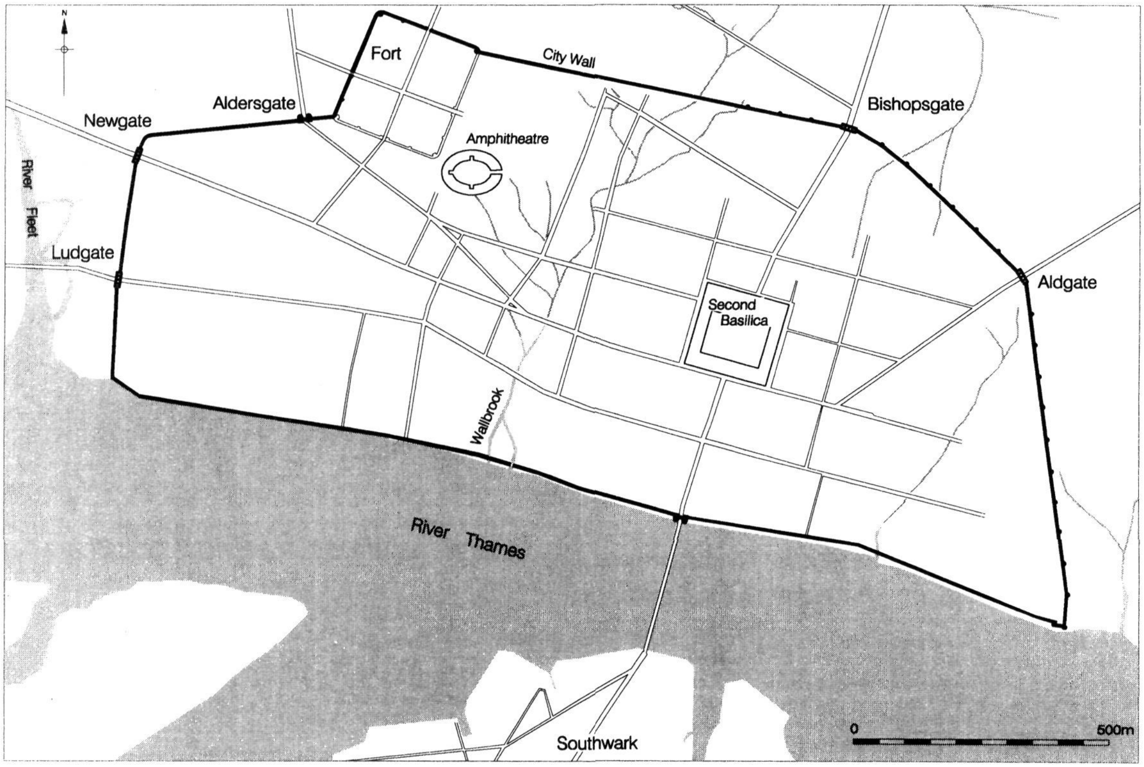


Fig 3. Plan of Roman London and the city wall

the W part of the site is occupied by the Castle and Falcon Hotel and the NE dog-leg by the Parcel Office. The W side of Noble Street, now occupied by the gardens, was by the time of Richard Horwood's map occupied by terraced buildings, which continued to occupy the site until their destruction in the Blitz during the Second World War.

PRE-CITY WALL ROMAN ACTIVITY
(Fig 4)

A 'U' shaped ditch, measuring 1.70m by 0.60m deep, was recorded in a NE–SW aligned section in the SE corner of site (Fig 5). An apparent return, heavily truncated by a later cut, continued in the NW–SE section. The ditch was backfilled with a mixture of brickearth and gravel fills from which no datable finds were retrieved. However, this cut predated the Roman city wall, which was built over it, and was probably associated with the Cripplegate fort, as it seems to have respected the rounded SW corner of the fort. It did not align with the fort ditch excavated by Grimes in the Noble Street garden area but was very similar in size to that recorded by Grimes (Grimes 1968, 52) and the base was at an almost identical level (Watson 1993, 9). It may, therefore, represent a second ditch beyond that recorded by Grimes, suggesting that the fort may have been protected by a double ditch on its W side.

An E–W aligned cut backfilled with a homogeneous dark grey-brown silty deposit was encountered in top plan along the S boundary of the site (Fig 4). In section it was flat bottomed and cut to the N by a later city ditch. The cut was traced for up to 38m across the site roughly following the line of the later city wall and survived to a width of up to 6.60m and depth of 1.50m; it did not continue on the line of the later city wall into the SE corner of site. This large feature could represent a city boundary ditch, which preceded the construction of the city wall. In other Romano-British towns, such as Verulamium and Silchester, the construction of walls was preceded in the 2nd century by a ditch and rampart defence (Wacher 1995, 71), and this may well have been the case in *Londinium* as well. Other traces of a pre-wall ditch have been found

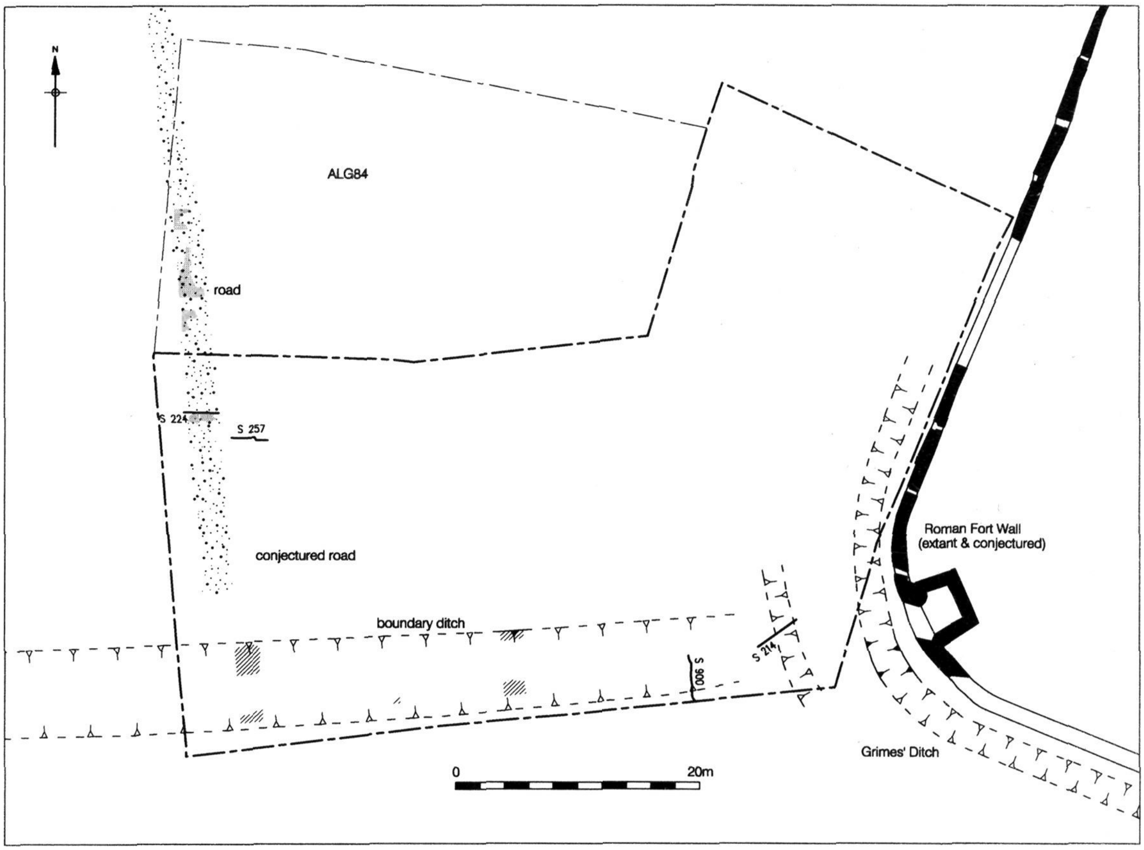


Fig 4. Plan of Roman boundary ditch and Cripplegate fort

to the E of the fort at Crosswall (Egan *et al* 1981), Dukes Place (Maloney 1983, 97), 1 Crutched Friars (Merrifield 1965, 291), 85 London Wall (Sankey & Stephenson 1989, 117–18), and opposite 57 London Wall (Pye 1985). The pottery assemblages from the ditch indicate that it was dug *c.*AD 100 and had rubbish tipped into it until the end of the 2nd century (Lyne 2000). The ditch's alignment with the SW corner of Cripplegate fort, its termination before the ditch possibly associated with the fort, and the 2nd-century dating for its infilling suggest that it may have been contemporary with the fort, and, together with the remains found on several sites to the E, may represent the late 1st/early 2nd-century boundary/*pomerium* of *Londinium*. However, the early 2nd-century boundary has previously been postulated as being on a line S of the SW corner of the fort, based on a change in the alignment of the E–W street, at a point where it was intersected by other roads, and the distribution of early burials (Marsden 1976, 47–9; Perring *et al* 1991, 108–9). This would be the first evidence of such a boundary W of Cripplegate fort, suggesting that the boundaries of *Londinium* extended further to the W in its early history than previously thought. A similar earlier, narrower boundary ditch, the backfill of which was dated to AD 70–100, was traced immediately to the N of the later S wall of the Cripplegate fort just to the E of the present

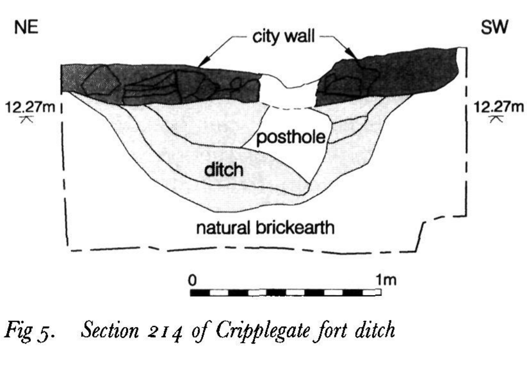


Fig 5. Section 214 of Cripplegate fort ditch

site (Howe & Lakin in prep), which might suggest that the fort itself was preceded by a boundary ditch.

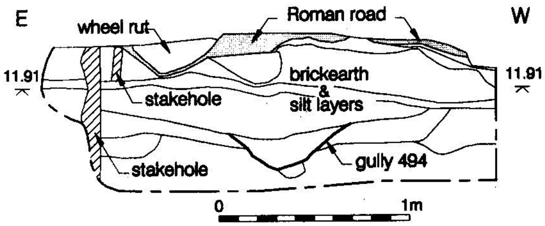


Fig 6. Section 224 of Roman road

In a sewer heading in the NW corner of the site an island of Roman archaeology survived the extensive truncation caused by the city ditch (Fig 6). A N–S aligned gully [494], 1.55m by 0.62m by 0.28m deep, was sealed by a series of brickearth and silt layers. Thin gravel surfaces, up to 2.20m wide, were observed. A roughly N–S aligned road up to 2.00m wide was found on the site immediately to the N at the same height and in direct alignment (Egan 1985), the gravel being mixed with mortar. It would seem likely that this was a continuation of the metalling observed in the sewer heading. A slight hollow backfilled with a mixture of silt and gravel at the E side of the road could be the remains of the attempted repair of wheel ruts, a feature also observed to the N (Egan 1985). A series of seven vertically driven stakeholes, roughly aligned N–S along the E edge of the road, might represent the remains of a road-side fence. Dating material from the road was scarce, consisting of fragments of tile dated to pre-AD 60/61–mid 2nd century. However, pottery recovered from the make-up dumps below was dated to the second half of the 1st century–early 2nd century. Two postholes, one vertical, the other set at an angle of 45 degrees, could possibly represent part of an upright and brace of a wooden bridge across the city ditch (see Fig 7). However, both were recorded in section only and definite interpretation is not possible.

The dating material, such as it is, suggests an early date for the road, late 1st century–early 2nd century, and suggests that the road was in place before the Roman city wall was erected. It is therefore necessary to speculate what became of this road when the wall was built. From the archaeological investigations beneath Aldersgate Street in 1939 (Maloney 1983, 110) it was suggested that Roman Aldersgate was a later addition to the city wall. However, this road was on a direct alignment with the projected E passage of the later Roman Aldersgate, which was unfortunately not observed on site, and it may be a forerunner of the later major Roman street which left the city through Aldersgate. It may have originally had a small postern gate through the wall which then, as the importance of the road grew, was converted into a major city gateway.

THE ROMAN CITY WALL AND DITCHES (Fig 8)

The foundations of the Roman city wall were observed along the S part of the site. The wall had previously been revealed in 1922, during excavations on the site of the Castle and Falcon Hotel and its yard (RCHM 1928, 90). The foundations consisted of lumps of roughly hewn ragstone and flint in a bonding matrix of sticky light brown puddled brickearth clay. This is consistent with the construction techniques of the wall revealed on other sites on its circuit (Marsden 1980, 121). The foundation measured

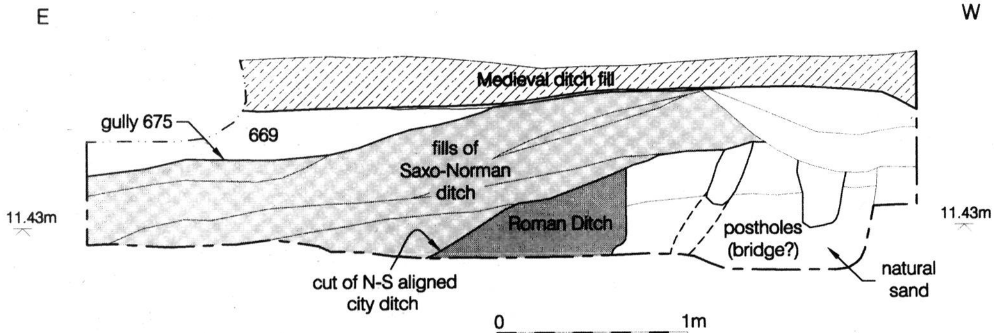


Fig 7. Section 257 of medieval city ditch

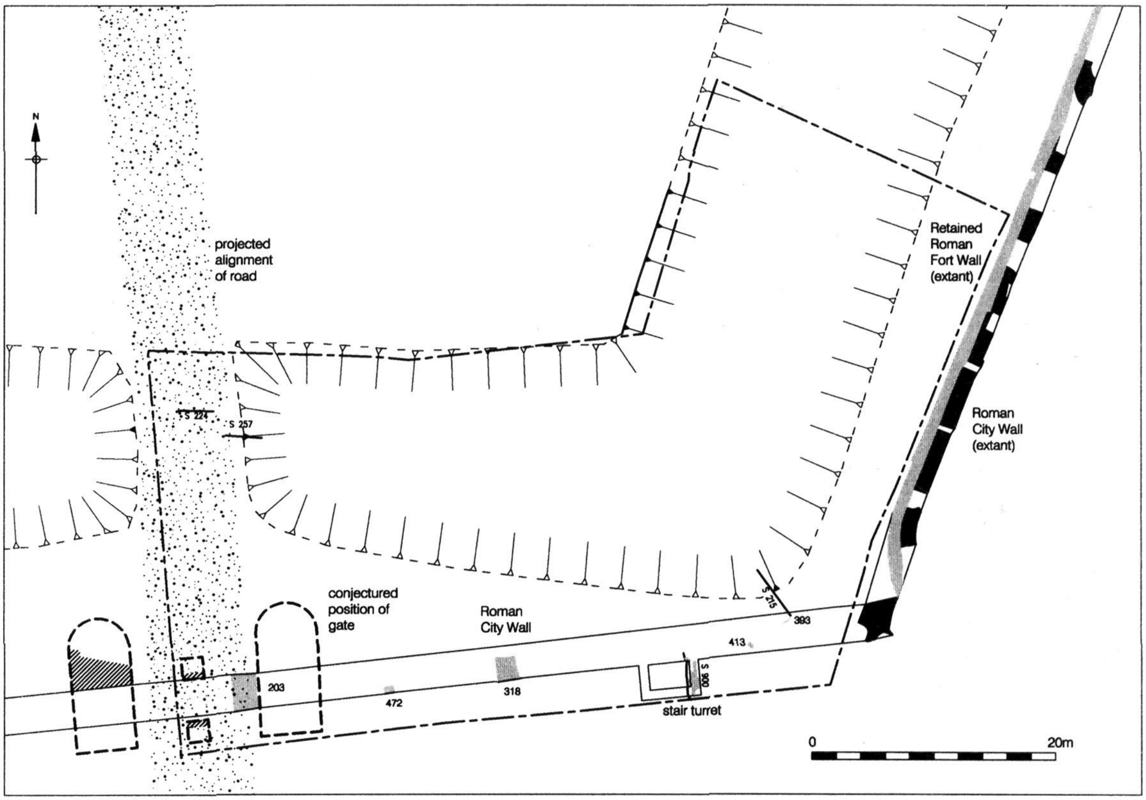


Fig 8. Plan of Roman city wall and turret

3.23m max wide in the W, the only area in which the full width could be observed (Fig 9), as it was heavily truncated by modern concrete footings elsewhere. This was much wider than the *c*.2.70m encountered elsewhere on its circuit (Perring 1991, 90). The construction of a wider foundation at this point could have been in response to the local ground conditions (Maloney 1983, 98). In 1939 the opening of a GPO tunnel beneath Aldersgate Street in the SW corner of the site found that the site was occupied by a marshy hollow or stream bed filled with black silt to a depth of at least 18ft below street level. The footings of the city wall had been widened and deepened and then reinforced with large blocks of ragstone and timber piles (Merrifield 1965, 103) to overcome the problem. To the E remnants of ragstone foundation bonded with a light brown sandy mortar and up to 0.52m high were revealed on top of the puddled clay foundation, which was at least 0.60m deep. The surviving fragments of wall were in direct alignment with the heavily truncated stub of city wall in the SW corner of the Noble Street Garden as discovered by Grimes (Grimes 1968). It would appear that the foundations of the wall were deeper the further W they progressed across site.

Dating material for the city wall was sparse. The foundation of the wall was trench built, mainly cut through the earlier infilled boundary ditch which ran along the S part of the site. The date of the infilling would appear to be the second half of the 2nd century. Two fills, [915] and [916], of another earlier feature were also cut by the city wall in the area of the putative turret (Fig 10). These were dated to the late 2nd century. The dating material retrieved on this site would seem to confirm the construction of the city wall taking place some time between AD 190 and 225 (Lyne 2000).

Towards the SE corner of the site a N–S aligned wall, measuring 2.44m by 0.66m (0.77m with clay foundation) wide and constructed from ragstone and sandy lime mortar resting on a puddled clay and flint foundation, was revealed

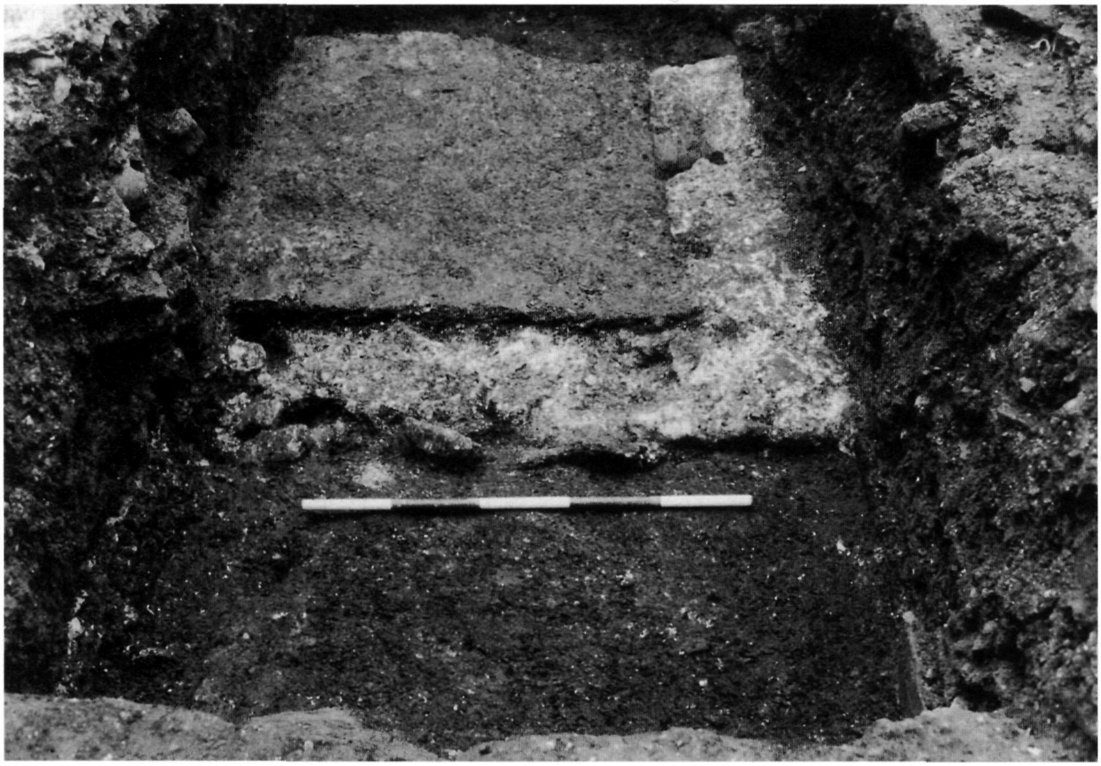


Fig 9. View of city wall

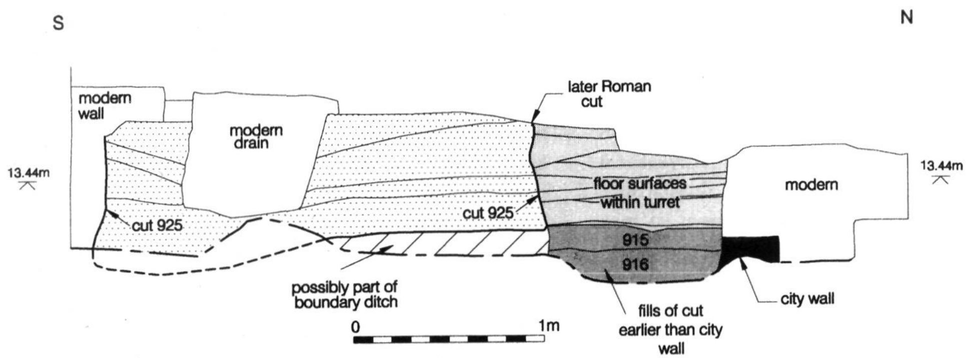


Fig 10. Section 900 across deposits within turret

lying perpendicular to and to the S (*ie* internal to) of the truncated remains of the city wall. This wall was identical in construction to the city wall and would appear to be part of an internal structure against the city wall, most likely a stair turret. The remains of four other internal turrets have been found along the wall circuit. Three of these were found on the wall between the Tower of London and Aldgate and one more was located on the Central Criminal Court site between Newgate and Ludgate (Marsden 1980, 122–3). They varied in size internally from 11ft by 6ft (3.35m by 1.83m) at No. 19 Tower Hill (Cottrill 1937, 28) to 9ft by 5ft (2.74m by 1.52m) at the one between Tower Hill and the Wardrobe Tower (*JRS* 1958) Their walls were also of varying thicknesses ranging from 2ft 8in (0.81m) at No. 19 Tower Hill to 3ft 2in (0.97m) at the Central Criminal Court (Marsden 1970, 3). The wall on the present site measured between 0.66m and 0.77m thick, but had been heavily truncated from above with only a few mortar bonded lumps of ragstone remaining, and there were no signs of an E–W return. However, its general size and its construction would suggest that it was a stair turret.

The position of the turret is of major interest. It is very close to the SW corner turret of the Cripplegate fort and adds to the debate over the status of the fort after the city wall was built. The filling of the ditch at the SE corner of the fort produced material ranging down to the late 2nd or early 3rd century suggesting that at least this part of the fort's defences had gone out of use by the time of the construction of the city wall (Grimes 1968, 39). It is, therefore, possible that the SW turret of the fort also became superfluous with the building of the city wall, and was pulled down at this time and replaced by the turret discovered on the present site.

To the W of the wall a sequence of probable brickearth floor layers with silt and burnt occupation deposits, cut by a large pit [925] to the S, was revealed in section (Fig 10). Pottery from these deposits was sparse as they were mainly examined in section, which was cut back by 10cm for finds retrieval. However, the pottery that was retrieved was dated to the second half of the 2nd century, which suggests that all the material was residual as two fills, [915] and [916], below these deposits were dated to late 2nd century and were not out of keeping with an early 3rd-century date for the construction of the city wall. The fills of the large cut to the S [925] produced small assemblages of residual material of 2nd-century date, much of which was probably derived from the disturbance of the deposits within the turret. These were interpreted as being occupation deposits within the turret, with the large cut possibly being where the ladder or stairs had been removed.

Associated with the Roman city wall was a series of brickearth, gravel, and clay silt layers against the internal face of the wall. A similar sequence of brickearth sealed by gravel was recorded in very truncated form against the wall in Area B. Similarly a gravel deposit was found against the wall in the SE corner of site. These were probably the remains of the internal rampart against the city wall, which was most notably found at the Central Criminal Court, Warwick Square (Marsden 1980, 120–1). Finds were very sparse as no excavation was permitted but eight sherds of pottery dating to the first half of the 2nd century were recovered during cleaning of layer [307]. This material would most likely have come originally from the upcast from the construction cut of the city wall, which passed through the large earlier E–W boundary ditch, and cannot be a guide for the construction of the wall or the bank.

Remains of a ditch were observed in the SE corner of the site, where a flat-bottomed cut [402], measuring at least 2.07m wide and 1.25m deep with a gently sloping side to the S, was recorded in section (Fig 11). This was backfilled with a mixture of silt and brickearth deposits containing large lumps of ragstone, presumably originally part of the city wall. Finds were again sparse, consisting of a fragment of Gauloise amphora of uncertain form dated to between AD 43 and 250, and a few fragments of cbm dating to AD 120/160–late 2nd century/3rd century. The finds are consistent with a late 2nd-century/early 3rd-century date for the ditch. The city wall ditch was typically 3.05m to 4.88m wide, between 1.17m and 2.00m deep (Perring 1991, 91), and lay between 2.70m and 4.50m from the external face of the city wall. This cut lay *c*.2.20m from the projected line of the wall and would therefore seem to fulfil all the characteristics of the original Roman city ditch associated with the building of the wall.

In Area I in the NW corner of the site the remains of a linear cut [714] aligned N–S were backfilled with a dark grey-brown silt deposit [713] (see Fig 7 above). A small assemblage of 15 sherds of pottery dated to the first half of the 2nd century and cbm fragments of similar date were recovered. The feature was heavily truncated by the later medieval city ditch, making interpretation difficult. It was located just to the E of the Roman road in the sewer heading and might represent a roadside ditch up to 1.08m deep; however, it could alternatively be part of the later 4th-century city ditch, although the dating would seem to be too early.

Truncating the S edge of the city ditch was a 'V'-shaped cut [406], measuring 2.26m wide by 1.00m deep in section. It was backfilled with mixed brickearth and clayey silt deposits. Partial excavation for finds retrieval was undertaken; this showed the cut to be aligned E–W on its N side (the S edge was truncated), running parallel to the city wall with its truncated S side at a distance of only 0.60m from the outer face of the city wall. The few datable finds consisted of two sherds of 2nd-century pot, one very abraded,

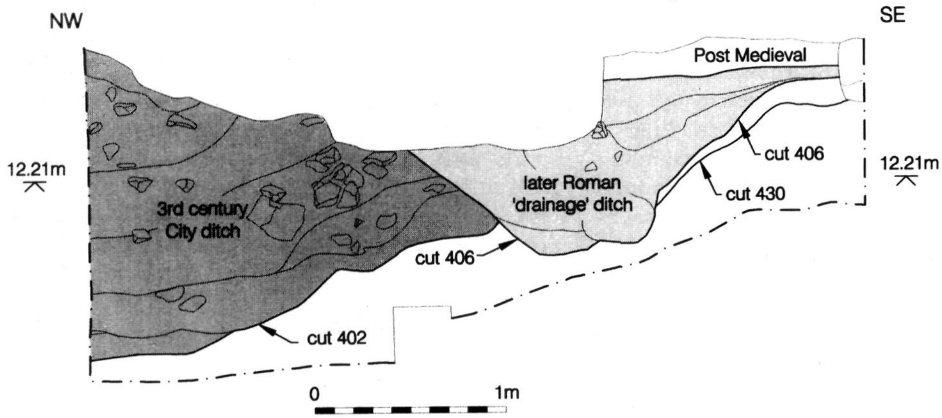


Fig 11. Section 215 of Roman city ditch

and fragments of 2nd-century cbm, which do not help to satisfactorily date the feature. It probably represented a later drainage ditch associated with the later Roman ditch. However, elements of a human skeleton, including the humerus, radius, ulna, scapula, and several ribs and vertebrae of an individual aged 25 to 30 years old, were recovered from one of the fills, suggesting that it might possibly be a grave, although the shape in section is very unusual (see Fig 11). It is possible that an individual was dumped into an open ditch and rapidly covered for a quick and clandestine burial.

Evidence of the later, wider, flat bottomed Roman city ditch found elsewhere on the wall circuit at Ludgate Hill (Hill 1977, 45), Aldgate/ Dukes Place (Marsden 1969, 20–6), and the GPO site (RCHM 1928) is less forthcoming on this site. This is probably due to it being largely cut away by the later, deeper medieval ditch; also as Maloney points out a large late Roman ditch could have remained open for a long time, especially following the abandonment of the city at the end of the Roman period, and the upper fills might well contain pot of early medieval date, as was the case in the possible late Roman ditches found at Houndsditch and Dukes Place (Maloney 1983, 111). However, in the tunnel beneath Aldersgate Street, which connected the sewer heading in the NW corner of site to the main sewer, a flat bottomed cut slightly sloping from N to S was observed. The cut measured at least 6.48m E–W by at least 2.20m N–S by 1.50m in depth. This was backfilled with a mixture of dark grey and dark brown waterlain silt and sandy silt containing frequent Roman cbm and animal bone. It may represent the late Roman ditch. Two sherds of Saxon pottery and some fragments of late Saxon leather shoes recovered from the tunnel may represent the scanty remains of a later Saxon city ditch. Stratigraphic retrieval of finds was impossible and the finds which were recovered came from the contractor's spoil during a watching brief on the digging of the tunnel. To the E of the sewer heading a N–S, possibly linear, cut, heavily truncated to the E by later ditches, was observed. The silt backfill contained 2nd-century pot and was apparently contemporary with the ditch deposits in the tunnel to the W of the gravel surfaces in the sewer heading. It would, therefore, appear that the strip of land occupied by the earlier road had been left as a causeway approaching the site of the Roman gate at Aldersgate. This causeway through the ditches seems to have been respected by the Saxon ditch and in part by the medieval city ditch, the sides of which rose up as it approached the W edge of the site.

The edge of the later Roman city ditch closest to the city wall had been lost on the site due to the presence of the large medieval ditch *c.*3.00m from the wall. However, a large ditch to the N of the site contained much Saxo-Norman pot and could well have originally been the late Roman ditch. Evidence for this ditch can be found on other sites in the vicinity. The W edge of the late Roman ditch was recorded at a distance of *c.*25m from the outer face of the city wall at 7–12 Aldersgate Street (Egan 1985), making the late Roman ditch some 23m wide. On the E side of Aldersgate Street in 1887 Fox observed a large, flat bottomed ditch, 22.71m wide by 4.29m deep with an inner edge 3.12m from the face of the Roman wall, which he interpreted as Roman, although this dating was doubted by Wheeler (RCHM 1928). Tunnelling for a sewer in 1924 revealed 'black mud, still oozing in some places, and very foul smelling' a few feet to the N of the city wall and extending 21.30m to the N, containing numerous animal bones (Harding & Marsden 1986, 757). This was then reckoned to be part of the medieval city ditch, but the material is very similar to that observed in the sewer tunnel excavated as part of the current project which was dated mainly to the Roman period with some Saxon finds.

No remains of the Roman, medieval, or post-medieval gateway at Aldersgate were observed on site. During building work in 1922, 210ft (64.01m) of Roman wall traced from Bastion 15 was observed (RCHM 1928, 90) but no mention was made of the gate. If the interpretation of the ragstone masonry found in the GPO tunnel beneath Aldersgate Street in 1939 is correct the E side of the gate was predicted to lie in the SW corner of the site (Maloney 1983, 110–11). Indeed the E opening would have been in direct alignment with the earlier Roman road, found in the sewer heading and at 7–12 Aldersgate Street, and with the apparent remains of a causeway crossing over the Roman and later city ditches. However, it was not possible to excavate in the predicted location of the gate due to the presence of large steel supports maintaining the integrity of the party wall of the Lord Raglan public house.

SAXO-NORMAN CITY DITCH

In the NW part of the site adjacent to the boundary wall of 7–12 Aldersgate Street a sequence of fill deposits was revealed. One mid brown organic deposit extended along the length of the party wall suggesting that the fills were all contained in one large E–W feature. A Saxo-Norman date (11th century to early 12th century) has been given to these deposits, which may form the fills of a large defensive city ditch. The maximum width of Saxon ditch observed was 6.60m N–S. However no sides or base were visible, since its S edge was cut away by the later medieval city ditch and its N edge would appear to be just beyond the site boundary.

A N–S aligned ditch of similar date was recorded in the SE corner of 7–12 Aldersgate Street (Egan 1985), the outer edge of which extended at least 25m from the city wall. No evidence of any E–W aligned ditch was found along the S periphery of 7–12 Aldersgate Street, but, if a distance of *c.*25m from the city wall was maintained round the dog-leg to the W, the edge of the ditch would have been positioned on the party wall boundary. To the W at the junction of Little Britain and King Edward Street a large E–W ditch, with stakes driven in its sides, contained a fill dated mid 11th to mid 12th century, providing further evidence for a late Saxon city ditch (Gibson 1995). Other evidence for a Saxon city ditch was observed at Ludgate Hill (Hill 1977, 45) and possibly at Houndsditch (Vince 1990, 90).

A small number of residual Early Saxon pottery sherds of a 5th- or 6th-century date were present in the backfill of the Saxo-Norman ditch and later pitting. Early Saxon finds from within the City area are extremely rare, consisting of small assemblages from Billingsgate and elsewhere along the waterfront and outside the city walls at St Brides and in the Roman cemeteries at Mansell Street and West Smithfield (Blackmore & Williams 1997, 54–6). 5th-century Saxon activity has also been recorded at Clerkenwell to the NW of the site (Cowie & Harding 2000, 177). Only four sherds were recovered and they may have been imported onto the site with material from elsewhere. However they may be evidence of at least a transitory presence in the near vicinity.

SAXO-NORMAN PITTING

Several pits cutting into the infilled Saxon ditch in the NW part of the site were identified in both plan and section. The organic remains within them suggest their primary use as cess pits. An excavation at 7–12 Aldersgate Street revealed a series of pits of Anglo-Norman date along the E side of Aldersgate Street, suggesting an extra-mural ribbon development (Egan 1985). The cess pits found on the current site are probably part of the same development, encroaching on the partially filled in late Roman/Saxon ditch.

A large quantity of fragments of crucibles (over 500) was found sporadically in the late Saxon ditch fills but mostly from fill [668] of a Saxo-Norman gully [675], where 497 sherds with 10 lips of individual crucibles were identified. This gully measured 8.4m by 0.65m by 0.53m max deep and was aligned roughly NW–SE. The base was relatively flat, sloping slightly down to the

W. The majority of these crucibles were in Early Medieval coarse whiteware, with four crucibles of Stamford ware also present (Jarrett, below). These have been dated to the late 11th century. The large quantities of crucibles found on site indicate metal working on a large scale just outside the city wall, where the risk of fire to the wooden buildings of the city would be less. The crucible fragments and associated metal slag were subjected to further analysis in order to determine the industrial processes involved. Petrographic thin sectioning of the crucibles and analysis of the slag involving furnace tests and EDS (Energy Dispersive Spectroscopy) on the metal prills contained within the slag resulted in a conclusion that they were used for 'silver refining' and 'silver processing' by means of lead extraction. This process either involved silver extraction by lead, to produce lead bullion for the later refinement of the silver content, or a cupellation process (Lacey 2000). According to Stow silversmiths used to live in Silver Street which was to the NE of the site where London Wall now runs. Perhaps this was a continuation of silverworking from late Saxon times into the medieval period.

The presence of the teeth of a field vole, a species requiring ground cover and therefore more commonly associated with the rural environment, serves to illustrate the rural setting found immediately outside the city wall in the Saxo-Norman period (Armitage, below). The faunal material recovered from the Saxon ditch and Saxo-Norman pitting can be identified as a whole as discarded food debris from all stages of meat preparation and consumption (slaughtering, primary/secondary butchering, as well as kitchen and table waste) (Armitage, below). This material provides an insight into the diet of the inhabitants of the Saxo-Norman/early medieval period. There was a distinct lack of variety, with the diet dominated by meat (especially cattle and sheep). The infrequency of pig and domestic fowl/geese/duck suggests there was little (if any) localised backyard food production. There is a wider variety with respect to fish, with cod and herring and the presence of mackerel and flat fish showing the preponderance of marine fish over freshwater fish (Armitage, below). This lack of variety in the diet is confirmed by the relative scarcity of plant remains and diversification recovered from the environmental samples (Carruthers, below).

The survival of the Saxon ditch and Saxo-Norman pitting in the NW corner of the site suggests that the medieval ditch was not as wide as the earlier Roman 4th-century and Saxon ditch at this point, its outer edge measuring only 18.5m from the line of the city wall.

MEDIEVAL BASTION 15 (Fig 12)

In the SE corner of the site a curving masonry fragment constructed of roughly hewn lumps of ragstone, chalk, flint, and occasional tile bonded together with soft dark yellow very sandy lime mortar was found (Fig 13). The external stones were faced and the wall curved round to the S. It measured 1.90m N–S by 2.90m E–W by at least 0.32m high. A smaller fragment to S respected the same curve. This represents the remains of medieval Bastion 15 (Merrifield 1965) which was inserted into the angle formed by the junction of the city wall and Cripplegate fort. The N end of the wall roughly aligns with the small fragment of wall keyed into the fabric of Cripplegate fort in the Noble Street garden. The bastion was circular according to its representation on Ogilby and Morgan's Map of 1676; however, the maps of Agas *c.*1562, Braun and Hogenberg 1572, and Leake and Hollar 1667 and the archaeological evidence, observed both on the present site and in 1922, would seem to point to a semi-circular or horse-shoe shaped bastion (RCHM 1928, 104). A fragment of pot recovered from the bastion was dated to 1080–1350, and its foundation cut through an apparently 3rd/4th-century Roman deposit. Although finds retrieval was minimal because of the restrictions on excavating within the Scheduled Ancient Monument, the fabric of the masonry, which included a fragment of medieval tile dated 1240/70–1270/1350, certainly points to a medieval date for the bastion, thus confirming that the hollow bastions on the W circuit of the wall were medieval, whilst those with solid bases on the E circuit were of Roman date.

MEDIEVAL CITY DITCH: 13th/14th CENTURY (Figs 14–15)

Area A, the main area of excavation, contained a sequence of six large infilled cuts, which are interpreted as being the city ditch with evidence for its periodic cleaning out and re-cutting.

The medieval ditch was found to be at least

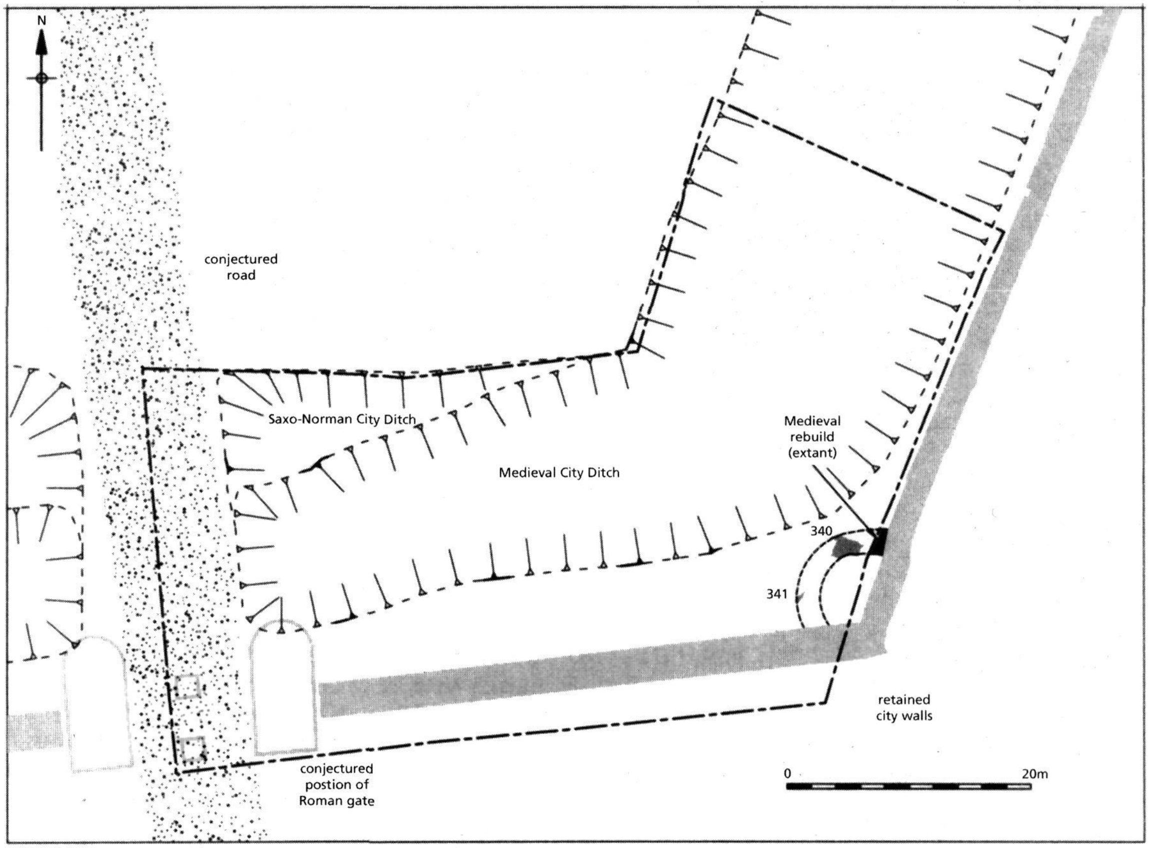


Fig 12. Plan of medieval city wall and bastion

17.50m wide extending from 3.10m from the city wall in the N and it was up to *c*.4.00m deep. In the excavation at 7–12 Aldersgate Street the outer edge of the medieval ditch was observed at a distance of *c*.25m from the line of the city wall (Egan 1985). The edge of the medieval ditch probably lay under the party wall to the N in the NE part of the site. However, to the W the ditch did not appear to have been so wide as the outer edge was recorded in a modern service trench as being only 18.5m from the projected line of the city wall, suggesting that the ditch narrowed as it approached the gateway and road at Aldersgate. The E–W arm of the ditch is unlikely to have extended much further N than the site, since the property to the N plotted by Treswell in *c*.1610 (Schofield 1987, 34–5) belonged to Christ's Hospital, and it was well established long before the Dissolution, when it was known as 'Trinity Hall' and formed part of the endowments of the fraternity of the Holy Trinity in the parish church of St Botolph Aldersgate opposite (Dyson 1999). These measurements are comparable with observations elsewhere on the circuit, which seem to suggest that the ditch was not a constant width (Maloney & Harding 1979, 353). Stow mentions the ditch as being up to 200ft wide.

The earliest phase of the medieval city ditch measured at least 11.24m wide by at least 1.90m deep with a gradually sloping side to the S and a flattish base. It continued beyond the limit of excavation to the N. It was filled with dark brown and grey waterlain silts, suggesting that the bottom of the ditch was filled with water. For a great part of its history the city ditch at Aldersgate would appear to have been filled with water. In 1240–41 an unknown man was found drowned in the ditch outside Aldersgate (Chew & Weinbaum 1970, no. 143). The maps of Agas *c*.1562 and Braun and Hogenberg 1572 both show the ditch slightly to the N of the site as being waterfilled. This was certainly the case at Houndsditch, where a freshwater (slow-moving

Fig 13. View of bastion

and unpolluted) environment for the lower levels of the ditch was identified, with a more stagnant environment in the upper levels (Maloney & Harding 1979, 351). The survival of leather and textile finds from the first two phases of the medieval ditch seems to confirm the waterlain nature of the deposits. Among the plant remains recovered from the environmental samples were waterlogged remains of aquatic/semi-aquatic weeds, which were primarily marginals, some of which grow in seasonally exposed, often polluted muddy areas. The relatively low percentage present and small range of such plants suggest that the ditch did not contain standing water for long periods of time allowing a well-developed aquatic flora to become established, but probably experienced periodic episodes of waterlogging due to poor drainage (Carruthers, below). Towards the N end of the ditch attempts seem to have been made to consolidate the bank by dumping gravel and large lumps of ragstone, chalk, and ceramic building material. The fills have been dated to 13th/early 14th century, and the ditch probably represents the remains of the city ditch which Stow in his Survey of 1598 records was 'begun to be made by the Londoners in the year 1211, and was finished in the year 1213'.

RE-CUT OF CITY DITCH *c.*1350–1400

The above ditch was later re-cut with a similar flat bottomed profile, measuring at least 8.30m wide N–S by *c.*0.54m deep. This ditch seems to have been prone to silting up, as it was infilled with a mixture of apparently waterlain silts and bands of pure silts and sand lenses. The late 14th-century deposition date for the backfills of this ditch was based on the absence of Late London Ware within the pottery assemblage (Jarrett, below).

RE-CUT OF CITY DITCH *c.*1400–1500/50

The previous ditch was later re-cut to form another flat bottomed ditch, measuring at least 10.46m wide N–S by *c.*0.50m deep, which continued beyond the N limit of excavation. This

Fig 14. View of medieval city ditch

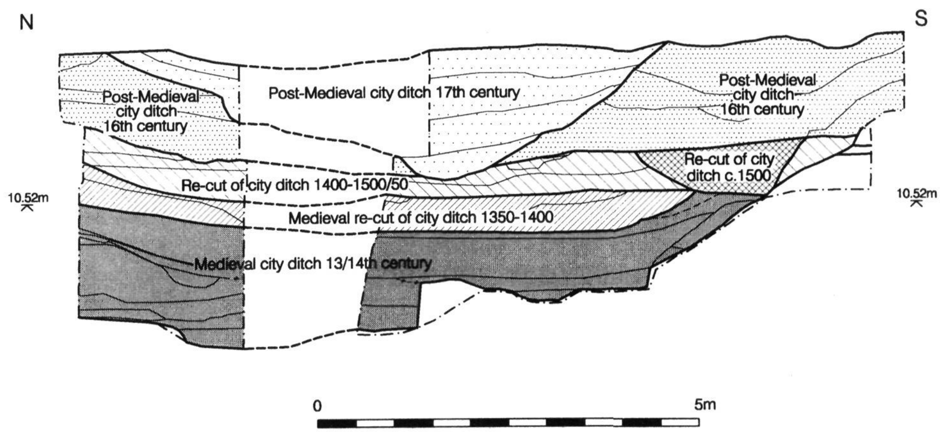


Fig 15. Section 221 across medieval city ditch

ditch also seems to have been subject to silting-up with frequent sand lenses within the fills. Dated to between the 15th and early 16th centuries this phase of re-cut could represent another cleaning episode of the ditch, or may perhaps have been done in response to the need for the city defences to be rebuilt during the Wars of the Roses when Ralph Joceline, Mayor of London, in 1477 'caused the whole ditch to be cast and cleansed' (Stow 1598, 51). This may have been a direct response to the poor state of the defences. Previously the dilapidated condition of the walls of London may well, in part, have accounted for the readiness of the City fathers to negotiate with both Yorkists and Lancastrians in the 1450s and 1460s; and in 1461 and 1471 when London had been threatened by Margaret of Anjou and then by the Bastard of Fauconberg whose guns shot at Aldgate and London Bridge (Lander 1990, 145).

RE-CUT OF CITY DITCH *c.*1500

The sequence of three flat-bottomed ditches was replaced by a much smaller cut with sharply sloping sides and a narrow flat-bottomed base which was only 0.90m wide. It measured 2.40m wide N–S by 0.89m deep. It was filled with an organic rich silty clay. This phase of the city ditch would appear to be much narrower and slightly deeper than that which it replaced. It does not appear to have been in use for long and must have quickly filled up either naturally or by man-made activity.

RE-CUT OF CITY DITCH 16th CENTURY

The smaller ditch was replaced by another large flat bottomed cut, measuring at least 10.90m wide N–S by 1.37m deep. It was gradually filled in by the dumping of domestic and other waste. The backfill of the ditch was dated to the late 16th century to early 17th century, but very few sherds of pottery of this date were recovered, most were earlier, from the mid 16th century.

POST-MEDIEVAL CITY DITCH 17th CENTURY

One last phase of city ditch was revealed, being much smaller and with its S side at *c.*9.00m from the city wall being much further away than the other ditches. It was roughly 'V'-shaped with fairly steep sides and a rounded base which measured 5.52m wide N–S by 2.04m deep. It perhaps represents one last attempt to improve the city defences in response to a time of political crisis, most probably the Civil War. This may be the ditch which appears and is called 'town ditch' on the map of Newcourt and Faithorne of 1658 and which would seem to be much narrower than the ditch which appears to the N of the site on the earlier Agas and Braun and Hogenberg maps. The pottery recovered from the fills suggests an early 17th-century date; no clay tobacco pipes were found. The possible mid 17th-century dating is based on the presence of brick fragments dated from 1620/40s–1900 from the primary fill of the ditch (Sabel 2000). Further evidence for a re-cutting of the city ditch during the Civil War is provided by three other sites to the E: St Alphage Street (Grimes 1968, 88), Fore Street (Flintham 1998, 233), and Dukes Place at the junction of Houndsditch and Aldgate (Maloney & Harding 1979, 354) where 17th-century material was found in the top fills of the ditch. However, it has been doubted that the whole ditch was re-dug around the entire circuit of the city wall during the Civil War because in many places it was built over or laid out as gardens by this time (Maloney & Harding 1979, 354), it may just have been a localised re-cutting of the ditch, although as Maloney and Harding argue there would have been little point in just re-cutting small sections. However, it is true that the only named mention of the city ditch on the Newcourt and Faithorne map is that section between Aldersgate and the bastion at the NW corner of Cripplegate fort, suggesting that, if the map is accurate, it was a localised survival by 1658.

GENERAL DISCUSSION OF THE MEDIEVAL/POST-MEDIEVAL CITY DITCH

The six phases of the medieval city ditch revealed within the main area of excavation (Area A) show that the city authorities must have waged a constant battle against Londoners disposing of their rubbish in the ditch. The city ditch was continually being cleaned out and re-dug, especially at times of political upheaval such as during the Wars of the Roses. However, this rubbish has provided an important archaeological record of the food and lives of ordinary Londoners.

From the analyses of the anatomical distribution/body part representation in the bones of domestic livestock, as well as the presence of poultry and fish bones, the bulk of the faunal material from all phases represents discarded domestic food debris (kitchen/table waste). There is very little evidence for concentrations of primary butchery waste from slaughteryards in individual deposits. There was a certain amount of industrial waste from horn-, bone- and antler-working crafts, but this was apparently intermixed with the domestic refuse during disposal into the city ditch, along with the carcasses of dead pet cats and dogs. Dead pack- and cart-horses, either as complete carcasses or in the form of disjointed portions (probably cut up to better facilitate their transportation and disposal), were also thrown into the city ditch either by their owners or by the knackers after processing/removal of their skins (Armitage, below). The absence of any evidence of weathering and biological degradation indicates that the bones had become incorporated into the deposits shortly following discard and had not been left lying scattered and exposed on the ground for any length of time prior to burial (Armitage, below). This suggests that the bones were not just dumped into the ditch but were covered immediately with other debris, probably in an attempt to smother the smell.

From analysis of the animal bone from the medieval and post-medieval phases of the city ditch it is evident that beef/veal was the most important staple item in the diet of Londoners, with mutton/lamb second, and pork/suckling pig a poor third. Apart from the remains of haunches of venison there were no bone elements, such as plover, crane, woodcock, dove or quail, within the assemblages to suggest high status. Domestic fowl and geese were consumed along with an increasing number of rabbits, however, and a wide variety of fish was represented (Armitage, below).

Vermin and scavengers were also present on the site, as attested by the discovery of bones of black rats and ravens, as might be expected following the disposal of meat and other rubbish into the ditch. However, there was a noticeable lack of evidence of small vertebrate fauna, such as wild mammals, birds, and amphibians, whose presence might be expected just outside the city walls, especially for the Roman and medieval periods (Armitage, below).

From the analysis of the pollen found in column samples taken from the bottom two phases of the medieval ditch, the absence locally of extensive tree growth is indicated. The pollen spectra are typical of medieval and later contexts in that there is little tree and scrub pollen but a very diverse assemblage of weeds derived from various habitats and via various transport mechanisms. The most widespread were wild grasses and cultivated cereals including wheat, barley, and rye. These are associated with numerous weeds typical of cultivated and waste ground. Most of the cereals are probably of secondary derivation coming from refuse; this might include human and animal ordure, straw floor coverings, roofing materials and waste food or the by-products of cereal crop processing (Scaife, below).

Certain findings suggest that the ditches were used for the disposal of human and animal cess. The presence of whip worm and maes worm indicates that there was a faecal component in the sediments and suggests that the cereal pollen was present in food and has passed through the guts of humans or animals. Another major source of pollen from ingested grasses and cereal fodder may result from the disposal of slaughterhouse offal in the city ditch. The presence of borage and hop pollen is also indicative of cess/faecal disposal, since borage is a well known pot herb and was also used in cups of wine and cider to impart a cool flavour. The presence of hop pollen, which would have come from beer drinking, is also an indication of the disposal of cess into the ditch (Scaife, below). Analysis of the fish bones by Armitage (Armitage, below) has also provided evidence for certain bones having passed through both human and canine digestion.

Analysis of the charred, waterlogged, and mineralised plant remains from four phases of the ditch by Carruthers has confirmed the cessy nature of much of the fills. The range of edible taxa present and the recovery of coprolites provide evidence that faecal material was a major component of the waste deposited in the ditches. Many of the seeds recovered were from plants that could be used for their culinary and/or medicinal properties, such as hemp, flax, pot marigold, white horehound, hemlock, and henbane. The wide range of medicinal plant species present in the samples taken from the ditch suggests either that the inhabitants were in poor health and were of high enough status to afford remedies or that a physic garden or hospice existed in the vicinity of the site for much of the medieval period (Carruthers, below). The lack of high status food among the animal remains would seem to suggest the latter alternative. Indeed, St Bartholomew's Hospital, founded in 1123, is not far to the NW.

The medieval ditches contained largely unabraded sherds of domestic kitchen and tablewares, but with a general absence of complete or near complete pots. This indicates the rapid deposition of rubbish and the mixing of materials resulting from the amalgamation of several middens from organised refuse disposal or the mixing of earlier material from the re-cutting and cleaning of the ditches (Jarrett, below). From the pottery analysis by Jarrett it is evident that the latest pottery in the last two phases of the city ditch is under-represented, indicating that contemporary refuse was not dumped into the ditch or that the ditches were maintained regularly.

Therefore, from the analyses of the different samples and finds recovered from the various phases of ditch fill, it is apparent that the ditch was the dumping ground of the City despite the City authorities repeated attempts to stop the practice. Everything from domestic household rubbish and human faeces to deceased pet cats and dogs was deposited into the ditch. But the proportion of bone elements representing butchers' waste is much less than that identified as domestic waste, suggesting that the City authorities may have had at least some success in regulating proper disposal of the butchers' waste products (Armitage, below). Generally the authorities fought a losing battle with only times of political crisis leading to effective cleaning and reinstatement of the ditch.

END OF THE CITY DITCH

So, when was the city ditch backfilled? The map evidence is slightly contradictory. On the Agas map of *c.*1562 (Fig 16) the area of the site suffers from the perspective used on the drawing and is largely obscured by the city wall; the distance between Bastions 14 (to the N) and 15 is also greatly foreshortened. However, immediately to the N of Bastion 14 the ditch is shown filled with water, to the W of Aldersgate the ditch is apparently present enclosed on its N side by a wall, but the area of the site up to Bastion 14 is shown as an open space. The Braun and Hogenberg map of 1572 (Fig 17) would appear to have a ditch filled with water running to Bastion 15 and Aldersgate, although yet again there is a slight problem with perspective and the area immediately beyond the city wall is obscured. The Newcourt and Faithorne map of 1658 (Fig 18) appears to show that the ditch has been filled in and built over nearly everywhere except in the vicinity of the site, where a narrow ditch is seen to extend from Aldersgate to the bastion at the NW corner of Cripplegate fort. By the time of Ogilby and Morgan's map of 1676

Fig 16. Agas map of c.1562

(Fig 19) the ditch has been infilled and the site was occupied by the Falcon Inn and its premises.

Documents of the period suggest that mention of the city ditch within the development area was spasmodic. The first recorded tenant of the ditch area was Noel Sotherton, a merchant taylor, who was preceded there by his father John, a baron of the exchequer. On 23 April 1589 Noel Sotherton was granted a new 40 year lease of 'a garden now in his tenure situate without Aldersgate under London Wall' (CLRO, City Lands Grant Book, i (1589–1616), ff1v, 14r). There was no specific reference to the city ditch in this lease. Nor was there such in a viewer's certificate of 3 June 1549 concerning a dispute between the City and the owner of the future Christ's Hospital property, and referring to a piece of ground outside Aldersgate, extending from his wall to the town wall and belonging of right to the City (Loengard 1989, no. 252).

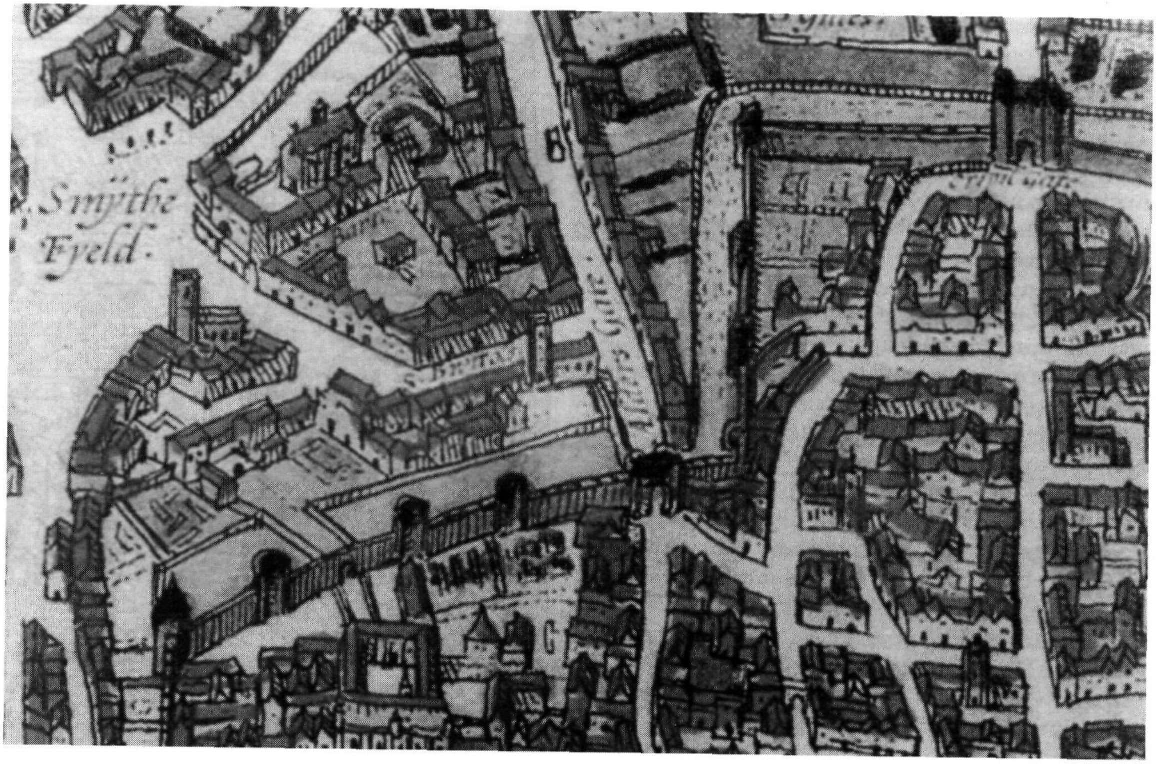


Fig 17. Braun and Hogenberg map of 1572

Fig 18. Newcourt and Faithorne map of 1658

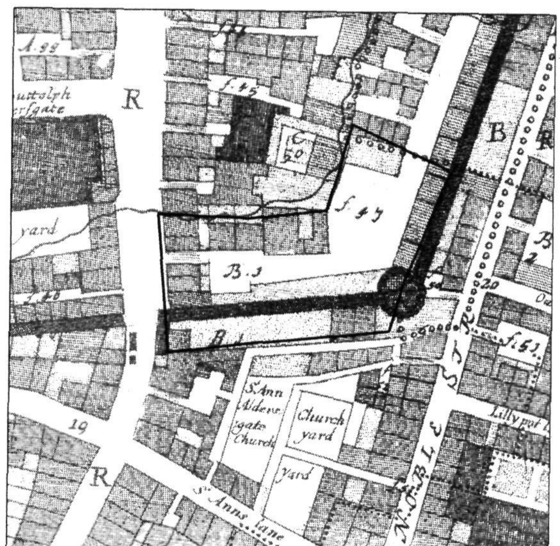


Fig 19. Ogilby and Morgan map of 1676

However, the ditch between Cripplegate and Aldersgate was ordered on 7 May 1602 to be kept in better sort – the tenant (Sotherton) being required to cleanse it from time to time (City Lands Grant Book, i. Ff59v, 60r). The city ditch to the W side of Aldersgate was referred to in 1667–68 (Fire Court, ii.D41) and as late as 1742 (CLRO, City Lands Deeds, Box 5 no. 8).

The leasing of gardens outside the city wall such as that outside Aldersgate leased to Sotherton did not preclude the existence of the city ditch, which the tenant was expected to respect and maintain; this could evidently be taken for granted without always being specified. Apart from the mid 16th-century reference to the 'George' to the south of the Christ's Hospital premises, there is no documentary evidence of building on the site before the Great Fire (Dyson 1999) and none before the Falcon on Ogilby and Morgan's map of 1676, though Leake and Hollar 1667 shows The Great Fire as reaching the site, which would have destroyed any buildings that might have stood there.

A lease of 1668 made by the City to William Thornhill concerning land on the present site treats the property as an ordinary plot of land and makes no mention of any contemporary ditch or of the site's former status as part of the city ditch (CLRO City Lands Deeds, Box 86 no. 3). By the date of Ogilby and Morgan's map, 1676 (Fig 19), the site was occupied by the Falcon Inn and its premises, and it continued to be occupied by the inn in different forms into the 19th century.

The archaeological evidence would seem to indicate that the last phase of the ditch was backfilled some time in the 17th century. It would seem to suggest that the city ditch was backfilled in this vicinity in the late 16th/early 17th century and then it was re-cut later in the 17th century, for example at the time of the Civil War. Evidence of such an occurrence was previously found by Grimes at St Alphage (Grimes 1968). An Act of Common Council of 1643 ordered the destruction of buildings erected against the outer face of the city wall (Smith & Kelsey 1996), suggesting that preparations were made to improve the City's original defences at the time of the Civil War despite the impressive modern defences that were constructed on London's outskirts (Sturdy 1975). So it is not unreasonable to suggest that the ditch was reinstated, where possible, at the same time and then backfilled after 1647 when London's new defences were dismantled with the removal of the Royalist threat.

POST-MEDIEVAL STRUCTURES ON THE INFILLED CITY DITCH

After the Restoration in 1660 the city ditch was no longer required and was infilled with domestic and other waste containing a great deal of animal bone and building material. Evidence of post-medieval structures built on the infilled ditch was recorded across the site. In the centre of the site towards the N of the main excavation area a 17th-century brick wall aligned N–S with associated postholes was recorded. To the NE a 17th-century brick cellar and later brick-lined well were uncovered. Further to the E a brick-floored cess pit, dating to the late 17th century, was found, and in the SE corner of the development area a rectangular brickearth-filled cut was probably the clay floor of a post-medieval structure. These structures were probably part of the Castle and Falcon Inn which occupied the site into the late 19th century. However, a quantity of fragments of red earthenware distillation flasks, associated with the manufacture of strong acids and indicating mid 17th-century metallurgy, was found in the backfilled cellar, which might point to another use for this building.

CONCLUSIONS (Fig 20)

The site at 1–6 Aldersgate Street is of particular importance in contributing to the history of London's defences from Roman times to the post-medieval period. This is the first evidence of an early Roman city boundary ditch to be found W of Cripplegate fort. The city wall has been located with certainty, being slightly further to the N than had previously been suggested. The dating of the construction of the wall has been found to be consistent with the late 2nd/early 3rd century. The discovery of a stair turret and its vicinity to the SW turret of Cripplegate fort is an interesting development. The city gate at Aldersgate, however, was not observed on site and the E part of it may have lain slightly to the E of the evaluation trench in an area where excavation was impossible. The remains of the Saxon ditch are a rare survival as elsewhere on the defensive circuit most of the

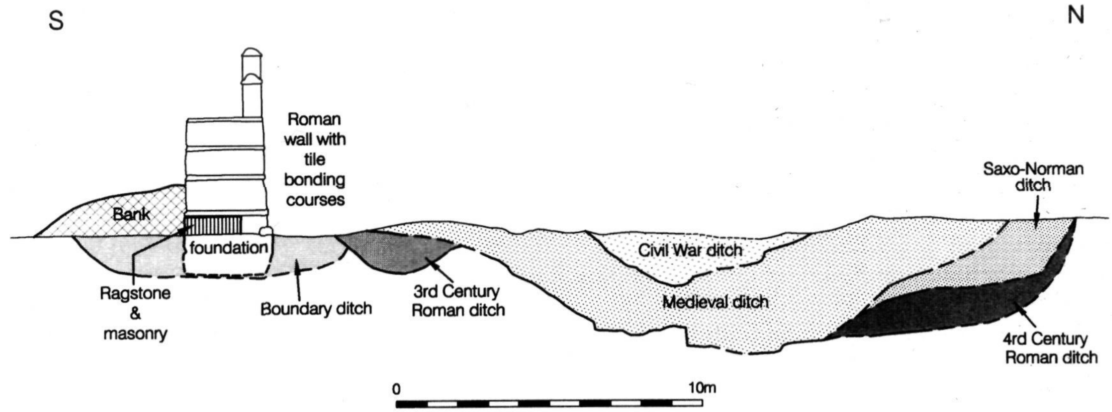


Fig 20. Composite section across the site

evidence for it has been destroyed by the later medieval ditch. The presence of medieval tile in the fabric of Bastion 15 proves its origin as medieval and contributes further proof to the suggestion that all the hollow bastions on the W circuit of the wall are of similar date. The several phases of re-cuts demonstrate that the cleaning and maintaining of the ditch was a continual process during the medieval and early post-medieval periods, necessitated by constant silting up of the waterfilled moat, and by the battle against the citizens of London who continued to use it to dump their rubbish. Finally the 17th-century ditch suggests that London was protected at least in part during the Civil War by an inner ring based on its 1600 year old defences.

THE STANDING CITY WALL FRONTING ONTO NOBLE STREET (Fig 21)

K.R. Sabel

The wall forming the E and SE boundary of the site (see plan, Fig 21) was recorded and analysed prior to the redevelopment and a watching brief was conducted during the wall's reduction as part of the works associated with the new building. The wall's surviving elements indicate the development of the buildings along the line of the city wall from the Roman period to the 20th century. A detailed analysis can be found in the report (Sabel *et al* 1997). This section briefly summarises the historic development of the buildings.

The foundations of the wall were formed by the Roman and medieval wall foundations

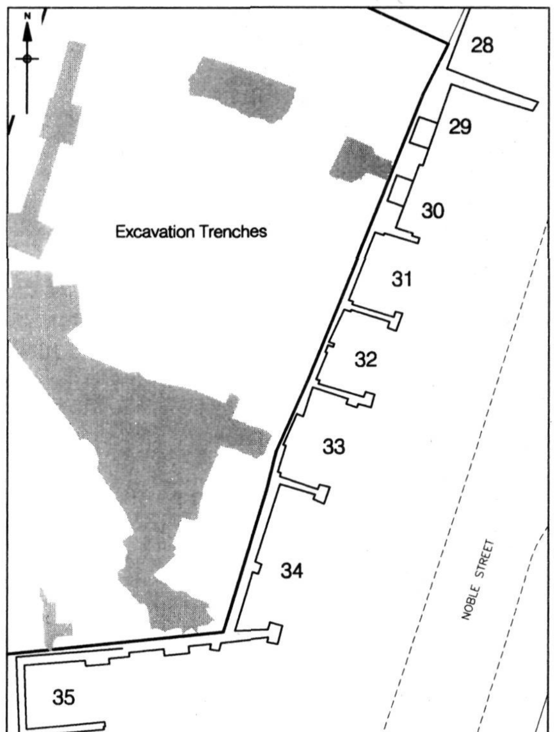


Fig 21. Location of wall

revealed by Grimes in excavations in 1949, 1957, and 1961–63 (Grimes 1968). The earliest surviving post-medieval building was the 18th- to early 19th-century building which stood to the W of the current wall. Its E wall was most recently the W wall of 34 Noble Street, parts of its S wall survive in the party wall between Alder/Castle House and 35 Noble Street, and evidence was found of a wall relating to this building extending W from the W wall of 34 Noble Street. An element of the party wall between 34 and 35 Noble Street of the same period indicates that these properties were delineated at this time. These buildings were mostly built re-using 15th- to 17th-century bricks with fewer more contemporary bricks. Lime wash on the E wall face in 34 Noble Street suggests that the external face may not have been intended to be seen. There is also evidence of the party wall separating 32 and 33 Noble Street at this period, although this does not extend to the main wall face. There was also a late 18th- to early 19th-century element of the same party wall.

During the 19th century the area immediately to the E of the current wall consisted of the back yards of the properties fronting Noble Street and arches through the party walls of 33 and 34 and 32 and 33 Noble Street which linked these areas remain extant.

Later in the 19th century a predecessor of both Falcon House and Alder House was built in brick with a brick-vaulted basement supported on cast iron beams set into the side walls. The E wall of this building now forms the main city wall from the S part of 28 Noble Street to 33 Noble Street, and the wall passed behind the 18th- to early 19th-century elements in 34 Noble Street. The construction of this building would have necessitated the demolition of any buildings to the W of the wall. The warehouse at 35 Noble Street was also built during this period. It was brick built with bonding timbers and presented a classical external W elevation with blind arched windows towards the rear elevation of the church of St Anne and St Agnes (Face 4), with the brickwork built in Flemish bond, whereas elsewhere in the building it was built in English bond for strength.

Later still in the 19th century, 32 Noble Street was extended as far as the wall face and the six storey building which formed 29 and 30 Noble Street was built against the wall (Goad Fire Insurance 1940s), with a window overlooking the back yard of No. 31. The construction of these buildings would have closed any path which may have existed through the back yards of the Noble Street properties. 28 Noble Street was also built during this period, although later than 29 and 30 Noble Street.

With the removal of any rear access between the buildings along Noble Street and with a pressure towards the intensified use of space in the buildings, such as the need to install internal bathrooms, the other Noble Street properties were gradually extended to the wall from the late 19th century until the Second World War bombing. 33 Noble Street was extended either before or at the same time as 34 Noble Street. The relationship between the extensions of 31 and 32 Noble Street is ambiguous. The extensions of 31–34 Noble Street were mostly two storied, with the basements excavated from the back yards and their ground floors lit by skylights. The southern end of 34 Noble Street's extension was of three storeys. Nos 28, 29 and 30, and 35 were internally re-modelled at this time.

During the 20th century two window recesses and windows were inserted in the W wall of 29 and 30 Noble Street at ground floor level. These were only finally blocked after the demolition of the buildings, probably during the 1950s. After the blocking, the N end of the W face (Face 6) was rendered and a new wall with a glazed brick W face was built along the rest of Faces 5 and 6.

The wall's development can therefore be seen to reflect changing social needs and pressures. There was a move towards warehouse and commercial use in the 19th century. In the later 19th and early 20th century the extension of some of the properties to the wall imposed a social and economic pressure for the other Noble Street properties to follow suit. The late 19th- and 20th-century internal alterations in many cases reflected the provision of extra comfort and better facilities in buildings, with the insertion of new windows and internal bathrooms and WCs.

THE DECORATED SAMIAN WARE

Joanna Bird

[268] Dr 37 in Montans ware (Fig 22.22), with interior groove below the rim. The large hooked chevrons, arrowhead motif, wavy-line borders, and what is probably the same lion occur on a mould in the style of the Leaf Stamp Potter (Simpson 1976, fig 7, no. 32). The ring motif was not apparently common at Montans, but *cf* fig 2, no. 10, stamped by Malcio. A date *c.*AD 110–145 is likely.

[268] Dr 37 in the style of Drusus I (X-3) of Les Martres-de-Veyre. The dolphin frieze and beaded

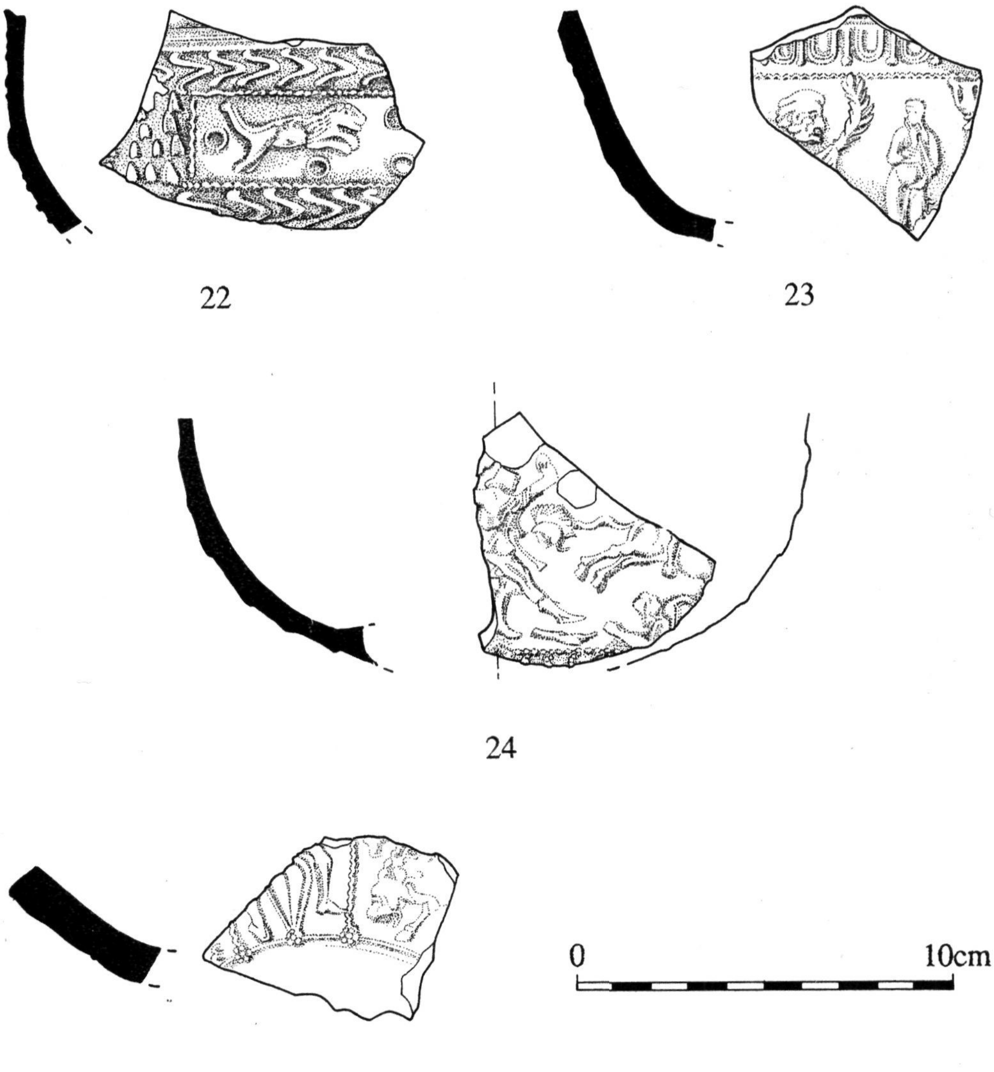


Fig 22. Samian ware

border are on Stanfield and Simpson (1958), pl 14, no. 173. *c.*AD 100–125.
[268] Dr 37 in the style of Drusus I (X-3) of Les Martres-de-Veyre. Stanfield and Simpson pl 15, no. 185 has the band of beaded rosettes, wreath of anchor motifs, and fringed scrolls; the figures are too fragmentary to identify. *c.*AD 100–125.
[268] Dr 37 by X-13 (Donnaucus) of Les Martres-de-Veyre or a potter of the Sacer group at Lezoux; they shared the leaf motif, Rogers L19, and similar beads and rosettes. The hare is not precisely identifiable. *c.*AD 115–130.
[268] Dr 37 in the style of Avitus of Lezoux (Fig 22.23). The ovolo, crisp wavy-line border and guideline (here below the border) are on Stanfield and Simpson pl 64, no. 18, the mask and lyre on pl 64, no. 22, and the cushion-shaped motif on pl 63, no. 10. The frond is Rogers J170, ascribed to Avitus; the figure is close to Oswald 923. *c.*AD 125–145.
[437] Dr 37 in style of X-13 (Donnaucus) of Les Martres-de-Veyre. The ovolo, beads, and rosette are on Stanfield and Simpson pl 42, no. 487; the motif in the panel is probably a tripod but is smudged (*cf* pl 42, no. 489). *c.*AD 100–125.
[437] Dr 37, probably by X-5 of Lezoux. The

ovolo, border, and corded motif are on Stanfield and Simpson pl 67, no. 2, the double medallion on pl 67, no. 8. The motif in the medallion is not identifiable. *c*.AD 125–150.

[437] Dr 37, Lezoux. The ovolo is too blurred and the figures too fragmentary to suggest an attribution; the rather heavy beads indicate an Antonine date.

[580] Dr 37 in the style of X-2 of Les Martres-de-Veyre (Fig 22.24). The figure is probably an Amazon, a larger version of that on Stanfield and Simpson pl 6, no. 62; the shield, helmet, border, and wreath are on pl 7, no. 95. The horse and rider are probably Oswald 246, recorded for X-1. *c*.AD 100–125.

[640] Dr 37 in the style of X-12 (Ioenalis) of Les Martres-de-Veyre. The ovolo and beads are on Stanfield and Simpson pl 41, no. 478. *c*.AD 100–125.

[655] Dr 37 in the style of X-9 (Medetus-Ranto) of Les Martres-de-Veyre (Fig 22.25). The crisp border, beaded rosette, and the lines at the base are on Stanfield and Simpson pl 31, no. 368; the animal may be the bear on pl 30, no. 360, and the figure is probably the Hercules on pl 34, no. 410. The leaf is Rogers U161, recorded for X-9. *c*.AD 110–130.

THE POST-ROMAN POTTERY

Chris Jarrett

The post-Roman pottery from the site dates from the early medieval period to the 17th century and reflects the chronology of the city ditches and activity within this area. A total of 1,933 sherds of pottery for these periods was recovered, weighing 39kg. The pottery was quantified by sherd counts, weight, and estimated vessel equivalents (Eves), but sherd counts appear to give a better representation of the material because of its fragmentary nature. This report outlines the ceramic chronology on the site with reference to its more interesting aspects and a more detailed report is available as part of the archive. Table 1 shows the distribution of pottery throughout Phases 4 to 12, quantified by sherd count. The final phase produced entirely residual pottery in modern features.

Phase 4, *c*.1050/1080–1150

Phases 4 and 5 represented early medieval activity on the site, mostly datable to the late 11th century, with Early Surrey ware (ESUR), Early medieval shell-tempered ware (EMSH), and glazed Stamford ware (STAM) present; all dated 1050–1150. Additionally other 11th-century pottery types occurred (see Table 1). Stamford ware was present as unglazed crucibles (Fig 23.26) and glazed pitchers (Fig 23.27). Imported pottery was present as Andenne-type ware (ANDE), North French wares (NFRE and NFRY), Normandy gritty ware (NORM), and Red-painted ware (REDP). A small number of sherds of London-type ware and its coarse variant (LCOAR), some glazed, were present and indicated activity from the end of the 11th century. Forms in these wares were usually jar-shaped and mostly used for cooking as indicated by the presence of external sooting, but bowls were present in most fabrics as well as a lamp in the Early medieval sandy fabric (EMS). A small number of residual Early Saxon pottery sherds of a 5th- or 6th-century date were present in the Phase 4 and 5 ditches, possibly imported onto the site with material from elsewhere. 5th-century Saxon activity has been recorded at Clerkenwell to the NW. However, Early Saxon occupation is believed to be sporadic and temporary in the vicinity around abandoned *Londinium* and it is difficult to interpret the presence of the small number of sherds on the site (Cowie & Harding 2000, 178).

Phase 5, *c*.1080–1150

The Saxo-Norman pottery from Phase 5 largely contained those pottery types present in the previous phase, but an absence of London-type wares was noted. The latter must infer an 11th-to early 12th-century date for this phase because of their presence in the earlier period of activity. Of interest was the presence of a large number of early medieval crucible fragments, mostly recovered from gully [675] and almost exclusively present in this phase in fill [668] where the quantity was so great the deposit was sampled. The crucibles from fill [668] consisted of some 497 fragments, weighing 1168g; the true number of crucibles present was under-represented and only 10 lips of individual crucibles could be identified. The majority of these crucibles were in Early medieval coarse whiteware (EMCW) with four sherds of Stamford ware crucibles present. The crucibles were impossible to reconstruct to produce a complete profile for a vessel, but the

Table 1. Phases 4–12. Quantification of pottery by sherd count

Code	**Fabric and date range**	**Phase** 4	5	6	7	8	9	10	11	12	**Total**
RPOT	Roman pottery	9	1						1		11
ESAX	Early Saxon pottery, 5th or 6th century	3	1								4
LSS	Late Saxon shelly ware, 900–1050	2	2								4
NFRE	Miscellaneous North French unglazed wares, 900–1200	1									1
NFRY	Miscellaneous North French glazed wares, 900–1200			1							1
REDP	Red painted ware, 900–1250	4	3						2		9
RHGR	Rhenish greyware, 900–1100		1								1
THET	Ipswich Thetford-type ware, 900–1150	2	1	2					1		6
EMS	Early med. sandy ware, 970–1100	23	13	2					1		39
EMCW	Early med. coarse whiteware, 1000–1150		493								493
EMSS	Early med. sand and shell ware, 1000–1150	21	9	3					2		35
ANDE	Andenne-type ware, 1050–1200	1	4								5
EMCH	Early med. chalky ware, 1050–1150	3	3						2		8
EMIS	Early med. iron-rich sandy wares, 1050–1150	7	2	8				2	1		20
EMSH	Early med. shell-tempered ware, 1050–1150	14	4					1			19
ESUR	Early Surrey ware, 1050–1150	26	15	1				2			44
LOGR	Local greyware, 1050–1150	1	3	1							5
NORM	Normandy gritty ware, 1050–1250	1									1
STAM	Stamford ware, 1050–1150	61	24	1							86
LCOAR	Coarse London-type ware, 1080–1200	4		2					1		7
LOND	London-type ware, 1080–1350	3		47	7	7	1	22	36	13	136
SHER	South Hertfordshire/Limpsfield greyware, 1140–1300					1		7	20		28
ROUL	Late Rouen ware, 1250–1350								1		1
KING	Kingston-type ware, 1230–1400			37	7	18		23	21	9	115
LOND HD	London-type ware, highly decorated 1240–1350			16				1			17
SAIN	Saintonge ware, 1250–1650				1			2	1		4
CBW	Coarse Border ware, 1270–1500			35	26	77	1	90	57	28	314
MG	Mill Green ware, 1270–1350							1	3		4
DUTR	Dutch redware, 1300–1650					1					1
SIEG	Siegburg stoneware, 1300–1500				1	1		3	1	1	7
CBW CIST	Coarse Border ware cisterns, 1340–1500					1			1	5	7
CBW FT	CBW cooking pots, flat-topped rims, 1340–1500				1	4		3	5		13
LMHG	Late med. Hertfordshire glazed-ware, 1340–1450					1		6	3	1	11
CHEA	Cheam whiteware, 1350–1500			1		11		10	3	3	28
CUER	Cuerda seca Spanish tin-glazed ware, 1350–1600								1		1
LANG	Langerwehe stoneware, 1350–1500					1				1	2
CBW BIF	CBW cooking pots, bifid rim, 1380–1500				2	3		3	1		9
TUDG	'Tudor green' ware, 1380–1500							12	11	7	30
LLON	Late London ware, 1400–1500					14		18	6	16	54
LLSL	Late London slipware, 1400–1500							9	1	3	13
TGW IMP	Tin-glazed ware (imported)								1		1
VALM	Mature Valencian Lustreware, 1430–1500					1					1
ANDAL	Late Andalusian tin-glazed ware, 1480–1550							1	1		2
CHEAR	Cheam redware, 1480–1550					1		2	4	4	11
CSTN	Cistercian ware, 1480–1600							1			1

Table 1. (Continued)

Code	Fabric and date range	Phase 4	5	6	7	8	9	10	11	12	Total
EBORD	Early Border ware, 1480–1550								1		1
MPUR	Midlands purple ware, 1480–1750									1	1
PMRE	Early post-med. redware, 1480–1600					10		42	72	26	150
PMSR	Post-med, slip-coated redwares, 1480–1650					1		3	10	4	18
RAER	Raeren stoneware, 1480–1610					1		15	12		28
SNTG	South Netherlands maiolica, 1480–1575							2			2
SPOW	Miscellaneous Spanish post-med. wares 1480–1900							1			1
COLP	Columbian Plain ware, 1500–1600							1			1
DUTSL	Dutch slip-coated ware, 1500–1650								1		1
BORD	Border ware, 1550–1700							1	1	4	6
FREC	Frechen stoneware, 1550–1700									2	2
NORS	Normandy stoneware, 1550–1700							1			1
PMBL	Post-med. black-glazed, 1580–1700								1	5	6
PMFR	Post-med. fine redware, 1580–1700									1	1
PMR	Post-med. redware, 1580–1900							1	3	42	46
TGW A	Tin-glazed ware, Orton style A, 1612–1650									3	3
TGW D	Tin-glazed ware, Orton style D, 1630–1680									1	1
Total sherds		186	579	157	45	154	2	286	290	184	1883

EMCW crucibles appeared to be hand-made, hemispherical in shape, with pulled lips. The rim diameters of these vessels ranged from 60 to 160mm, with the vast majority of the vessels being 80–100mm; this fits well with the descriptions of these vessels by Bayley *et al* (1991). None of the vessels recovered from the gully had an additional external surface of clay, noted by Bayley *et al*, which would have given the vessels greater thermal properties. However, a small number of crucibles with the additional clay 'cladding' were noted elsewhere on the site. A high proportion of the vessels were self glazed by the heating of the crucibles. Metallurgical analysis of the crucibles and metal working residues from the site indicated that the crucibles were employed in silver refining and silver processing by means of lead extraction. Saxo-Norman crucibles have been found elsewhere within the City of London for this period, for example a STAM example was present on the adjacent site of 7–12 Aldersgate (Vince 1990, 90), and more recently within the Cripplegate area (Pearce in prep); the large quantities of crucibles indicated metalworking on a sizeable scale on the site or in the vicinity.

Phase 6, *c*.1230/1270–1350

The Phase 6 ditches contained mostly London type wares, usually as glazed and slipped jugs but some examples of the highly decorated style (LOND HD) were present, dated 1240–1350. Kingston type ware was also notably present; this first appears in London *c*.1230. Another later Surrey whiteware, Coarse Border ware (CBW) dating from *c*.1270, was rare in the Area A ditches. A decorated CBW baluster jug with incised circular discs and piercings was recorded in this phase (Fig 23.28). Coarse Border ware was more prevalent in other areas where ditches of this phase were recorded. Other late 13th- to early 14th-century pottery assemblages from London at Swan Lane and Trig Lane demonstrate that KING becomes less important than CBW (Pearce & Vince 1988, 17). The process where CBW became more important was probably occurring in this phase.

Phase 7, *c*.1350–1400

In the Phase 7 ditches, London-type ware was sparsely represented – it finished production around *c*.1350 – but Kingston ware was present and included a pipkin (Fig 23.29), while Coarse Border ware was the dominant pottery type. In this phase forms appeared for the first time in the latter ware as cisterns and cooking pots/jars with flat topped rims, dating from *c*.1340, and cooking pots with bifid (lid-seated) rims, dating

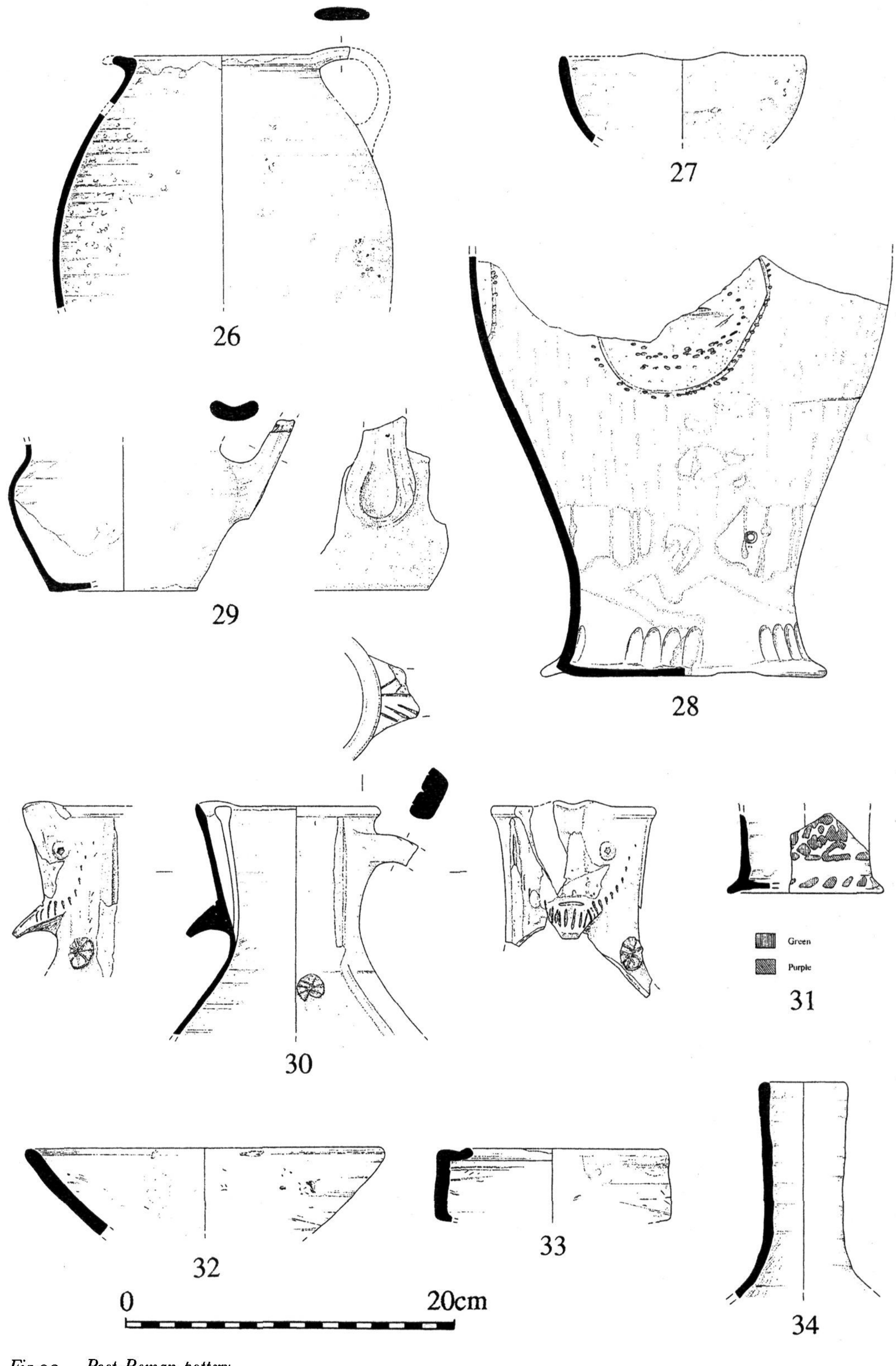


Fig 23. Post-Roman pottery

from 1380. Of note also were imported Siegburg stoneware and the base of a mottled green-glazed Saintonge (SAIM) jug.

Phase 8, *c.*1400–1500/50

The fills of ditches and features in Phase 8 again had a high occurrence of Coarse Border ware, but 15th-century Late London ware was present as well as Dutch redware (DUTR) and Langerwehe stoneware (LANG). In the latest fill of ditch [388], Raeren stoneware (RAER) was present for the first time, with Early Post-Medieval redware (PMRE) (formerly Tudor brown ware) indicating infilling at the end of the 15th century and early 16th century. Imported pottery also included a rim sherd from a Mature Valencian lustre ware (VALM) dish. Amongst the residual pottery was a rare CBW anthropomorphic jug depicting a male figure with an applied beard and a circular stamp with a central stamped star used to form the eyes. The body of the jug has applied bands of clay forming arms and other decoration as well as applied circular stamps consisting of four crossing lines (Fig 23.30). Few occurrences of CBW anthropomorphic jugs are known in London, and this example has more in common stylistically with the Kingston industry versions than other CBW examples (Pearce & Vince 1988, 108, fig 63, no. 65; 130, fig 85; 151, fig 106, no. 413). However, this style of CBW anthropomorphic jug is not necessarily unique for the industry. Anthropomorphic jugs in the London type, Kingston, and Coarse Border ware pottery industries fall within a general mid 13th- and 14th-century dating, but this example probably dates to within the highly decorated period for this ware of 1270–1350.

Phase 9 and 10, *c.*1480–1600

The ditch of Phase 9 [439] contained sparse amounts of pottery, mostly residual. The earliest ditch in Phase 10, Area A, produced sherds of Early Post-Medieval redware, Tudor green ware (TUDG), and probably residual Coarse Border ware, indicating a similar late 15th- to early 16th-century date as the Phase 8 ditches. The latest ditch in this phase contained Surrey/Hampshire Border ware (BORDG and BORDY) dated from *c.*1550–1700, while the occurrence of Post-Medieval redware (PMR) would indicate a date at the end of the 16th century for its infilling. Present also in the fills of the ditch were imported sherds of Saintonge ware (SAIN), South Netherlands maiolica (SNTG), and 16th-century Spanish wares such as Late Andalusian tin-glazed ware and Columbian Plain ware.

Phase 11, *c.*1580–1650

The final ditch in Area A [286] contained Early Post-Medieval redware PMRE, Border ware (BORDY), Post-Medieval black glazed ware (PMBL), and Post-medieval redware (PMR). An early 17th-century date for the back-filling of the ditch would seem most likely, but the material did not allow for more precise dating. Imported wares in this phase consisted of a rare sherd of Spanish Cuerda Seca (CUER), tin-glaze from the splayed base of a possible albarello (Fig 23.31).

Phase 12, *c.*1612–50

Features in this phase were associated with occupation features on the infilled city ditches. Gully [289] contained in its backfill sherds of PMBL, PMR, and a sherd of Tin-glazed ware in Orton style A (TGW A) as well as a *c.*1640–60 clay tobacco pipe. Industrial activity was noted in this phase as redware distillation bottles, associated with the manufacture of strong mineral acids, for example nitric or sulphuric acid, were present in three deposits. A very large quantity of these vessels was present in fill [211] of the cellar [220], together with a possible industrial saucer (cupel) (Fig 23.32). Trench D provided a small sample of these vessels, present as 27 sherds, representing at least 13 flasks, along with a PMR handled bowl. Layer [216], also in Area D, contained 20 fragments of distillation bottles, together with another part of an industrial vessel (Fig 23.33) and, in Test Trench 1, fill [207] of cut [206] contained the base of a bottle.

The fabrics of these distillation bottles were Post-medieval redware, often poorly made and fired, with blisters (Fig 23.34). The form is known from the first half of the 16th century from kiln waste at Kingston (Nelson 1981, 100) and from a group at Gresham Street (Moorhouse 1972, 118–19), where they are described as bottle shaped. In PMR, the vessel was also produced at Deptford in the late 17th–early 18th century (Divers & Jarrett 1999, 14–15, fig 10 no. 7). The distillation bottles from the site are probably 17th-century in date, and in the cellar these vessels were associated with an Atkinson and Oswald type 12 clay tobacco pipe (*c.*1640–1660). Many of the vessels had a red deposit (hematite), a result of acid production, possibly for the parting of precious metals, such as silver and gold (Bayley 1992, 7–8, fig 9; Heyworth 1996, 131). Therefore, mid 17th-century metallurgy, probably associated with the building belonging to cellar [220], was taking place on the site, in an area – Gresham Street and Cripplegate – noted for its metal working environs (Chew & Pearce 1999, 24).

THE SMALL FINDS

Nina Crummy

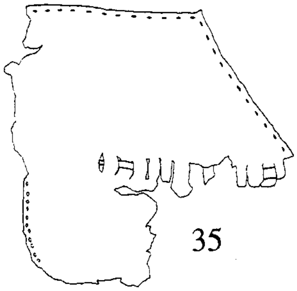
The only item definitely of Roman date is a small plain bone counter with a lathe-centre mark on the upper face from context [650]. This simple form first appears in the mid 1st century and was probably current throughout the Roman period (Crummy 1983, 91, Type 1).

The largest group of material is a collection of leatherwork from the fill of the city ditch, mainly of late Saxon and 14th-century date. It specifically complements two previously published groups from the City: the Saxo-Norman shoes and straps in Pritchard 1991, and the medieval shoes in Grew & de Neergaard 1988. Referencing has therefore been almost exclusively limited to these publications wherever possible. As the assemblage is quite small, no attempt has been made to identify the types of leather used, though differences are apparent to the naked eye.

The earliest leather comes from a single late Saxon context [580], and consists mainly of worn and fragmentary pieces of turnshoes, many too small to identify the style or date. Of those that can be dated all but one are 11th-century. The exception is an upper fragment from the heel of a low 10th-century shoe, on which the raised heel extension does not reach the solid top edge of the quarters. The shoe must have been seamed down the side, as was a shoe from Milk Street, (Pritchard 1991, fig 3.100). The 11th-century pieces are uppers and top-bands from ankle-boots. At least three pieces were from drawstring ankle-boots of the late 11th century. One quarters fragment (Fig 24.35) is of a similar pattern to an ankle-boot from St Magnus House, but has a single rather than double thong (*ibid*, fig 3.110). A fragment of a strap is pierced, and resembles one for a latchet fastening on a shoe from King Street (*ibid*, fig 3.104).

Apart from shoes the leatherwork from context [580] consists of small waste offcuts, two unidentified pieces, and strap fragments. The best-preserved strap (Fig 24.36) was constructed by a method seen on 11th- and 12th-century straps from sites in the City (*ibid*, 239). An unusual item, found in association with the 10th-century shoe fragment, consists of two thicknesses of leather folded over and held together by a thong passed through a series of incisions. No edges survive and the piece is so friable that it has not been illustrated. It may be binding to pad the edge of a wooden or metal object, or was perhaps from a garment. A somewhat similar fragment from the Barbican Ditch at Oxford Castle, though only a single folded thickness and of later date, had both edges surviving and was identified as from a belt or strap (Jones 1976, fig 20.37). The final piece from [580] (Fig 24.37) is a more or less rectangular panel with edge/flesh stitching along one long and one short side and grain/flesh stitching along the other short side. The other long side is an unsewn, cut, slightly curved edge, decorated with two rows of fine incisions set herringbone fashion. It may be one half of a two-piece collar.

Fig 24. 35 [580]. Fragment from the upper of an adult's ankle-boot with a small piece of a drawstring slotted through a line of incisions. The upper edge and side seam are sewn with edge/flesh stitching. This style of ankle-boot has been dated to the late 11th century with similar examples recovered from excavations at St Magnus House (Pritchard 1991, fig 3.110–11); 36 [580]. Length of strap formed by folding over both sides and sewing the edges together with a butt seam. This seam was reinforced by two further lines of stitching, one along each side, through the full double thickness. Length 290mm; 37 [580]. Panel of thin leather with edge/flesh stitching along one long and one short side and grain/flesh stitching along the other short side. The other long side is an unsewn cut slightly curved edge, decorated with two rows of fine incisions set herringbone fashion. Maximum dimensions 206 by 82mm. Possibly part of a collar; 38 [509]. Adult's left shoe of front-laced type: vamp, tongue, rand. Length (taken from rand) 255mm. The vamp has split from its opening down towards the toes. The tongue was attached with a binding seam along one side only. Similar to a front-laced shoe dated c.1330–50 from Baynard's Castle (Grew & de Neergaard 1988, fig 98).



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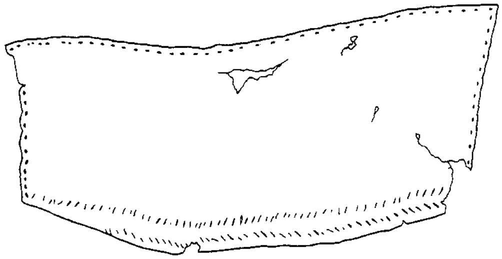

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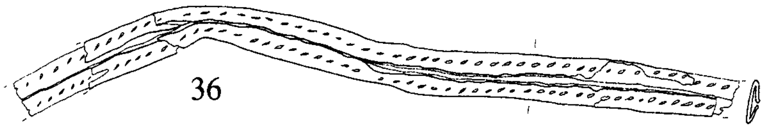

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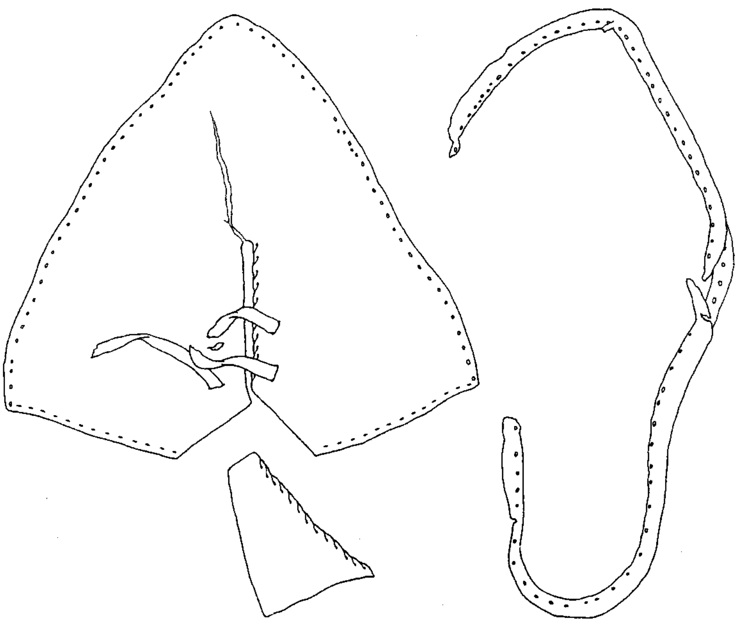

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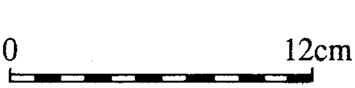


Three contexts from the various infillings of the city ditch produced the majority of the later medieval leatherwork: [509], [500], and [492]. In all three contexts the leatherwork again consists primarily of fragments of shoes, mainly soles and insoles of both one- and two-piece form, both child- and adult-sized. Some strap fragments and offcuts from leatherworking were also recovered. A waste fragment from [500B/509] is similar to a vamp with an elongated and blunt-ended toe, but is of ungenerous width and cut irregularly at the throat.

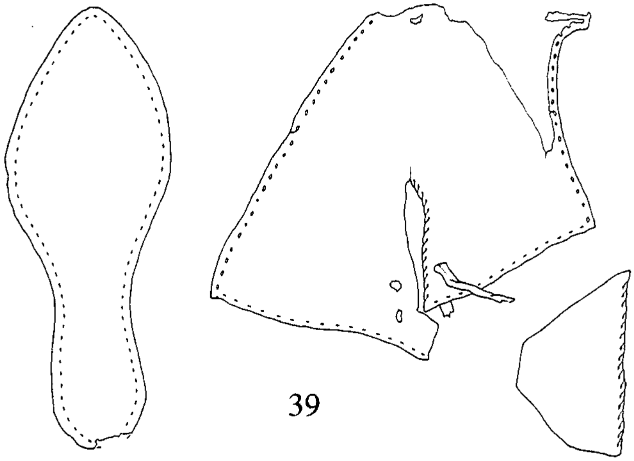
The more or less complete shoes and the more substantial upper fragments are closely comparable to two well-dated groups from Baynard's Castle dock, though none were recovered that match the more elaborate and decorated examples from that high quality assemblage (Grew & de Neergaard 1988, 28–9).

From [509] came three shoes comparable to examples from Baynard's Castle dated *c.*1330–50. Two, one a child's, are front-laced (Figs 24.38; 25.39) and one is toggle-fastened (Fig 25.40). On the toggle-fastened shoe the quarters have the high back and dipped sides also found on shoes dated to the later 14th century, and it may be appropriate to date this example close to *c.*1350. Other quarters of this form are also present in the context, as are two low open vamps with the elongated blunt-ended toe, *poulaine*, typical of the late 14th century (Fig 26.41–42). One of these vamps has a buckle-and-strap fastening (Fig 26.41). Moss packing from a *poulaine* was also recovered from this context. Of the strap fragments from [509], one is tongue-shaped, with a slit near the end, and is probably from a shoe, and another is partly twisted.

All the surviving features and designs of the shoes from [500] are matched by late 14th-century shoes from Baynard's Castle. They include further examples of quarters with high back and low sides, and other quarters which have a dip on one side only. One of these has the two lace-holes on the side opposite the dip that show it to be from a shoe fastened by a side-latchet. Two vamp fragments appear to be from boots with toggle fastenings. Each has edge/flesh stitching on its upper edge, and the remains of internal terminals from two straps set just within the edge. There is no vamp opening between these terminals. Two shoes from [500] are reasonably complete. One is a shoe with buckle-and-strap fastening (Fig 26.43), and the other is a well-preserved front-laced ankle-shoe (Fig 27.44). Deformities of the feet are demonstrated by the toggle-fastened shoe (Fig 25.40) on which the heel of the sole is worn on the inner side, a tread characteristic of pigeon toes, and a sole fragment is worn under both tread and toe tip, which may indicate hammer toe (Grew & de Neergaard 1988, 106–9). Two decorated fragments of leather came from [500], neither necessarily from shoes. One has a serrated cut edge, and the other has two parallel lines of short incisions down the centre.

Context [492] produced two fragments of uppers from 15th-century front-laced ankle-shoes. One is reasonably substantial, though its lower edges and most of one side of the vamp are missing (Fig 28.45). Both this example and the second fragment from this context have only two lace-holes. A possible parallel is a shoe from Sewer Lane, Hull, also dated to the 15th century (Armstrong 1977, fig 21, 13).

Fig 25. 39 [509]. Child's left shoe of front-laced type: sole, vamp, tongue. Length 175mm. Tongue attached with a binding seam along one side only; 40 [509]. Adult's left shoe of toggle-fastened type: sole, vamp, quarters. Sole scored and partly split across the tread, and with the inner side of the heel worn through. Length 226mm. The quarters have a fairly high back and low dip at the side, with the inner edge terminating in a butt seam with edge/flesh stitching. Here would have been attached the inserts, now missing, needed to allow the foot to be eased into the shoe. This shoe combines features seen on two from a context dated c.1330–50 at Baynard's Castle. The shapes of the quarters and of the sole are matched on a front-laced shoe (Grew & de Neergaard 1988, fig 98), while the side inserts occur on a toggle-fastened example (ibid, fig 95). The wear on the inner side of the heel is characteristic of 'pigeon toes' (ibid, 106–7).



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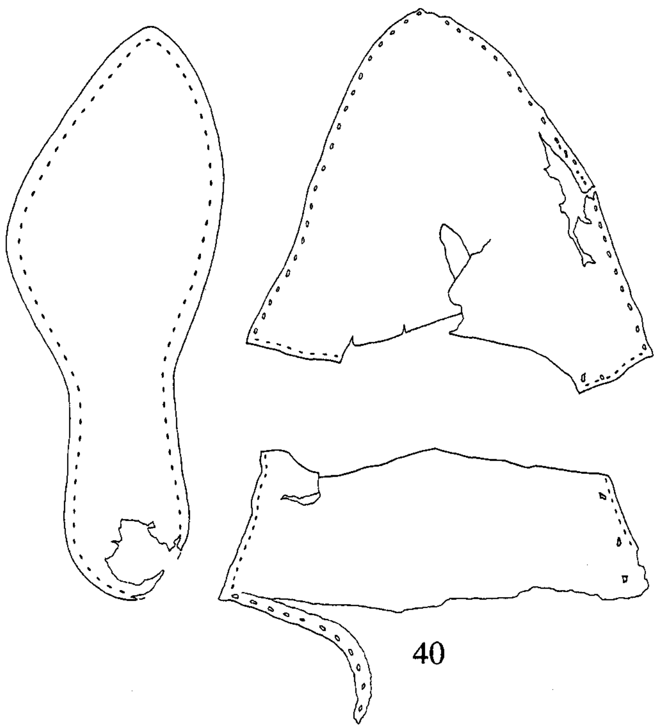

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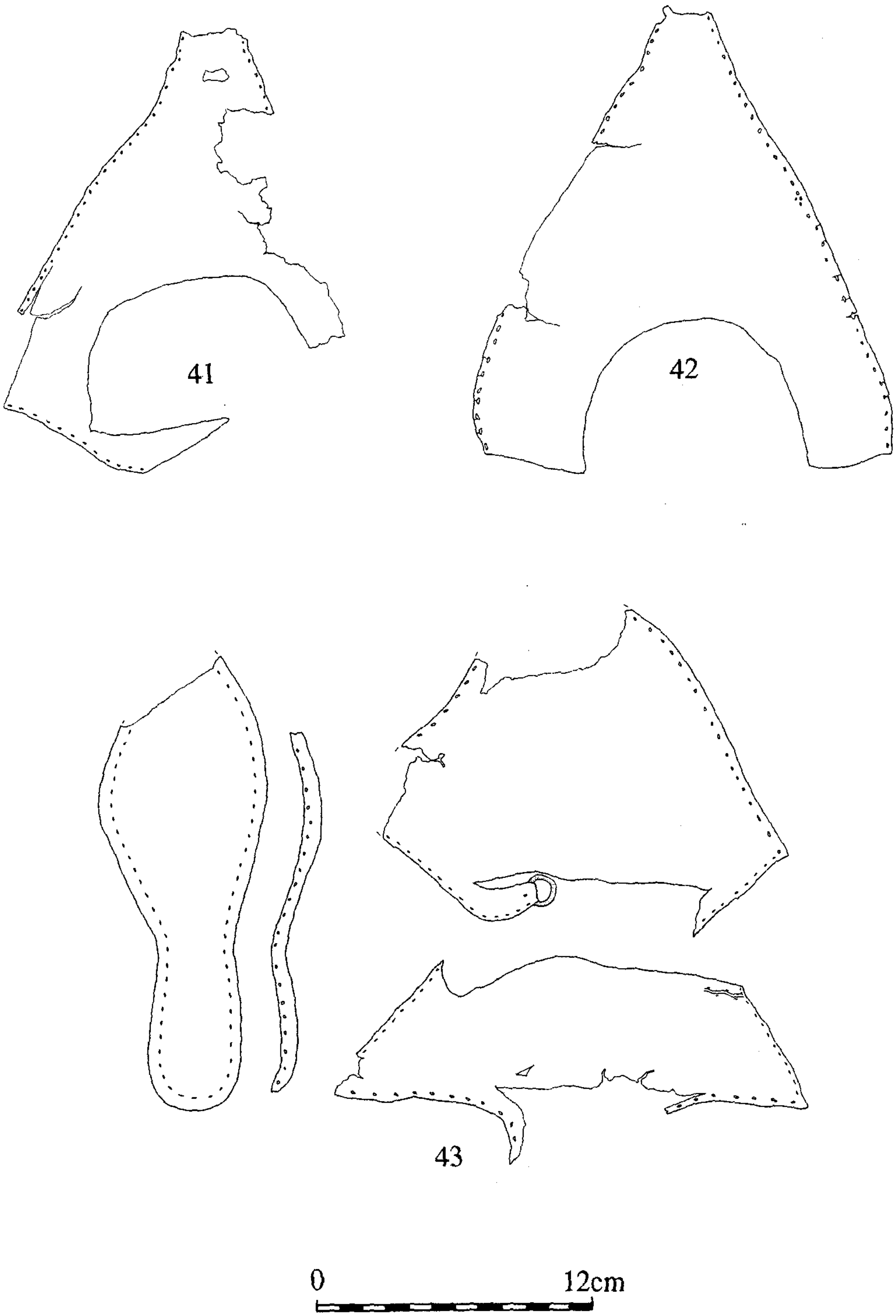

Fig 26. *41 [509]. Adult's left shoe with buckle-and-strap fastening: vamp. Curved open throat, and blunt-ended elongated toe. One side is missing, the other terminates in a butt seam above which projects a strap with pointed end and small hole for a buckle tongue. Similar to a shoe from Baynard's Castle dated c.1375–1400 (Grew & de Neergaard 1988, fig 102); 42 [509]. Adult's right shoe: vamp. Curved open throat, and the elongated blunt-ended toe typical of the late 14th century. Both sides end at a butt seam, with no sign of a strap. Similar to a shoe with front-latchet fastening from Baynard's Castle dated c.1375–1400 (ibid, fig 103); 43 [500]. Adult's left shoe with buckle-and-strap fastening: sole, vamp, quarters, rand. The toe, on both sole and vamp, is missing. The circular buckle is iron with a tin coating; its tongue is missing. The quarters are low-sided on the outer side only. This asymmetry can be seen on a late 14th-century front-laced shoe from Baynard's Castle (ibid, fig 99).*

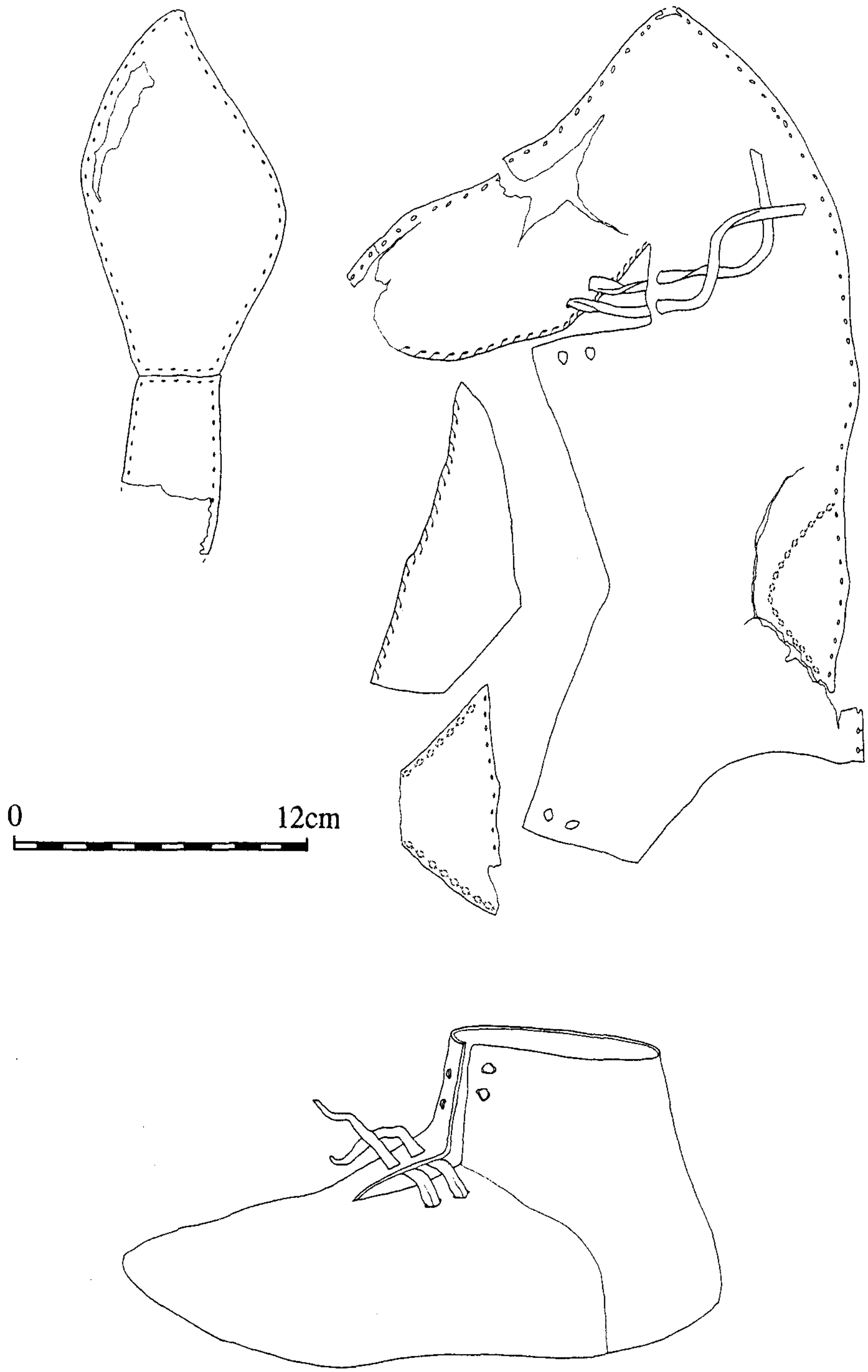

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Fig 27. 44 [500]. Adult's right front-laced ankle-shoe: sole, vamp, tongue, heel-stiffener, rand. Length 240mm. Two-piece sole, worn away at heel, and along the inner edge at the toe. The vamp is in one-piece, the two lower laces survive. The tongue was attached with a binding seam along one edge only. A similar late 14th-century ankle-shoe, but with an insert as the inner vamp wing, was found at Baynard's Castle (Grew & de Neergaard 1988, fig 101).

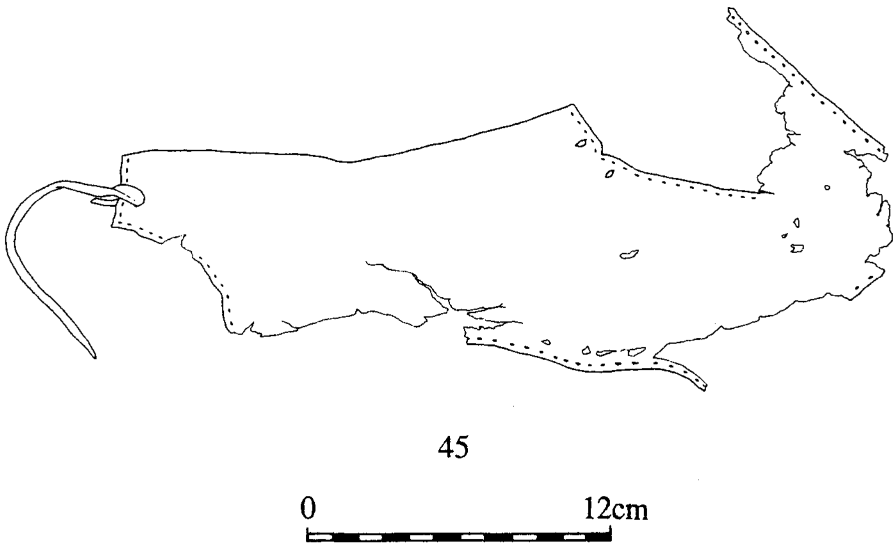
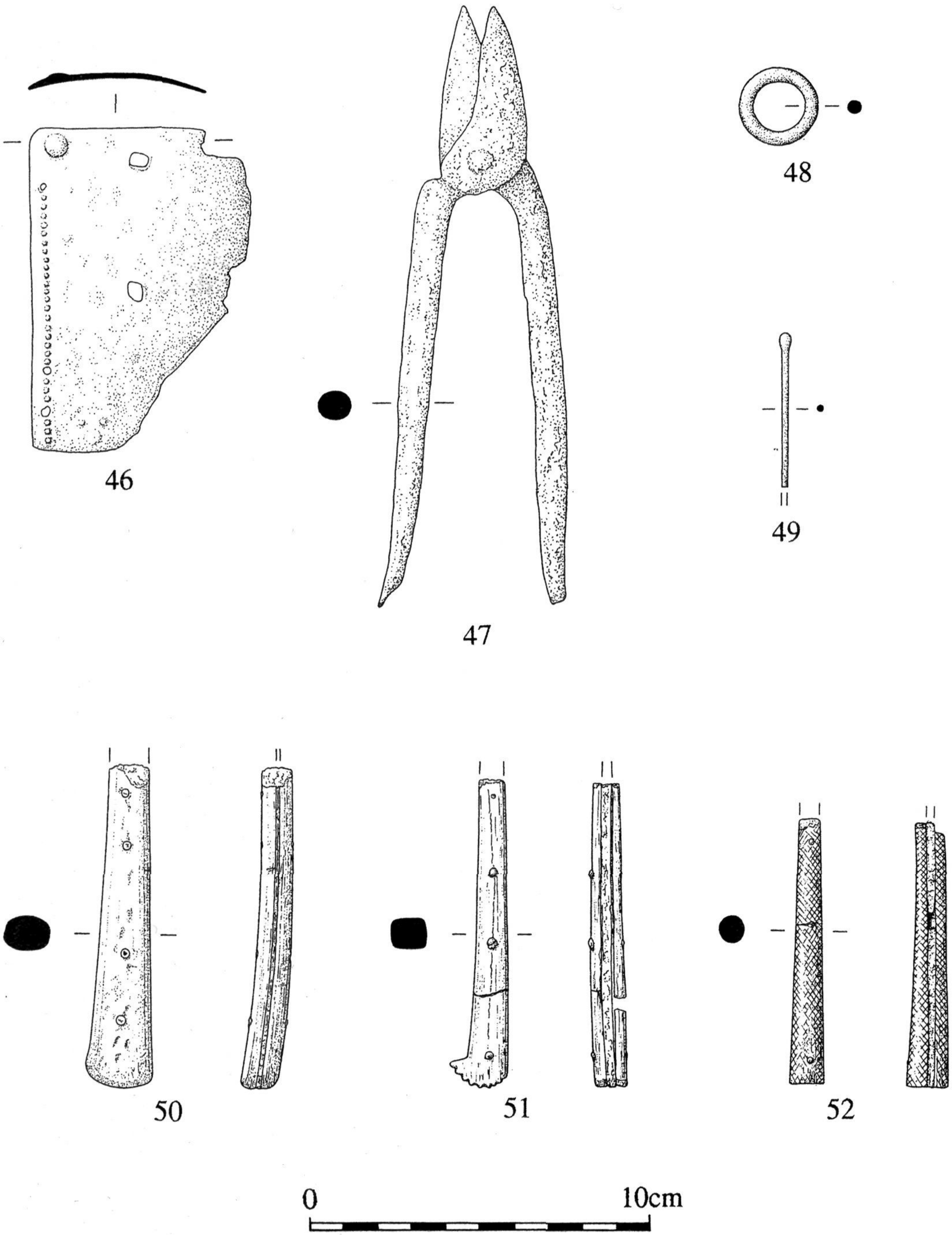


Fig 28. 45 [492]. Adult's front-laced ankle-shoe in one main piece. A short length of edge/flesh seam on the ?inner side suggests either that an insert was used at that point or that it was repaired at some time. It has only two lace holes. Probably similar to a 15th-century shoe from Hull (Armstrong 1977, fig 21, 13).

Compared to the leather, very little metalwork was recovered. The earliest piece is a fragment of sheet iron with white-metal inlay (Fig 29.46) from the context [580] that produced fragments of late Saxon shoes. It may be from the corner of a piece of furniture. The early post-medieval fill of the city ditch contained evidence of both industrial and domestic life in the area: a pair of iron clippers of a type used in metal-working for cutting up plate (Fig 29.47), a very worn fragment of a lead cloth seal, a plain copper-alloy ring, probably from a curtain (Fig 29.48), a small copper-alloy wire needle of a size used for fine sewing (Fig 29.49), and fragments of three knives with bone handles (Fig 29.50–52).

Fig 29. 46 [580]. More or less triangular piece of sheet iron with white-metal inlay. Along one edge is a row of tiny, regularly-spaced, white-metal dots, with slightly larger dots at intervals. There is a white-metal rivet at the surviving corner. The other two corners are damaged, but at one there appears to be a white-metal rivet with a square washer, two edges of which also have traces of white metal. Probably originally flat, it is now irregularly convex. Longest edge 97mm, thickness 2mm; 47 [216]. Iron clippers with convex backs to the blades, the points of which are damaged. The straight handles bow out sharply below the fixing rivet. Total length 180mm. A pair of clippers with similar blades, though of much earlier date, was among the iron-working tools from 16–22 Coppergate, York (Ottaway 1992, fig 201, 2249); 48 [258]. Copper-alloy ring of circular section, external diameter 21mm. Egan suggests that such rings were used for hanging up curtains (1998, 62–4); 49 [258]. Fine copper-alloy wire needle with small eye. Length, tip missing, 45mm, diameter 1.5mm. Suitable for fine sewing; 50 [607]. Two-piece tapering cylindrical bone handle with iron scale tang fixed by three copper-alloy rivets. Only a small fragment of the blade remains. The handle-plates are covered with regular fine incised hatching. Length 79mm; 51 [409]. Iron knife with blade, bolster and scale tang forged in one, and flat bone handle-plates. Most of the blade is missing. Its back is in line with the edge of the handle. The handle-plates are fixed to the tang by four iron rivets. The end is rounded, hooked and serrated. Maximum surviving length 135mm. The forging of blade, bolster, and tang in one piece was introduced in the 16th century. A similar handle from Colchester, Essex, dates to the end of the 15th or early part of the 16th century (Crummy 1988, fig 76, 3099), and another from Winchester dates to the early to mid 16th century (Hinton 1990, fig 261, 2899). The handle form also occurs in wood, with an example from Sandal Castle, Yorkshire, coming from a context dated 1485–c.1600 (Goodall 1983, fig 6, 69); 52 [285]. Iron knife with blade, bolster and scale tang forged in one, and bone handle-plates. Most of the blade is missing. Both back and edge are straight and in line with the lower edges of the handle. The handle is curved longitudinally. Its slightly convex plates widen towards the end and are held in place by four iron rivets. The end is curved, very slightly hooked, and incised with both long V-shaped and narrow grooves which are almost worn away where the handle rests against the ball of the thumb. Maximum surviving length 124mm.



THE TEXTILES

Penelope Walton Rogers

Fragments of a medium-fine wool textile were recovered from mid to late 14th-century levels of the city ditch (context [529]). The textile is of 'worsted' type, that is, woven from wool which has been combed, so that the yarn has a smooth, silk-like appearance. It is woven in 2/2 twill, which is the usual weave for worsteds in the medieval period. Textiles of this sort are a recognised medieval type, but not one which was very common. There are sixty or so comparable examples from medieval London (Crowfoot *et al* 1992, 36–9) and approximately ten more from other English towns (Walton Rogers unpub data). They are far outnumbered in the archaeological record by 2/1 twill and tabby-weave textiles, which represent the more usual clothing fabrics of the period. Worsted twills were used for clerical garments and for mass vestments, as witness the inner tunic worn by the late 15th-century pilgrim buried at Worcester Cathedral (Walton unpub) and the embroidered blue chasuble in which Abbot Dygon (d.1510) was buried at St Augustine's, Canterbury (Crowfoot 1983). They were also made into linings for fashionable garments (Crowfoot *et al* 1992) and may be tentatively identified with the medieval fabric known as 'say', which was used for wall hangings, bed curtains, and coverlets (Beck 1886, 290–2).

MAMMAL, BIRD AND FISH BONES

Philip L. Armitage

Methods of recovery and analysis of the bone

The majority of the bone elements submitted for analysis had been hand-collected routinely during the course of excavation and for those contexts where this was the sole means of recovery there is a noticeable absence of the bones of the smaller mammalian species and small fishes. For the 25 contexts listed below, however, the collection and sieving of soil/environmental samples ensured that such evidence was recovered, where present. All archaeozoological data presented in this report should therefore be carefully considered in the light of this dual collection strategy, and the assemblages from non-sieved contexts viewed as possibly exhibiting sampling bias in favour of the larger more robust bone elements.

Contexts where soil/environmental sampling was carried out and small mammal and small fish bones recovered are listed as follows:

Phase	Contexts
4	[640], [650], [702]
5	[641], [668], [689]
6	[507], [509], [510], [529]
7	[492], [495], [496], [500]
8	[388], [456], [459], [461], [487], [488]
9	no sieved samples
10	[349]
11	[216], [258], [259]
12	[201]

Study of the faunal remains followed standard archaeozoological methodological and analytical procedures. Identification of the mammalian and fish bones was undertaken using the author's own comparative osteological specimens and those kindly supplied by Mrs Alison Locker. For the purpose of identifying the bird bones, reference was made to the modern comparative osteological specimens in the collections of the Ancient Monuments Laboratory (English Heritage), London (now relocated to Fort Cumberland, Portsmouth). Access to this reference collection was very kindly arranged by Dr Simon Davis.

Recording sheets giving full details of anatomical distribution (NISP = numbers of individual skeletal elements identified), with associated weight-of-bone data, together with measurements taken from selected adult bone elements (after the method of von den Driesch 1976), form part of the archival documentation for this particular site. For the purposes of this published report, all these data have been summarised.

Numbers of bones and species identified

A total of 6,327 animal bone elements (NISP) are represented. Of these 4,481 (70.8% of the total) are identified to species and to part of skeleton, and 1,846 (29.2%) remain unidentified. Of the 4,481 identified specimens, 4,121 (92% of the total) are from mammalian species, 171 (3.8%) from bird, and 189 (4.2%) from fish species. There are no amphibian or reptilian species represented. Of the 1,846 unidentified specimens, 1,554 (84.2% of the total) are mammalian, 35 (1.9%) bird, and 257 (13.9%) fish.

A summary of the numbers of bone elements by species/taxon and stratigraphic phase is presented in Table 2.

General descriptions of the assemblages and species by phase

Phase 2: pre-city wall Roman activity

This very small assemblage is recognised as discarded food debris. The presence of skull fragments, jawbones, and metapodia of cattle

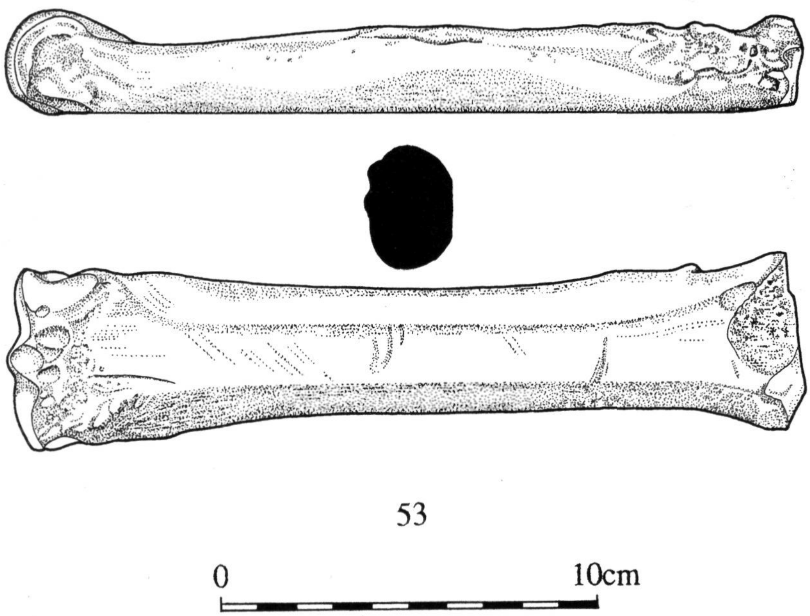


Fig 30. 53. Bone skates

and sheep indicates that these animals had been slaughtered, butchered, and consumed locally. Of the identified bone elements, those of cattle form the greatest proportion by weight (93.4% of the total) and it is speculated that the assemblage may have derived from the nearby Cripplegate fort – applying the findings of King (1978, 225) who demonstrated a correlation between high concentrations of cattle bones (reflecting high levels of beef consumption) and military sites in Roman Britain.

Among the sheep elements (context [205]) is an adult horn core (length of outer curvature 105mm) very similar in size and overall appearance to those found today in the horned ewes of the primitive Soay breed.

Phase 3: Roman city wall and ditches

Another very small assemblage, predominantly the remains of cattle and sheep that had been slaughtered, butchered, and consumed locally. Besides this food debris, Phase 3 also yielded the bones from the skeletal remains of two dogs, one of which (from [408]) is identified as female from the broad basioccipital markings (criteria of The & Trouth 1976) with an estimated height at the shoulder of 56cm (calculated from the lengths in two long bones, applying the regression formulae of Harcourt 1974). From the length of a complete cattle radius (GL 228mm) the withers height in this individual is estimated to have been 98cm (calculated using the factors of Matolsci 1970), which even by Roman standards would have been a very small, reminiscent of the unimproved, dwarf (scrub) cattle typical of the pre-Roman Iron Age (Grigson 1982; Armitage 1982).

Context [405] yielded 22 human bones from a single skeleton of an individual aged about 25 to 30 years at time of death.

Phase 3/4: Roman ditch or stream channel ([580], fill of [581])

The bones from [580] (fill of [581]) are for the purposes of this report considered separately from those above owing to the possibility of intrusive Saxon/early medieval material in an otherwise Roman assemblage. This problem is well illustrated with reference to the presence of two bone artefacts (both fashioned from horse metacarpal bones) commonly interpreted as ice-skates (Fig 30.53). Generally, such artefacts are associated throughout NW Europe with medieval sites, with many dating from the 11th to 13th centuries, the period of climatic deterioration leading to the onset of a 'little ice age'. It is important to note, however, that two skate-like

Table 2. Numbers of animal bone elements (NISP) by species and stratigraphic phase

Species/Phase	**2**	**3**	**3 or 4**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**TOTALS**
horse			12	7	9	14	1	1		1	6	2	53
cattle	21	16	74	177	272	85	126	309	5	459	464	160	2168
sheep	4	8	60	110	217	47	114	214	4	205	173	106	1262
goat				1									1
pig	2		11	19	33	12	16	49	2	36	31	15	226
dog		4	86	20	10	22	30	31		15	9	5	232
cat			6	4	2	8	17	73	1	11	5	11	138
rabbit							3	2		5	1	5	16
fallow/red deer							2	3		2	1		8
roe deer			1	1									2
black rat							6	1		1			8
house mouse						2	2						4
wood mouse										1			1
field vole					2								2
domestic fowl			1	4	1	6	20	30	1	18	18	11	110
domestic goose					4	3	4	10	1	10	11	4	47
mallard/dom.duck					2			1				1	4
tufted duck										1			1
teal								2					2
other duck							2					1	3
raven			1					1				1	3
crow				1									1
roach						1	1						2
eel				2	7	5	7						21
cod				32	14	2	3	1					52
ling						1							1
pollack								1					1
haddock							1	1					2
whiting						9	2	2		1			14
cod family										1			1
conger eel								2					2
plaice						2	8				1		11
sole						1	2			1			4
mackerel				1		1	7						9
herring				8	19	23	18			1			69
unident. fish				7	23	90	102	18		16	1		257
unident. bird						5	11	7		5	2	5	35
unident. mammal	8	1	27	82	344	65	211	436		249	113	18	1554
TOTALS	35	29	279	476	959	404	716	1195	14	1039	836	345	6327

objects – one made from an ox radius, the other from a sheep metapodial bone (presumably an ice skate intended for use by a child) – were discovered from a securely dated late Roman context, General Post Office site, City of London (specimens identified and published by West 1982a). The dating of the bone skates from [580] therefore remains open.

Excluding the bone skates, the assemblage from [580], viewed as a whole, is interpreted as a probably contemporaneous deposit comprising discarded food debris intermixed with the remains of pet dogs and cats, a scavenger (raven *Corvus corax*), and refuse from horn-working activity (represented by the horn cores of two castrate sheep and one ox, all of which have been detached from the cranium by chopping through the base). In addition, there are twelve equid bones representing the remains of at least four adult horses and one foal (aged between 16 and 20 months at time of death). The virtually complete lower jawbone of one of the adults is aged between six and eight years on the basis of the pattern of wear in the incisor teeth (criteria of the American Association of Equine Practitioners 1966); the presence of a moderately developed incisor tooth in this same specimen identifies the sex as a castrate (gelding). A complete pelvis (right and left conjoined innominate bones) – possibly from the same individual as the jawbone – is also identified as that of a gelding (using the anatomical features described and illustrated by Fleming 1891, 132–3 and Getty 1975, 302–3). Withers heights in three of the adult horses can be estimated from the lengths of their long-bones (using the factors of Kiesewalter 1888). The resultant calculated heights of 1.25, 1.30, and 1.31m would all be considered pony-sized by modern standards (by comparison, modern riding and race-horses generally have a stature of between 1.5 and 1.6m, while large draught horses like the shire are 1.7m at the shoulder) but compare very favourably with the size-ranges documented for horses from other Romano-British sites, including Oxfordshire sites where the horses were between 1.22 and 1.41m at the shoulder (Wilson *et al* 1978, 117).

The assemblage includes 86 bone elements from the skeletal remains of at least seven dogs, whose ages at time of death are indicated by epiphyseal fusion in their long-bones: five animals were fully mature while two were much younger individuals– under 5 to 6 months (based upon ageing data published by Sumner-Smith 1966). The shoulder heights in the five adults when alive are calculated (method of Harcourt 1974) as follows: 35.8, 49.0, 52.9, 68.8, and 74.9cm. In the last animal, the sex is identified as female from the broad basioccipital markings in its skull, which also features a prominent, ridge-like sagittal crest similar to those found in the skulls of modern terriers. Evidence for the advanced age and/or poor dental health of this female dog is provided by ante-mortem loss of both upper canine teeth (with complete closure/healing over of their alveoli) and by the much shortened (worn-down) enamel crowns of certain of the lower cheekteeth (P4, M1, and M2), which has resulted in exposure of the underlying dentine in their occlusal (biting) surfaces. There appears also to have been marked degenerative osteoarthritis affecting the left hip joint in this same dog, as evidenced in its innominate bone by the severe exostoses of the acetabular rim, with erosion (pitting) of the interior acetabular articular socket, and in the associated femoral proximal epiphysis (caput) by peripheral exostoses and eburnation (polishing) of the articular surface. In the right femur of another, smaller dog, there is evidence of a past traumatic injury in which the femoral shaft was fractured in its mid region, and the subsequent lateral and vertical stress-loads imposed on this bone element during the period of healing resulted in malunion (misalignment) of the broken halves, which has left a piece of the shaft protruding.

A single adult cat is represented by six long-bones (fore and hind limbs). The two wild species identified in the Phase 3/4 assemblage are each represented by a single bone element: roe deer by an immature (neonate?) metatarsus and raven by a sternum. Domestic fowl is repre sented also by a single bone element: an adult femur.

No fish bones were recovered from [580].

Phase 4: Saxo-Norman city ditch

The bulk of the faunal assemblage (comprising bones of cattle, sheep, and pigs) is recognised as discarded food refuse from all stages of meat preparation and consumption (slaughtering, primary/secondary butchering, as well as kitchen/table waste), intermixed with the skeletal remains of other food species (fowl and fish) as well as those of pet dogs and cats, a scavenging crow, and horses.

Horse bones from [654] include a humerus with the proximal articulation chopped through and another with knife cut (scoring) marks circling the shaft (either from skinning or defleshing). While these specimens could possibly indicate human consumption of horse meat (perhaps from dire necessity in a time of famine), it should be remembered that generally this practice was at that period 'discountenanced' by the Church (see Wilson 1976, 71), and a more likely explanation for the butchering is that this is evidence of the feeding of horse meat to dogs. Possible evidence for the (arguably) more gruesome practice of recycling dead dogs as food for their still living companions (as discussed by Wilson & Edwards 1993, 54) is provided by a canine skull from [654] that has been chopped by an axe or cleaver.

Phase 4 produced the only positively identified goat bone element for the whole site (from [708]): a right horn core of an adult male, LOC length of outer curve 305mm, BC basal circumference 155mm, whose shape may be described as long, straight, with a well-developed keel on the anterior edge (as in the horn core of the old English goat breed). This specimen has been detached (chopped) from the cranium, and is therefore recognised as waste from horn-working activity. Further evidence for this craft activity is provided by the following horn cores and cranium of sheep recovered from Phase 4 contexts:

Table 3

context	bone element	description and method of detachment of the horn (& horn core) from the head ( )
[637]	horn core	R adult male (b)
[637]	horn core	L adult male (b)
[647]	horn core	L young male LOC 225mm (b)
[650]	horn core	R juvenile/subadult male (b)
[655]	horn core	? adult male (c)
[677]	cranium	sex indet. (a)

Key to method of detachment: a: horn chopped through well above its base (along its length); b: horn chopped through very close to the axis of attachment to the skull; c: horn removed by chopping well below its basal axis, leaving a portion of the cranium still attached.

Determinations of the sexes and ages in the above specimens were based on the criteria of Hatting (1975; 1983) and Armitage (1977, 82–8).

Evidence of removal of the horn sheath of cattle for use as a raw material is provided by the horn core of a young adult medium-horned ox (castrate) from [640], which has been detached (chopped) from the head with a portion of cranium still attached (classification of this and other cattle horn cores from other phases follows the system of Armitage & Clutton-Brock 1976 and Armitage 1982a).

A dog skull from [654] is identified as male of the terrier-type. Shoulder heights in four dogs are calculated from the lengths of their limb bones, as follows: [650], 64.3cm; [654], 30.7 and 56.8cm; [702], 64.2cm. These animals fall within the size-range of Anglo-Saxon dogs (23–71cm) documented by Harcourt (1974, 171).

At least two cats are represented in Phase 4: a juvenile aged under nine months at time of death ([650]) and a fully grown adult over 15 to 17 months ([696]) (based upon ageing data in modern domestic cats published by Smith 1969). The length of the humerus (GL 97.1mm) from [696] indicates a cat of comparable stature to the average-sized modern animal (modern data collected by Armitage gave a mean of 98.6mm and size-range 89.5–113.3mm, N=8) – an unanticipated finding as cats in the High Medieval period in Britain were generally of much smaller size than their modern counterparts, as discussed by Armitage (1977, 108–9) and Bond and O'Connor (1999, 412).

Roe deer is represented by a single immature metatarsus (distal epiphysis unfused) from [650].

Five bird bones are identified from three of the contexts: [650]: humerus, ulna and tarsometatarsus of domestic fowl; [685]: tarsometatarsus of crow (*Corvus corone*); [709]: tarsometatarsus of domestic fowl. Both domestic fowl tarsometatarsi are identified as female from the absence of a spur (criteria of West 1982b) and the size of the intact specimen from [709] (GL=57.8mm) falls into the lower end of the size-range 57.0–78.9mm documented by Maltby (1979, 210) for the unspurred (female) tarsometatarsi from Exeter (deposits dated 1200–1300) – in comparison with modern fowl this bird would appear somewhat diminutive and scraggy.

Of the 43 identified fish bones from Phase 4, 32 (74.4% of the total) are cod: [640]: 3 cranial fragments, 4 posterior abdominal vertebrae, 4 caudal vertebrae; [650]: 3 cranial fragments, 1 basioccipital bone, 1 premaxilla R, 1 maxilla R, 3 dentaries 1R 2L, 2 opercular bones, 1 ceratohyal, 1 epihyal, 1 branchiostegal ray, 1 anterior abdominal vertebra, 1 posterior abdominal vertebra; [654]: 2 cranial fragments, 1 premaxilla, 1 dentary R, 1 articular R. Cod bone elements exhibiting butchering marks are confined to three posterior abdominal vertebrae (all from [640]) which have bilateral cranio-caudal cuts through the transverse processes. Singer (1987, 90) identifies such marks as evidence of filleting of fish. None of the cranial elements appears to have been chopped and these therefore represent the remains of whole fish heads perhaps cooked in stews.

The other identified fish bones comprise vertebrae of herring (8 specimens), mackerel (1 specimen), and freshwater eel (2 specimens).

Phase 5: Anglo-Norman pits, ditches and gullies (11th–13th century)

As with Phase 4, this assemblage comprises proportionally high frequencies of cattle, sheep, and pig bones recognised as discarded food refuse from all stages of meat preparation and consumption (slaughtering, primary/secondary butchering, and kitchen/table waste) intermixed with the bones of other food species (fowl and fish), and the remains of pet dogs and cats, and wild fauna (represented by a field (short-tailed) vole (*Microtus agrestis*)).

Apart from a single cattle horn core (juvenile/subadult short-horned female, LOC 124mm) from [680], all the specimens from Phase 5 representing debris from horn-working activity are from sheep and include crania (which have had their horn cores removed) as well as detached (isolated/separated) horn cores; these are listed as follows:

Table 4

context	bone element	method of detachment of the horn (& horn core) from the head ( )
[638]	horn core	L adult male (b)
[680]	horn core	R old adult castrate LOC 120mm BC 112mm (c)
[680]	horn core	R adult male LOC 250mm BC 138mm (c)
[680]	horn core	L old adult castrate (c)
[680]	horn core	L old adult male (c)
[694]	horn core	L adult male (c)
[694]	horn core	R & L (pair) adult male (c)
[700]	horn core	adult male LOC 195mm (b)
[644]	cranium	adult female (a)
[644]	cranium	young male (a)
[667]	cranium	adult male (a) also split in half along the sagittal axis
[679]	cranium	adult male (a)
[698]	cranium	adult of indeterminate sex (a) also split in half along the sagittal axis

Key to method of horn detachment: a: horn chopped through well above its base (approx a quarter of the distance along the length); b: horn chopped through very close to the axis of attachment to the skull; c: horn removed by chopping well below its basal axis, leaving a portion of the cranium still attached.

Method 'a' at first appears somewhat wasteful by trimming off the basal portion of the horn sheath (while on the core), but this piece may have been regarded by the craftsman as unsuitable as raw material owing to the presence of closely arranged basal annular/seasonal-growth rings, which are especially pronounced in the larger horns of older rams. It is interesting to note that this distinctive technique of cutting off the horn sheath above the base seems to have been largely confined to the High Medieval period and is rarely seen in horn-working debris from later medieval/post-medieval contexts.

The splitting in half of some of the sheep crania (for extracting the brain) may indicate that these (and the other sheep skulls) are butcher's waste, and that the horns had been removed by the butcher for sale direct to a horn-worker rather than supplied via a tanner as was the more usual procedure in the medieval period (Serjeantson 1989).

A horse femur from [679] shows evidence of having been gnawed by a dog, suggesting perhaps that horse meat had been fed to dogs, or, alternatively, a portion of horse hind leg had been scavenged by a dog from a knacker's yard. The heights at the withers in three of the horses represented by limb bone elements from [644], [679], and [694] are estimated (after the method of Kiesewalter 1888) at 124.7, 127.4, and 135.4cm. An example of an ankylosing lesion is identified in two adjoining (articulated) horse lumbar vertebrae from [669]; in these specimens, the condition involves bony bridging across the intervertebral discs (on the ventral surface) resulting in fusion of the centra. In their appraisal of this pathologic condition, Stecher and Goss (1961, 254) note its absence in wild equids and suggest that its incidence in domestic equids may be the consequence of trauma or from repeated stress imposed upon the posterior region of the spinal column as in animals ridden frequently or employed throughout their lives in haulage or as pack carriers.

The dog skull from [689] is identified as a female of the terrier-type; the reduced (worn down) enamel crowns in the upper and lower cheekteeth, resulting in the exposure of the dentine, and ante-mortem loss of the left canine tooth (with complete closure of the alveolus) indicate this animal was of advanced age at time of death. A skull of another adult dog was recovered from [641] (infill to cesspit [642]); although this specimen is incomplete and much fragmented, its sex is identified as male from the surviving narrow basioccipital markings. From the measured length (GL=227mm) of a tibia from [679], the shoulder height of a third dog is estimated at 67.2cm.

An individual cat of indeterminate age and sex is represented by a piece of skull and a lumbar vertebra from [679].

The residue of a sieved soil sample taken from [689] yielded two teeth (an upper incisor and an upper molar) of a single field (short-tailed) vole.

Seven bird bones from five of the Phase 5 contexts are identified as follows: [668], domestic goose, coracoid; [669], domestic goose, radius; [676], mallard/domestic duck, coracoid; [680], domestic fowl, ulna; [680], domestic goose, carpometacarpus, ulna; [699], mallard/domestic duck, humerus.

Of the 40 identified fish bones from Phase 5, 19 (47.5% of the total) are from herring, 14 (35%) from cod, and 7 (17.5%) from freshwater eel. Both herring and eel are entirely represented by vertebrae, while cod comprises the following bone elements: [641]: 1 articular L, 2 posterior abdominal vertebrae, 2 fragments of unidentified vertebrae; [676]: 1 branchiostegal ray; [680]: 2 dentaries (R & L=pair), 1 articular (with retroarticular), 1 ceratohyal R, 1 posterior abdominal vertebra; [689]: 1 branchiostegal ray, 1 posterior abdominal vertebra; [699]: 1 articular L. By comparison with modern specimens of known size, the length-range (TL) in the Phase 5 eels is assessed at between 40 and 50cm.

Phase 6: medieval city ditch and Bastion 15 (13th/late 14th century)

Domestic (kitchen/table) refuse intermixed with that from butchers' slaughteryards and horn-workers, as well as the skeletal remains of horses, pet dogs and cats, and rodent vermin (represented by a pair of femora (R & L) of a single house mouse (*Mus musculus*) from the sieved residue of Seed-sample 26 from [509]).

Horn-working debris comprises the following seven sheep horn cores; all of which have been cut from the skull by an axe blow directed from the side of the head through the basal axis or just below:

[509] adult male R; LOC 195mm BC 129mm
[531] 5 specimens (MNI=5):
[531] adult male R; LOC 270mm BC 144mm
[531] old adult male L
[531] adult male L; LOC 265mm BC 135mm
[531] adult male L
[531] adult male L
[539] young adult male R; LOC 150mm.

Use of cattle horn as a raw material is evidenced by the following three horn cores that have been chopped from the skull by an axe blow directed below the horn core base (leaving a portion of the cranium still attached):

[510] old adult medium-horned ox; BC 178mm
[530] adult short-horned ox; BC 138mm
[530] young adult short-horned ox; BC 151mm.

The 14 horse bone elements include two adult lumbar vertebrae from [539] which exhibit ankyloses (fusion) of their centra and lateral transverse processes (evidence that this horse had been ridden frequently or had worked throughout its life as a draught or pack animal).

At least five dogs and two cats (all mature animals) had been thrown as carcasses into the section of the city ditch crossing the Alder/Castle/Falcon House excavation site. None of the bones from these animals exhibit any evidence of skinning and therefore they were probably household pets that had lived and died nearby. Most of the dogs were of similar stature to modern medium-to-large terriers: from the lengths of their limb bones the shoulder heights in three of them were determined at 40.8, 47.5, and 55.0cm. Context [643], however, yielded a right innominate bone of a very much smaller dog: the measured length of this bone (GL 86mm) compares favourably with that taken by the author on the innominate bone (GL 86.7mm) of a modern toy poodle in the osteological collections of the Ancient Monuments Laboratory (English Heritage), London. Evidence of spondylosis deformans, a pathological condition relatively common in archaeological animal remains, especially dogs (see Baker & Brothwell 1980, 131) was found in the thoracic vertebrae of an adult dog from [512]; the centra are all deformed, and exhibit periarticular lipping (exostoses), together with eburnation (polishing) and grooving/faceting of the cranial and caudal articular surfaces.

Phase 6 yielded 9 bird bones from two contexts: [509], domestic fowl: 1 synsacrum; 3 vertebrae; 1 tibiotarsus (GL 126.2mm); 1 phalanx I; domestic goose: 1 carpometacarpus (GL 91.4mm); [512], domestic goose: 1 skull; 1 sternum. The goose sternum (breastbone) from [512] is chopped in half, a pattern of butchering also recorded in two similar specimens excavated from 14th- to 16th-century rubbish pits in the town of Dokkum, Friesland, the Netherlands (von Gelder-Ottway 1979, 116, fig 3.C).

45 fish bones are identified from two of the Phase 6 contexts: [509] (sieved samples): herring: 23 vertebrae; whiting, 1 dentary, 8 vertebrae (= 3 anterior abdominal, 3 posterior abdominal and 3 caudal); eel: 5 vertebrae; cod: 2 caudal vertebrae; plaice: 1 preopoerculum, 1 caudal vertebra; roach: 1 pharyngeal bone; sole: 1 caudal vertebra; mackerel: 1 vertebra; [510] (sieved sample): ling: 1 vertebra. Attention should be drawn to two of the eel vertebrae and the caudal vertebra of the plaice (all specimens from [509]) which exhibit the distortion of shape in the centrum characteristic of fish bones ingested/digested/voided by humans (see Wheeler and Jones 1989, 75, fig. 5.2), indicating these particular fish bones were probably in human faeces when deposited/disposed of in the ditch.

Phase 7: later medieval re-cut of the city ditch (c.1350–1400)

Like the assemblages from earlier phases, that of Phase 7 comprises cattle, sheep, and pig bones recognised as food refuse from all stages of meat preparation and consumption (slaughtering, primary/secondary butchering, and kitchen/table waste). Bones of other food species are also represented: fowl and fish, and, for the first time, rabbit and fallow deer.

Unlike the previous phases, however, there is a noticeable absence of horn-working debris: apart from an isolated sheep skull (from [493]) which has had the horn cores removed (chopped through at the base). There is also a paucity of horse bone elements; again limited to a single bone: a complete adult radius (from [499]) from an animal with an estimated withers height of 1.3m.

In common with the earlier phases, the Phase 7 assemblage includes skeletal remains of dogs and cats, representing at least four adult dogs and an equal number of adult cats. In the absence of any noticeable skinning marks on their bones, it is suggested that these animals had probably been kept nearby as pets rather than for their skins. One of the dogs (from [492]) is identified as a male of the terrier-type from its skull, with an estimated shoulder height (based on the lengths of its humerus and radius) of 40.6cm. Another dog (from [495]) is identified by its short snout and domed forehead, exhibited in its skull, as a spaniel-type.

A piece of red deer antler tine (from [495]) provides the only evidence in this phase for bone-working activity. Fallow deer is represented by a single adult metatarsal bone from [492].

Rodent vermin are represented by bone elements of black rat (*Rattus rattus*) and house mouse: [495] (sieved sample) yielded 1 piece of black rat cranium and 2 mouse bones (mandible & cervical vertebra); [492] (sieved sample) yielded 5 rat vertebrae, 1 rat mandible, and 1 rat maxilla (dental wear-stage C subadult/adult – classification system of Armitage 1997).

26 bird bones are identified (from [492], [495], [496] and [500] combined, incl. sieved samples), as follows: domestic fowl: 1 clavicle, 1 coracoid (GL 54.8mm), 1 humerus, 1 ulna, 2 synsacrum, 2 femur (intact spec. GL 95.4mm), 1 tibiotarsus (GL 104.9mm), 1 tarsometatarsus, 9 vertebrae, 1 rib; domestic goose: 1 sternum, 1 femur, 1 phalanx I (immature), 1 vertebra; duck (*cf Anas/Aythya* sp.): 1 scapula, 1 ulna.

49 identified fish bone elements came from sieved soil/seed/environmental samples collected from [492], [495], [496] and [500] combined: roach, 1 pharyngeal bone; eel, 7 vertebrae; cod, 1 premaxilla, 1 post abdominal vertebra, 1 vertebra (indet.); haddock, 1 dentary (*cf* in size to modern specimen TL 36cm); whiting, 1 post abdominal vertebra, 1 caudal vertebra; plaice, 1 post abdominal vertebra, 6 caudal vertebrae, 1 indet. vertebra; sole, 2 vertebrae; mackerel, 7 vertebrae (including 1 from [495] digested by a human); herring, 18 vertebrae.

Phase 8: early post-medieval re-cut of city ditch (c.1400–1500/50)

Predominantly food refuse from all stages of meat preparation and consumption (including kitchen/table waste), comprising bones of cattle, sheep, pigs, deer, rabbits, domestic and wild fowl, freshwater and marine fishes. Skeletal remains of pet dogs and cats are also represented, as are those of scavengers and vermin (raven and black rat).

The Phase 8 faunal samples include only moderate amounts of horn-working waste, identified by the presence of the following specimens: sheep horn cores (all detached from the skull by an axe blow directed close to the base of the core, from the side of the head):

[420] L adult male
[420] L young adult male
[456] R young adult castrate LOC 133mm BC 94mm
[488] R adult female LOC 127mm

sheep crania (with their horn cores removed by chopping through close to the base):
[388], 3 specimens; [461], 1 specimen

cattle horn cores (chopped from the skull with attached portion of frontal bone):
[388] adult medium-horned ox with sawn core
[488] young adult short-horned ox LOC 185mm.

Antler-working is evidenced by the portion of fallow deer (*Dama dama*) cranium (from [456]), right side, with attached basal part of the antler (comprising the pedicle, coronet, and brow tine). Inspection of the butchering pattern indicates that the whole antler (with portion of frontal bone) was originally removed by a series of repeated cuts (made by an axe or heavy cleaver) transversely through the cranium, with the blows directed laterally just behind the orbital region, followed by cutting of the antler itself, as evidenced by several chopping marks on the beam posterior to the brow tine. Deer antler throughout the medieval period was commonly and widely used as raw material for manufacture of combs.

Two further fallow deer bone elements (from the food refuse) are identified: an innominate bone (from [388]) of an adult male (criteria of Lemppenau 1964) with the acetabulum chopped (evidence of the removal of the hind leg from the carcass); and a complete, adult metatarsal bone (from [456]).

31 bone elements are identified as dog, representing at least eight adults and two immature animals. Based upon epiphyseal fusion times in modern dogs given in Sumner-Smith (1966) the age at death of one of the immature animals is assessed at under six months, while the other was between six and thirteen months. Three skulls (two from [456] and one from [488]) are all identified as male of the terrier-type, with one of the specimens from [456] exhibiting signs of bi-lateral pressure atrophy across the maxillae (evidence perhaps that this animal was frequently muzzled). An ulna from [461], from an animal with an estimated height at the shoulder of 45.4cm, shows evidence of osteoarthritis that afflicted the elbow joint; in this specimen there is extensive peripheral exostoses (bony outgrowths), with associated eburnation (polishing) and grooving of the articular surface. In addition to the ulna above, the presence of the complete limb-bones of seven other dogs allows their respective shoulder heights to be calculated, as follows: 29.6, 34.3, 46.7, 47.1, 50.2, 51.9, and 53.5cm.

The relatively high frequency of identified cat bone elements from Phase 8 (NISP = 73) reflects the presence in the collected faunal material of a partially complete skeleton from [456] and several groups of once-articulated (associated) limb-bone elements, including two pairs of right femora and right tibae from two adult cats from [487]. The majority of the cats (exact number indeterminate) are adults, but at least one immature animal aged under nine months at time of death is represented by an unfused femur from [488], and another animal aged over 17 months but less than 21 months is represented by a humerus, radius, and ulna (with all epiphyses fused except for the distal radius) from [388]. In the absence of any evidence of skinning, it is suggested all the cat bones from Phase 8 are from pets rather than animals kept for their skins.

Black rat is represented by a single adult radius (GL 26mm) from [456].

Phase 8 yielded 44 bird bones (from [388], [420], [456], [459], [461], [487], [488] combined) identified as follows:

domestic fowl: NISP = 30: 1 scapula; 1 coracoid (GL 64.3mm); 5 humerus (intact specs. GL 70.8 & 73.0mm); 2 radius; 3 ulna (intact spec. GL 63.5mm); 4 femur (intact specs. GL 78.6, 88.1 & 88.9mm); 7 tibiotarsus (intact specs. GL 101.7, 114.6, 124.2, 128.9 & 139mm); 2 tarsometatarsus (1 spurred = male GL 83.3mm context [420] and 1 unspurred = female context [487]); 3 vertebrae; 2 unident. long-bone shafts
domestic goose: NISP = 10: 1 clavicle; 2 humerus (intact spec. GL 174mm); 2 radius; 1 ulna (GL 162mm); 1 carpometacarpus (GL 93.2mm); 1 tibiotarsus; 1 tarsometatarsus; 1 phalanx I
mallard/domestic duck (*Anas platyrhynchos*): 1 tarsometatarsus
teal (*Anas crecca*): 2 carpometacarpus (R & L = pair)
raven: 1 ulna.

7 fish bones are identified from sieved samples collected from [456], [459], [461], [487], [488] combined: cod, 1 caudal vertebra; pollack, 1 anterior abdominal vertebra; *cf* haddock, 1 posterior abdominal vertebra; whiting, 2 anterior abdominal vertebrae; conger eel, 2 vertebral centra. Special mention should be made of the cod caudal vertebra (from [459]) which exhibits modification consistent with its having been chewed/ingested/digested/voided by a dog in its faeces. A further vertebra (species indeterminate) from [456] appears to have been digested also, but by a human (suggesting this particular bone element had been deposited in human faeces).

Phase 9: early post-medieval re-cut of city ditch (c.1500)

This very small sample (from [438]) comprises food (kitchen/table) refuse (beef, mutton, pork, chicken, and goose bones) together with one humerus of an immature pet cat. The single domestic fowl bone is identified as an adult radius with greatest length (GL) 66.7mm. No fish bones were recovered.

Phase 10: early post-medieval re-cut city ditch (16th century)

Primary and secondary butchering refuse together with that derived from domestic (kitchen/table) sources form the bulk of the assemblage from Phase 10. Skeletal remains of domestic dogs and cats are also represented, as are those of smaller wild mammalian species: black rat and wood mouse (*Apodemus sylvaticus*). This assemblage exhibits a relatively high frequency of horn-working waste, as evidenced by the presence of 15 sheep horn cores all cut from the skull by an axe chopping through the base of the horn from the side of the head; of the specimens so identified, the greatest concentration (11 specimens = 73.3% of the total) came from [334], as shown below:

[331] adult male, R: BC 164mm
subadult female, R; BC 91mm
[334] young adult male, R; LOC 120mm BC 99mm
young adult castrate, R: LOC 115mm BC 110mm
young adult castrate, R; LOC 110mm BC 109mm
adult female, R; LOC 150mm BC 108mm
young adult male, L; LOC 105mm BC 91mm
adult castrate, L
young adult castrate, L
adult female, L; BC 93mm
young adult female, L
adult male? (piece only)
indet. (piece only), L
[335] indet. (piece only)
[349] subadult, male; LOC 58mm

In addition to these detached horn cores, there are three skulls (two specimens from [335] and one from [349]), that have had their horns removed by chopping through just below the basal axis of the horn cores.

Evidence of cattle horn-working is provided by four chopped horn cores (all from [349]) identified as follows: a young adult short-horned ox (castrate); two adult medium-horned oxen; and a young adult medium-horned ox. In each of these the horn had been detached from the head by an axe blow directed below the core base, leaving part of the frontal bone attached.

Horse is represented by a single bone element: a first phalanx from [331]. Fallow deer is represented by one femur (from [330]) and a tibia (from [349]); both specimens from adult animals.

From [331] there is an adult pig metatarsus IV with proximal periarticular exostoses and erosion (pitting) of the articular surface. In the absence of eburnation and grooving (as would be expected in a case of degenerative osteo-arthritis), this appears to be an example of osteo-myelitis/septic arthritis – the condition arising as a result of an infected joint in the hind foot.

A sieved soil sample collected from [349] (sample 10) yielded a cervical vertebra of black rat and a left adult innominate bone of a wood mouse.

Using epiphyseal fusion in long-bones (criteria of Sumner-Smith 1966) as a basis for establishing the ages at time of death of the Phase 10 dogs, the following individuals are recognised: one immature animal aged less than five to eight months, and four older animals aged at least ten months or more. Stature (shoulder heights) in three of the older dogs is estimated from their respective long-bones as follows: [331], humerus (R & L pair), 44.5cm; [349], left tibia, 53.8cm; left tibia, 55.8cm.

Eleven bone elements from the skeletal remains of at least five cats are represented; ages at time of death are estimated from epiphyseal fusion in their long-bones (criteria of Smith 1969) as follows: four fully grown (adult) individuals aged over 15 to 18 months and one immature animal under nine months.

[319], [330], [331], [334], [349], [410], and [613] combined yielded the following bird bone elements:

domestic fowl (NISP = 18): 1 coracoid; 3 humerus (intact spec. GL 77.9mm); 1 radius (GL 54.4mm); 5 ulna (intact specs. GL 75.4, 75.7, 81.3, 84.4mm); 4 femur (GL 75.8, 82.1, 93.2, 98.5mm); 3 tibia; 1 phalanx I
domestic goose (NISP = 10): 2 scapula; 1 radius; 2 carpometacarpus (GL 90.6, 120.5mm); 2 femur (intact spec. GL 81.9mm); 1 tibiotarsus; 1 tarsometatarsus; 1 phalanx I
tufted duck (*Aythya fuligula*): 1 coracoid (from [349]).

A sieved soil sample collected from [349] yielded four identified fish bone elements: *cf* whiting, 1 post abdominal vertebra; cod family (indet.), 1 vertebra; sole, 1 caudal vertebra; herring, 1 vertebra.

Phase 11: post-medieval city ditch (17th century)

The faunal material deposited in the city ditch during this phase comprises primary and secondary butchering debris, domestic (kitchen/table) waste intermixed with the skeletal remains of pet dogs and cats, as in the previous phases. With respect to the horn-working refuse, however, there is a marked difference in its composition. In earlier phases, sheep horn cores noticeably outnumbered those of cattle, but here the situation is reversed – the Phase 11 contexts yielded 24 cattle and 10 sheep specimens. Except for a single specimen of a young adult medium-horned ox (castrate) from [258], all of the cattle horn cores came from [216] and these are summarised below:

Table 5

group/age class	cow	bull	ox	indet.
short-horned:				
adult	1		3	
young adult				none represented
medium-horned:				
adult	1	1	2	
young adult		1	1	
subadult/juvenile			1	1
long-horned:				none represented
indeterminate group:				
adult				8
young adult				2
subadult/juvenile				1

In these specimens the horns had been hacked off the skull by means of a cleaver or axe either as a pair attached to a portion of the frontal bone (which subsequently broke apart) or separately by means of chopping just below each horn core base in turn, by a blow directed obliquely from either the back of the head or from the side (as illustrated in Armitage 1980, 85, figs 1a–c). After soaking, the outer horn sheaths could then be pulled off their cores and used whole in the manufacture of such items as livestock drenching horns or powder horns, or softened by heating, pulled apart, cut up, and pressed flat between heated oiled-iron plates to convert the horn into translucent sheets used in glazing lanterns. There is evidence that at least one of the horns had been sawn through whilst still on its core, apparently leaving behind the basal portion of the outer sheath where the closely grouped growth-rings probably rendered it unsuitable as raw material.

Of the ten sheep horn cores recovered from Phase 11, nine came from [258] and [259], with a single specimen from [216]: four are recognised as adult males, four as young adult males, one as an adult castrate, and one as a young adult castrate (LOC in intact specimens: 170 and 190mm (both males) and 240mm (castrate)).

In addition to the many cattle horn cores from [216] there is an ox mandibular ramus (lower jawbone) that exhibits marked swelling in the region of the alveoli (teeth sockets) of the fourth premolar and first molar. This condition was probably due to inflammation at the tooth roots resulting from impacted food causing irritation of the tissues, resulting in the formation of abscess chambers which ultimately caused ante-mortem shedding of the affected teeth (as discussed in Baker & Brothwell 1980, 154). This same specimen also shows the non-metrical trait of a vestigial (*ie* incompletely developed) third cusp (hypoconulid) in the lower third molar. Maltby (1979, 40) found this congenital abnormality to be relatively common in the cattle jawbones he was studying from Roman Exeter (21% of cases) but, as discussed by Albarella *et al* (1997, 27–8), it is somewhat rarer in medieval and post-medieval British cattle (with the incidence ranging regionally from 3% to 10%). Mention should also be made of the fact that this jawbone shows evidence of butchering: the diastema had been cut completely through the bone either by an axe or heavy cleaver.

There is a single cervid bone element from Phase 11: a sawn piece of antler tine (from [259]) of either red deer or fallow deer (species indet.), identified as waste/off-cut from antler-working activity/craft.

Six horse bones are identified: five specimens from [216] comprising 1 mandibular ramus from a gelding (castrate) aged 7–8 years at time of death; 1 innominate bone; 2 femora (one of which is chopped through below the proximal epiphysis); 1 phalanx I; and one specimen from [285]: a piece of mandibular ramus (age and sex indet.).

Among the dog bones are two crania: one from [216] is identified as female of the terrier type (with a moderately developed sagittal crest), and the other from [259] is of a very small dog comparable in size to the modern toy poodle in the osteological reference collections of the Ancient Monument Laboratory (English Heritage) London. In this specimen the cranium is domed (bulbous-looking) and the snout short, both these anatomical features are found in spaniel-type dogs and indicate this animal was probably a lady's lapdog; examples of these small, lop-eared dogs adorned with belled collars are frequently depicted playing at the feet of ladies on monumental church brasses, including the following (in chronological order): Margaret Torryngton (1356), Great Berkhampstead, Hertfordshire; Margaret de Freville (1410), Little Shelford, Cambridgeshire; Margarita Cheyne (1419), Hever, Kent; and Agnes Salmon (1430), Arundel, Sussex (Beedell 1973; Armitage 1977, 104–7). In Juliana Barnes' Book of Saint Alban (1486) mention is made of the toy dog, which is listed as a 'small ladies popis' (quoted in Vesey-Fitzgerald 1957, 80–1). From the length of the complete adult tibia ([258]) the shoulder height in one of the dogs from Phase 11 is estimated at 57.6cm.

Contexts [216], [258], [259], [285], [328] combined yielded 29 bird bone elements, identified as follows:

domestic fowl (NISP = 18): 2 coracoid (intact spec. GL 55.8mm); 5 humerus (intact specs. GL 64.5, 75.6, 81.1mm); 1 ulna (GL 81.0mm); 5 femur; 4 tibiotarsus; 1 tarsometatarsus (unspurred = female)
domestic goose (NISP = 10): 1 humerus; 1 radius; 4 carpometacarpus (intact spec. GL 85.6mm); 1 femur; 2 tibio-tarsus (GL 119.5, 127.5mm); 1 tarsometatarsus (GL 91.1mm)
mallard/domestic duck: 1 coracoid.

A sieved soil sample taken from [259] produced the only identifiable fish bone from this phase – a caudal vertebra of plaice which is almost twice the size of a modern comparative specimen of a fish of this species of TL 34cm.

Phase 12: post-medieval activity on infilled city ditch and fill of cesspit

This last site phase is represented by the following component faunal assemblages:

Context [201] 17th-century make-up dump sealing the city ditch

Predominantly household food refuse (bones of beef, mutton, pork, rabbit, and domestic fowl) intermixed with the skeletal remains of pet dogs and cats, pieces of two horse jawbones (from a knacker's yard?), and a single femur from a raven. Three chopped sheep horn cores are recognised as waste from horn-working activity: adult male R LOC 160mm BC 140mm; young adult castrate R LOC 145mm BC 108mm; another young adult castrate L LOC 120mm BC 106mm. Evidence of the exploitation of cattle horn as a raw material is provided by a single chopped horn core identified as that of an adult medium-horned bull.

A very large pig metacarpus III (GL 90.1mm) merits special mention as this specimen exceeds in size those from two modern wild boars (comparative GL measurements: 83 & 85mm) reared in London Zoo (documented by Noddle 1980, 407). While this specimen is also much larger than its medieval counterparts (GL size-range 68–86mm: various authors), it does compare favourably with one of the pig metacarpus III bones (GL 90.7mm) from the early Tudor deposits excavated at Baynard's Castle, London, which was interpreted (Armitage 1977) as a large domestic male. As discussed by Noddle (1981), at the close of the Middle Ages British pigs increased in size and by the 18th century 'there are some enormous animals documented in the contemporary livestock literature'. This specimen in addition to its large size also exhibits moderate exostoses and localised pitting/erosion of the bone on the medial (inner) surface – evidence of a septic lesion (infection) in one of the forefeet?

The bird bones from [201] are identified as follows:

domestic fowl (NISP = 11): coracoid (GL 50.6, 54.2mm); 1 humerus (GL 84.0mm); 2 ulna (an immature and an adult); 2 femur; 1 tibiotarsus; 3 tarsometatarsus (two recognised as males from the presence of a spur, the other broken specimen is of indeterminate sex)
domestic goose (NISP = 4): 1 sternum; 2 tibio-tarsus; 1 tarsometatarsus
mallard/domestic duck: 1 tarsometatarsus (GL 49.2mm)
other duck (indet. sp.): 1 tibiotarsus
raven: 1 femur (GL 69.4mm)

There are no fish bones from this or any other Phase 12 context.

Context [556] infill of brick well/soakaway [521] (post-medieval)

Another very small assemblage of household food refuse (bones of cattle and sheep) together with a single sheep horn core, chopped across the base (= horn-working waste) identified as an adult male R LOC 180e.

Contexts [566] and [568], combined infill of cesspit [569] (1650–1700)

Household (kitchen/table) refuse comprising beef, mutton, and pork bones.

Analysis and discussion

Site environment

Some insight into the site environment (habitats) is provided by the presence of certain small wild mammal species. An overgrown habitat close to the city wall near the Alder/Castle/Falcon House site is indicated by the field vole from the Anglo-Norman (11th–13th century) phase (Phase 5), as this particular animal generally prefers to live in rough, ungrazed grassland – thus confirming William Fitzstephen's observation in his work *Descriptio Londoniae* that just beyond the city walls lay 'fields for pasture, and a delightful meadow-land, interspersed with flowing streams...' (quoted in Wheatley 1970, 502). The wood mouse also favours overgrown habitats, and today is abundant and widespread in London's outer suburban gardens; but this species will also often enter houses during the winter months (Burton 1974) and its presence on the site in the 16th century (Phase 10) may perhaps be explained by this behaviour. It would, however, have been in competition with the many rats and mice (commonplace commensal vermin) already found in this part of London (whose presence is evidenced by their bones from Phases 6, 7, 8, and 10). Yet another scavenger species, this time a bird, the raven, is represented by bone specimens from Phases 3/4, 8, and 12. Indeed, the raven was a 'ubiquitous urban scavenger' throughout N Europe, especially during the medieval period, according to O'Connor (1993, 159) who also records its disappearance from British cities and towns from the 17th century onwards; this perhaps makes the bird from Phase 12 among the last of its kind to naturally inhabit the City (leaving only its 'captive' relations in the Tower of London remaining today).

Refuse dumping in the city ditch (medieval and early post-medieval period)

From historical sources it seems the dumping of refuse into the city ditch was an illicit but largely unregulated activity, with the authorities either powerless or disinclined to prosecute transgressors.

In his survey of *Street Life in Medieval England* Salusbury (1939, reprint 1948, 77) observes that the 'private citizen was only too ready to dispose of dead dogs and cats by dropping them ... just over the town wall'. Evidence for such casual and opportunistic disposal of unwanted carcasses into the city ditch near Alder/Castle/Falcon House is provided by the many skeletal remains of these animals recovered from all the medieval and post-medieval phases. These private citizens also seem on the archaeological evidence to have had no reservations about dumping their ordinary household refuse (especially food debris) into the city ditch. Likewise, butchers, horn- and antler-workers as well as those working in knackers yards all seem to have exploited the city ditch as a convenient garbage dump – presumably thereby saving themselves the expense and trouble of carting their noxious refuse out beyond the City limits. It should be noted however that proportionately the amounts of bone elements representing butchers' waste are generally much less than those identified as domestic food refuse in the assemblages, reflecting perhaps the greater control the City authorities were able to exert over the butchers (*cf* ordinary citizens) in respect of ensuring the proper disposal of their waste products (see Sabine 1933).

As discussed by Sabine (1937, 36–7) London's Mayors in times of national emergency often did instigate the cleansing of the city ditch where required in order to restore its original intended function as a defensive feature. Such action was taken for instance in 1378 in response to the threat of imminent attack by the French (*ibid*) and Butler (1999) further discusses this aspect in the light of the Alder/Castle/Falcon archaeological evidence. What the faunal evidence makes clear, however, is that immediately such threats were over, the city ditch was quickly refilled with refuse by local households and tradesmen–indicating just how ineffective were the authorities in preventing such activity. By the early post-medieval period, the development in heavy siege artillery had rendered the city ditch and wall obsolete and, apart from its apparent temporary restoration during the time of the Civil War (in the 17th century)(see above), the upkeep of the ditch for military purposes was no longer of concern to the authorities, and it rapidly became infilled.

Diet and foodways of the inhabitants

Extrapolating back to the households from which the food refuse thrown into the city ditch originated, it is possible to say something about the variety and quality of their diet (viewed collectively) as the bulk of the faunal remains represents domestic (kitchen/table) waste. For the purposes of this assessment only the medieval and post-medieval assemblages (Phases 4–12) were chosen for analysis; the earlier (Roman) assemblages were omitted owing to their small samples; also left out for the same reason was the Phase 9 assemblage.

Bone-weight data rather than NISP was employed as the most accurate means of determining the relative (proportional) contributions made to the diet by the principal meat-supplying species. For greater precision, non-food bone elements (horn cores of sheep and cattle) were omitted from the calculations. The results of this analysis are presented in Table 6 which shows that, for all the phases under consideration, beef/veal was the most important staple-item in the diet, with mutton/lamb second, and pork/sucking pig making a lesser contribution.

From Phase 7 (later medieval period) through to the more recent Phase 12 there is evidence for the consumption of rabbits. Measurements taken of the rabbit limb-bones all fall within the size-ranges of modern wild rabbits and identify them as warren- rather than hutch-reared (criteria of Armitage 1981).

Phases 7, 8, and 10 also reveal evidence for the consumption of fallow deer meat; the prevalence of hind-limb bone elements of this species in these assemblages indicates that the supply of venison was in the form of haunches (following the interpretation made by Albarella & Davis (1996, 34) who, in a survey of high status (castle) sites, discovered a similar discrepancy in body-part representation of both red and fallow deer).

Apart from the venison mentioned above, there is nothing else in the faunal assemblages to suggest high status. Overall the diet appears to have been one of basic sufficiency rather than of extravagance, and there is (for example) no evidence for the lavish consumption of a diversity of bird species – including plovers, cranes, woodcock, dove, quail, as well as exotics such as peafowl and great bustard – as apparently enjoyed by the inhabitants of Baynard's Castle, City of London, in the late Middle Ages and early Tudor period (as documented by Bramwell 1975). Instead the Alder/Castle/Falcon inhabitants relied on domestic fowl and geese, supplemented by the occasional duck; however in Phases 6, 7, 8 and 10 they apparently indulged in a wide variety of freshwater and marine fish. From the historical and modern records of fish species caught in the Thames compiled by Wheeler (1979) and from information relating to the modern distributions of marine fish species published by Kennedy (1954) it is possible to suggest where the fish species represented in the assemblages were caught.

According to criteria proposed by Wheeler (1977) small cod in the size range TL 60–80cm would have been caught by inshore fisheries off the E coast, while larger individuals than this could only have come from more distant waters in the northern North Sea. In order to determine which of these applied to the cod eaten in Phases 4 and 5, estimates of size (TL) were made using measurements taken from the dentaries, premaxillae, articular and opercular bones (after the methods of Ekman 1973, 56; Wheeler & Jones 1976; Rojo 1986); dentary depth measurement 'A' (devised by Wheeler & Jones 1976) was not used because of its known inaccuracy in large-sized individuals (as discussed by Armorosi *et al* 1994, 11). From 14 estimated values, the cod elements indicated a size-range between 90 and 149cm TL showing these were the products of

Table 6. Relative proportions (% of the total/phase) of the three main domesticates, based on bone weight, omitting non-food refuse (horn cores of cattle and sheep)

Phase/species	**cattle**	**sheep**	**pig**
4: Saxo-Norman	80.3%	15.7%	4.0%
5: Anglo-Norman (11th–13th cent.)	72.7%	23.3%	4.0%
6: Medieval (13th/late 14th cent.)	82.0%	13.3%	4.7%
7: Later medieval (*c*.1350–1400)	73.4%	18.9%	7.7%
8: Early post-medieval (*c*.1400–1500)	77.6%	15.5%	6.9%
10: Early post-medieval (16th cent.)	87.7%	9.4%	2.9%
11: Post-medieval (17th cent.)	88.2%	9.2%	2.6%
12: Post-medieval	80.1%	15.6%	4.3%

deep-sea fisheries in the North Sea, and therefore probably supplied to London either in the form of 'stockfish' (dried cod) or as preserved cod in barrels (either packed dry-salted or pickled in brine). Irrespective of the method or methods used in their preservation, it was usually the practice to remove the head during processing; cranial bone elements should therefore be absent at consumption sites, according to Perdikaris (1996). In view of this model, the disproportionate predominance of cranial parts and associated dentaries in the food refuse (Phases 4 and 5) seems highly anomalous. It is, however, worth mentioning that traditionally in Britain the 'cod's head and shoulder' were considered as delicacies and the best parts of this fish owing to the 'particularly rich and nutritious' thick tongue and cheeks, and the very firm fleshy neck, according to Hartley (1954, 239), who further observed that when served together such parts from a single large cod would make 'a substantial dish for three or four people'.

Neither pollack nor haddock are normally found in either the outer Thames estuary or in the southern North Sea and therefore must have been caught in the same 'distant water' fishing grounds as the cod. Whiting has always entered the outer Thames estuary in high numbers and this is probably where the specimens represented in the assemblages were caught. Herring, plaice, and sole are also commonly abundant in the Thames mouth, but the conger eel must have originated from elsewhere (English Channel?) as it is uncommon in both the Thames and southern/central North Sea. Conger eels were often preserved by pickling for transportation and long-term storage: split lengthways, rolled into collars, and soused like brawn (as described by Wilson 1976, 54). Mackerel is associated with open coasts and moderately deep water, and has never been recorded from the Thames. This fish must therefore have been caught by deep-sea fishermen. In contrast the freshwater eel and the roach were probably caught by local net-fisheries either in the freshwater reaches of the tidal Thames or in one of the tributaries.

Livestock husbandry

Analysis of the cattle and sheep bone elements recovered from site gives useful insight into the breed-types and sizes of these animals from Roman to early post-medieval times, as well as revealing their ages at time of slaughter. The results of this research make a further contribution to our knowledge of the history of livestock husbandry in Britain.

Cattle

No crania of polled (naturally hornless) cattle are represented, all the animals are horned and identified as belonging to the short- and medium-horned groups (classification of Armitage 1982b and Armitage & Clutton-Brock 1976).

Using the factors of Fock (1966) for metapodia and Matolcsi (1970) for the other long-bones, the withers heights (in cm) in the cattle are calculated as shown in Table 7.

Intra-site assessment of these data reveals the Anglo-Norman/High Medieval cattle to have been of small stature, including dwarf individuals under one metre high at the shoulder. This picture of impoverished stock is found to be common and widespread throughout Western Europe during that period, as discussed in detail elsewhere by Armitage (see Armitage 1980, 406–8; 1982b, 53). By the later medieval period, however, there is evidence of improvement, with the average height increasing from 103.8 to 117cm, and there is yet a further increase to 122cm by the early post-medieval period. Somewhat surprisingly, however, there is an absence in the later medieval/early post-medieval assemblages of bone elements of the sturdy-built, very tall (up to 151cm at the shoulder) long-horned cattle recorded from other early Tudor sites in the City of London, including Baynard's Castle (see Armitage 1977, 38–63; 1980, 408–11).

The age classes of the cattle represented in each of the faunal assemblages comprise calves as well as juvenile, subadults, and fully grown adults. A summary of the epiphyseal fusion in the more complete long-bone specimens is given below (Table 8).

Sheep

Horned rams, ewes, and wethers (castrate sheep) are all represented in Phases 2–12. Polled (naturally hornless) sheep, however, are identified only from the later medieval and early post-medieval phases, evidenced by three crania from the following contexts: [492] (Phase 7); [488] (Phase 8); and [216] (Phase 11). There are two

Table 7. Summary of the calculated withers heights in the cattle, by phase

	withers height (cm) N	Mean	Range	SD
Phases 2 & 3: Roman	3	108.3	98.0–115.2	–
Phases 4 & 5: Saxo-Norman/Anglo-Norman	5	103.8	95.9–115.5	–
Phases 6 & 7: Later medieval	5	117.0	110.1–126.9	–
Phases 8–12: Early post-medieval	45	122.0	107.9–137.3	6.95

Table 8. Summary of the epiphyseal fusion in the cattle long-bones (after Grant 1985)

		Roman P2, 3 & 3/4		Anglo-Norm. P4 & 5		Later med. P6 & 7		Early post-med. P8–12	
Approx. age at fusion	**Bone element**	**UF**	**F**	**UF**	**F**	**UF**	**F**	**UF**	**F**
10 months	pelvis		2		4		3	3	22
	scapula D				2	3	3	1	14
18 months	humerus D				3	1	7	1	24
	radius P		1		7	1	2	2	7
2–2½ yrs	metacarpus D		3	2	4		4	5	39
	tibia D	1	1		3		4	1	5
	metatarsus D	4		3	6	4	2	10	27
3½ yrs	femur	2		1	3	1	2	13	19
	calcaneum			1				11	6
3½–4 yrs	humerus P	2	1			1	3	11	13
	radius D	3	1	3	5	2	2	6	17
	ulna P		1	1				2	3
	femur D	2			2		2	8	25
	tibia P	1			1	4		10	13

Key: UF = unfused; F = fused; P = proximal epiphysis; D = distal epiphysis.

explanations for the presence together in the same phases of both polled and horned individuals: they represent two distinct breed-types (one hornless and the other horned) or only a single breed-type is represented in which the rams were always horned while the ewes were either horned or polled (as in the primitive Soay sheep of today).

In addition to the crania completely lacking horn cores, there are also two specimens (from [334] (Phase 10) and [216] (Phase 11)) which have only rudimentary (short and stubby) cylindrical horn cores (scurs).

Withers heights (in cm) were calculated from the lengths in the long-bones (after the method of Teichert) as shown in Table 9.

Intra-site assessment of these data reveals remarkable similarity in the mean stature values in the Roman, Saxo-Norman/Anglo-Norman, and early post-medieval sheep, and the only anomaly is in the later medieval sheep where apparently there is a preponderance of smaller individuals represented. Also surprisingly, the sheep from the early post-medieval assemblages do not include examples of the tall, unimproved longwool sheep (the largest of which attained shoulder heights up to 80cm) that have been recorded from other early modern sites in the City of London, including Aldgate (see Armitage 1983, 93).

Ages at death in 38 sheep from the combined medieval phases and 44 from the combined early post-medieval phases (represented by jawbones and isolated dp4 and M3 teeth) have been determined using the pattern of eruption and dental attrition in the lower cheekteeth (after the method of Payne 1973). The results of this analysis are presented in Table 10.

The main differences in the kill-off patterns seem to be in the relatively greater frequency of

Table 9. Summary of the calculated withers heights in the sheep, by phase

	withers height (cm) N	Mean	Range	SD
Phases 2 & 3: Roman	1		59.0	
Phases 4 & 5: Saxo-Norman/Anglo-Norman	23	59.3	54.0–64.1	3.13
Phases 6 & 7: Later medieval	18	56.0	51.9–60.6	2.39
Phases 8–12: Early post-med.	23	59.1	54.5–64.7	3.09

Table 10. Kill-off pattern in the medieval and early post-medieval sheep

suggested age range	wear stage	no. individuals medieval (Phases 4–7)	no. individuals early post-med. (Phases 8–12)
0–2 months	A	0 (0%)	0 (0%)
2–6 months	B	5 (13.2%)	1 (2.3%)
6–12 months	C	2 (5.3%)	1 (2.3%)
1–2 years	D	6 (15.8%)	6 (13.6%)
2–3 years	E	4 (10.5%)	5 (11.4%)
3–4 years	F	11 (28.9%)	13 (29.5%)
4–6 years	G	9 (23.7%)	17 (38.6%)
6–8 years	H	1 (2.6%)	1 (2.3%)

lambs (aged 2–6 months) in the medieval phases and in the larger number of mature sheep (aged 4–6 years) in the early post-medieval phases which, supported by the high frequency of male and castrate horn cores, suggests culling of older animals that had been primarily kept for their wool rather than as meat producers.

POLLEN ANALYSIS

Robert G. Scaife

Pollen analysis has been carried out on the fills of the Phase 6 medieval ditch dated to the 13th/14th century and the fill [500] of the Phase 7 later ditch dated to between 1400 and 1500, excavated at Alder/Castle/Falcon House. An initial assessment was carried out on material obtained from this substantial ditch profile (Scaife 1999a) with the aim of establishing presence or absence of pollen and spores and potential for environmental reconstruction. Pollen was successfully recovered from two sampled profiles (Sections 228 and 229) which showed a marked diversity of herbs with few trees and shrubs. As a result, the more complete profile, Section 229, has been studied in greater detail. The results of this fuller analysis are presented here.

Methodology

Samples for pollen analysis were obtained directly from the open sections using box monolith tins. These were sub-sampled for pollen analysis in the laboratory at the same time as examination of the stratigraphy was carried out (see Keeley 1999). Samples of 2ml were taken at 5cm intervals. Standard procedures were used for the extraction of the sub-fossil pollen and spores (Moore & Webb 1978; Moore *et al* 1991). Pollen counts of 400 grains of dry land taxa and extant mire/aquatic and spores were counted. These data are presented in standard pollen diagram form (Table 11) with the pollen sum comprising dry-land pollen as a percentage of its sum and mire and spores as percentages of these groups plus the total of dry-land taxa for each level. Absolute pollen frequencies were calculated using the addition of a known number of exotic spores (*Lycopodium*) to a known volume of sample (Stockmarr 1971). Pollen taxonomy generally follows that of Moore and Webb (1978) modified

Table 11. Pollen data

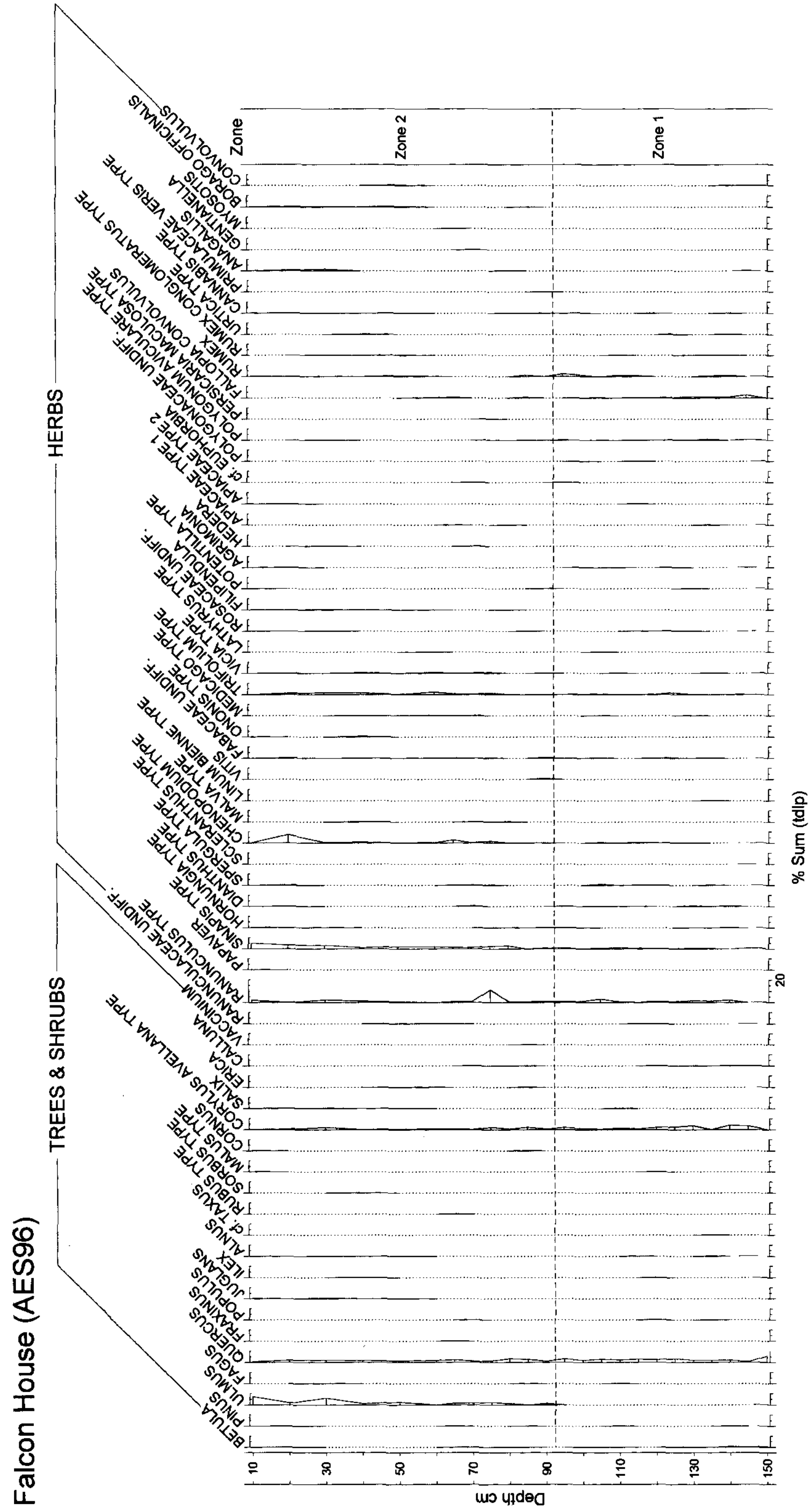
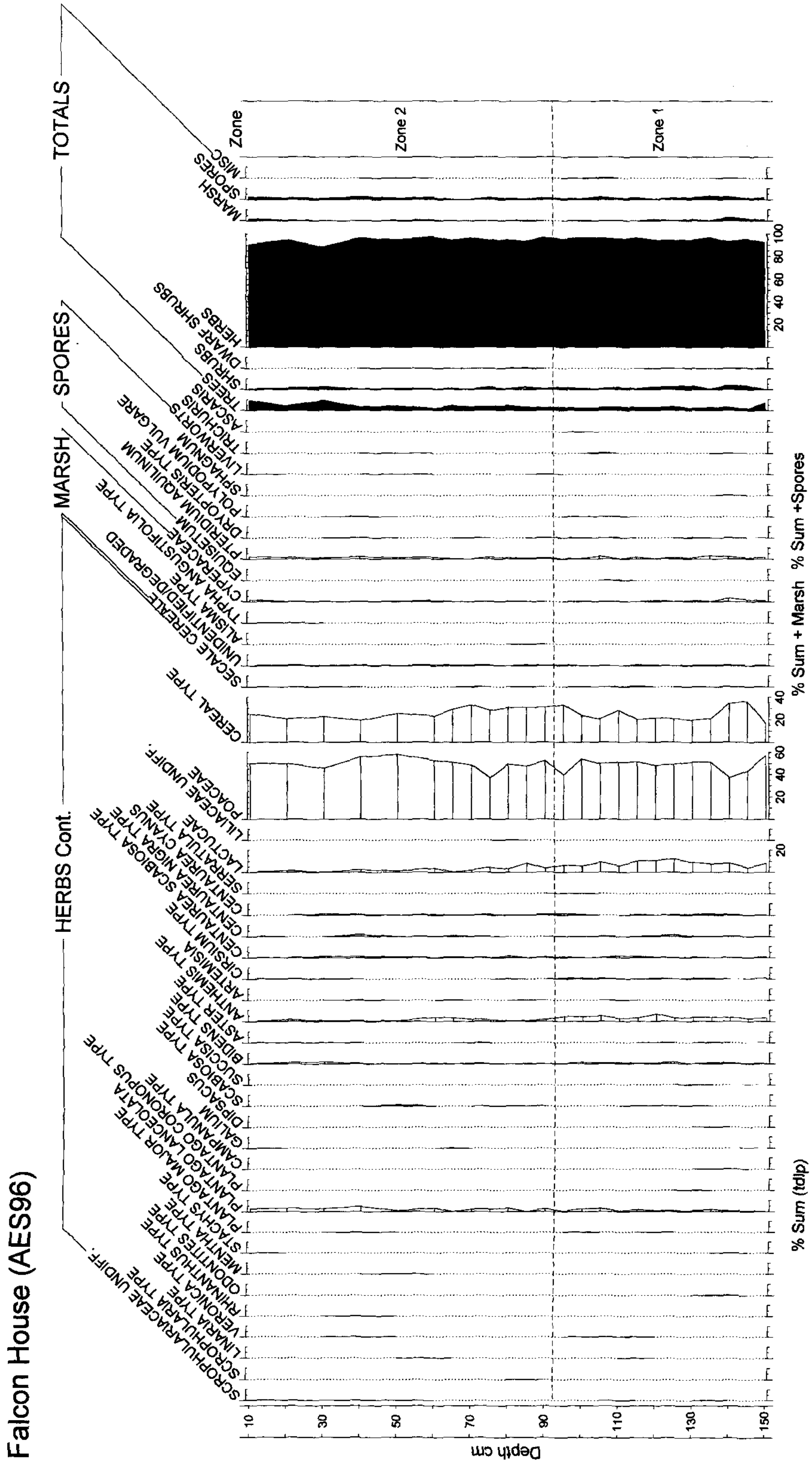


Table 11. (Continued)



according to Bennett *et al* (1994) in accord with Flora Europaea/Stace (1991). The pollen diagram was plotted using *Tilia* and *Tilia* Graph. These procedures were carried out in the Department of Geography, University of Southampton.

Section 229: the pollen data

Pollen was present and was generally well preserved in all samples examined. Absolute pollen frequencies were calculated and values ranged from 30,000 to 70,000 grains per/ml. The pollen sequence is stratigraphically homogeneous but with a diverse and dominant range of herbs comprising up to 95% of total pollen. In contrast are the small values of tree and shrub pollen. The latter attain a maximum of 20% in the upper half of the profile. Two pollen assemblage zones have been recognised on the basis of these changes and lesser changes in the herb flora. These local pollen assemblage zones are distinguished as follows from the base of the profile upwards.

Zone 1: 150–92cm. Herbs are dominant (to 95%) with few trees (av. 5–6%) and shrubs (5%). Trees comprise a small but consistent record of *Quercus* (3%) with sporadic occurrences of *Betula*, *Pinus*, *Fraxinus*, *Populus*, *Ilex*, and *Alnus*. Shrubs comprise small but consistent records of *Corylus avellana* type with sporadic *Erica* and *Calluna*. Herbs are dominated by small diameter, wild Poaceae (to 56%) with Cereal type (to 38%). Lactucae (12%), *Anthemis* type (6%), and other Asteraceae are also relatively important. In addition to these is a diverse range of herbs comprising many families. Taxa which appear more frequent in this zone include: *Dianthus* type, *Spergula* type, *Agrimonia*, *Polygonum aviculare* type, *Fallopia convolvulus* type, and *Rumex*. Taxa worthy of note also include *Centaurea cyanus*, *Secale cereale*, and *Cannabis* type. There are few spores which include *Pteridium aquilinum*, *Dryopteris* type, and *Polypodium vulgare*. Parasite ova of *Trichuris* and *Ascaris* are present.

Zone 2: 92–10cm. Herbs remain dominant (90–95%), whilst there is some increase of tree pollen (to 10%). The latter occurs as a result of increasing *Ulmus* (to 7%) in this zone. Also of note is *Juglans* from 50cm (< 1%). The dominance of herbs is maintained by Poaceae (to 55%) and Cereal type (35–40%). The overall diversity of herb taxa is maintained from Zone 1 but with some reduction in importance of Asteraceae types (especially Lactucae and *Anthemis* type). *Cannabis/Humulus* type and *Centaurea cyanus* remain. The presence of *Borago officinalis* in this zone is interesting and discussed further below. Spores are similar to those recorded in Zone 1 with *Pteridium aquilinum*, sporadic *Dryopteris* type, *Polypodium vulgare* and liverworts.

The excavated profile was shown to comprise a number of contexts relating to periods of cut and fill. The depths of these relative to the pollen profile is as follows:

cm	context
0–32	[500]
32–48	[509] (upper)
48–80	[509]
80–88	[529]
88–148	[531]
148–157	[534]

With perhaps the exception of the major division between [534] and [531], there appears to be no substantial variation in pollen numbers or taxonomic diversity across the boundaries of the upper fills.

Discussion of results

The taphonomy of pollen recovered from ditches is complex and thus there may be difficulties in interpretation of the pollen spectra recovered. There are also few published data relating to the analysis of such contexts. However, useful information on the local depositionary environment can be gained from analysis, especially where other 'normal' depositional environments such as peat mires, lakes, or ponds are not available. This has been demonstrated from Iron Age features at Shills, Glasgow (Robinson 1983) and Romano-British sites in Glasgow and Yorkshire (Dickson *et al* 1979; Tinsley & Smith 1974 respectively). Long term changes in agriculture have been identified from field boundary ditches spanning the late Bronze Age to medieval periods at Market Deeping, Cambridgeshire (Rackham & Scaife forthcoming). Pollen present in ditches in urban contexts comprises taxa which may be derived from a number of sources. These sources may include direct pollen transfer from surrounding vegetation via 'normal' airborne or insect vectors or from secondary, derived sources such as domestic waste of various forms. Reworked pollen from older sediment/soils must also be considered. In recent years, pollen analyses of urban archaeological contexts have given a better understanding of such sources (Greig 1981; Scaife 1982a), enabling some useful conclusions as to depositionary environments to be made. These factors have to be taken into account in the interpretation of the pollen spectra obtained from the Alder/Castle/Falcon House ditch profile.

Profile 228 (assessment; Scaife 1999a) and Profile 229 both exhibit a paucity of tree and shrub pollen types which is commensurate with other pollen data from medieval and later contexts in London. This undoubtedly indicates the absence locally of extensive tree growth, but it must also be considered that the pollen spectra from secondary sources may have had a swamping effect on airborne derived assemblages thus suppressing to some extent evidence for local (tree) growth. However, when compared with existing data for the region, the paucity of trees, excepting possible planted taxa, is consistent throughout with the small percentages of *Quercus* (oak) and other wind pollinated taxa clearly reflecting a farther/regional background.

In local pollen assemblage Zone 2, from [531] upwards, there is a clear increase in *Ulmus* (elm) spanning some 80cm of the profile. This must represent an expansion of local growth, perhaps in larger parks or gardens. *Juglans* (walnut) is an interesting occurrence being regarded as a Roman introduction into Europe as a whole. There is an increasingly large number of English sites which have produced evidence of its presence. Such records come from Roman London and include the Temple of Mithras (Scaife 1982b) and post-Roman London at Cromwell Green, Westminster (Greig 1992) and Tudor sediments at Somerset House (Scaife 1999b). It seems that once introduced into this region it has been maintained throughout the historic period.

Overall, the pollen spectra are typical of medieval and later contexts in that there is little tree and shrubs pollen but a very diverse assemblage of weeds derived from various habitats and via various transport mechanisms (Greig 1982; Scaife 1982a). By far the most important pollen element are Poaceae – wild grasses and cultivated cereals including *Triticum/Hordeum* type (wheat/barley) and *Secale cereale* (rye). These are associated with numerous weeds typical of cultivated and waste ground (ruderals and segetals). The latter notably include *Polygonum aviculare* (knotweed), Brassicaceae (charlocks), *Convolvulus* (bindweed), *Fallopia convolvulus* (black bind-weed), and Asteraceae types (daisy family), including *Centaurea cyanus* (blue corn flower). Other herb types may also relate to this arable cultivation but are of herbs with wide ecological range and/or not palynologically differentiable to lower taxonomic levels. These may thus relate to waste ground areas in an urban context.

The very substantial numbers of cereal pollen and associated weed/segetal taxa imply use of cereals. However, it is most probable that this pollen is of secondary derivation coming from refuse. This might include human and animal ordure, straw floor coverings, roofing materials and waste food or the by-products of cereal crop processing; that is, pollen trapped in the ears of cereals being released during threshing and winnowing (Robinson & Hubbard 1978; Scaife 1986, 1995). The presence of *Trichuris* (whip worm) and *Ascaris* (mawes worm) indicates that there is a faecal component in the sediments and it seems likely that the cereal pollen was present in food (bread *etc*) and has passed through the gut of humans or animals. Alternatively, as discussed for Broad Sanctuary, Westminster (Scaife 1982a), slaughter house offal may also have been disposed of in ditches and river/stream channels (see Armitage above). This may also have been a major source of pollen from ingested grasses and cereal fodder. Other possible cultivated plants recovered include *Linum bienne/usitatissimum* (flax), *Humulus/Cannabis* type (hop and hemp), and, in Zone 2, *Borago officinalis* (borage). The latter is a very interesting and rare pollen record of this introduced Mediterranean herb. Whilst borage spreads rapidly, growing on waste ground, pollen records here associated with strong evidence for a cess/faecal content suggest that its pollen may also be from this source given its culinary importance. This plant is a well known pot herb, with its young shoots being used in salads, pot boiled, and also for candied flowers. However, perhaps a more likely explanation of its presence here is that borage was formerly always used as an ingredient in tankards of wine ('claret cups') and cider to impart a cool (cucumber like) flavour (Gerard 1985; Grieve 1931, 1984). Pollen from the flowers and that deposited on the foliage used would, as with cereal pollen noted, readily pass through the gut. Unfortunately, it was not possible to distinguish between hemp and hop pollen, although both taxa are likely to have been of importance and hemp seeds were recovered in the plant macro analysis (Carruthers, below). Hop, however, is a strong possibility coming from beer making and consumption and similarly passing through the gut.

THE CHARRED PLANT REMAINS

Wendy Carruthers

Introduction

Excavations on the Alder, Castle and Falcon House site revealed, amongst other features, the medieval city ditch (Butler 1999). Soil samples were taken from several wet to waterlogged deposits for the recovery of environmental information. Five samples from four phases of the medieval ditch fill (13th century to 16th century) and one sample from a Saxo-Norman Phase 5 pit (AD 900–1200) were examined for this report.

Methods and state of preservation

The soil samples were wet-sieved to 500 microns. Five of the six samples contained a fairly wide range of well-preserved plant remains, with some of the more delicate species being well represented *eg Conium maculatum*, *Urtica dioica*. Mineralised and part-mineralised plant remains were found in four of the six samples.

The three samples with the lowest diversity also produced the fewest mineralised remains, so (as with even continuously waterlogged assemblages) it is likely that there has been some loss of taxa. However, this probably occurred during the medieval period, rather than following excavation, as it is unlikely that the deposits have remained fully waterlogged throughout their history. Despite this, a wide enough range of taxa was recovered to provide an insight into the types of waste being deposited in the ditch and the local environment.

The flots and residues were sorted under a dissecting microscope, and most of the fruits and seeds were stored in test tubes. In a few cases, however, the seeds were so numerous that it would have been too time consuming to have removed and counted every seed. For these taxa an estimate of frequency was made in order to save time.

Results

Table 12 presents the results of the analyses. All of the calculations (% compositions) were carried out using only the waterlogged and mineralised plant remains, as charred material is usually derived from a different range of processes. Where numbers of seeds were estimated, the following average figures were used in the calculations: ++ = 13, ++++ = 200, +++++ = 400.

Discussion

The medieval city ditch

A wide range of plant remains was recovered from the five samples examined for this report, including a small amount of charred cereal remains, and frequent waterlogged and mineralised material. Fish bone was particularly abundant in [495] and [509], and mineralised insect puparia were especially numerous in [495]. Since the number of seeds per litre, diversity and degree of mineralisation were also greatest in these two deposits, preservation conditions clearly were at their best in these lower ditch fills.

Mineralisation takes place in deposits that are rich in nutrients, as well as being moist but probably not fully waterlogged (Carruthers forthcoming; Green 1979). Calcium and phosphates enter solution during the decay process, percolate down the soil profile, and are taken up by plant cells. It is probably this downward movement of minerals that caused the lower ditch levels to have the greatest level of mineralisation, although the soil water content is also critical. At the Late Bronze Age site at Potterne, Wilts (Carruthers forthcoming), a mineralised surface was found to have formed beneath a highly organic midden-type deposit due to this process.

Preservation of the fruits and seeds as calcium phosphate sub-fossils also depends on the amount of thickening in the cell walls. The thin walled seed embryos can more easily absorb the mineral solution and are consequently more often preserved by mineralisation, as are soft-bodied insect pupae (Carruthers forthcoming). Material from this site was of particular interest to the author in demonstrating this method of preservation. For example, most of the hemlock seeds from [509] appeared to be preserved by

Table 12. The charred and waterlogged plant remains

( ) = charred; [ ] = mineralised or part mineralised; no brackets = waterlogged; + = occasional (1–5); ++ = several (6–20); +++ = common (21–100); ++++ = frequent (101–300); numerous (>300)

Habitat Key: * = introduced; A = arable; C = cultivated; D = disturbed; E = heath; F = food/fibre/medicinal plant; G = grassland; H = hedgerows; M = marsh; P = ponds & ditches; R = rivers & streams; S = scrub; W = woodland; Y = waysides; a = acidic soils; c = calcareous; l = light soils; n = nutrient-rich soils; o = open; s = shaded; w = wet/damp

Taxa: **i) Charred Cereal Remains**	**Context** **Sample no.**	**349** **10**	**388** **11**	**488** **16**	**495** **19**	**509** **26**	**641** **34**
Triticum sp.	Bread wheat-type grain		(4)		(2)		
T. spelta L.	Spelt glume base				(4)		
cf. *T. dicoccum* Schſbl.	cf. Emmer glume base				(3)		
T. dicoccum/spelta	Emmer/spelt glume base				(12)		
T. dicoccum/spelta	Emmer/spelt spikelet fork				(5)		
Hordeum sp.	Barley grain frag.		(1)				
Avena sp.	Oat grain		(1)			(1)	
Indeterminate cereal			(1)		(5)	[5]	

ii) other economic plants	**Context** **Sample no.**	**349** **10**	**388** **11**	**488** **16**	**495** **19**	**509** **26**	**641** **34**	**Habitat**
Calendula officinalis L.	Pot marigold achene					1		F*
Cannabis sativa L.	Hemp seed				2	11		F*
Euphorbia lathyris L.	Caper spurge seed				1			F?*
Ficus carica L.	Fig seed	13	40	87	61	77		F*
Fragaria vesca L.	Wild strawberry seed			27				FHSW
cf. Juglans regia L.	cf. Walnut nutshell frag.					1		F*
Linum usitatissimum L.	Flax seed					1		F*
Malus sylvestris (L.) Miller	Crab apple seed					8		FHSW
Prunus domestica cf. *insititia*	Cf. Bullace stone					1		F*
Malus/Pyrus communis	Apple/pear embryo				[1]			FHSW
Vitis vinifera L.	Grape			6	30	26		F*

Table 12. (Continued)

possible economic plants	**Context** / **Sample no.**	**349** / **10**	**388** / **11**	**488** / **16**	**495** / **19**	**509** / **26**	**641** / **34**	**Habitat**
Brassica / Sinapis sp.	Charlock, mustard etc. seed	[2]			40	[219]		ACDY
Conium maculatum L.	Hemlock mericarp		1	1		[181]		DwPY
Corylus avellana L.	Hazelnut shell frag.					51		FHSW
Hyoscyamus niger L.	Henbane seed		32	1	3		1	Dn
Malva sylvestris L.	Common mallow nutlet					[21]		D
Marrubium vulgare L.	White horehound nutlet	130	105	3	19	83	1	FGoD
Prunus spinosa L.	Sloe stone					1		FHSW
Prunus sp.	Sloe/cherry/plum kernal			[1]				
Prunus sp.	cf. Sloe/cherry/plum stone frag.					14		F
Rubus *sect.* Glandulosus *Wimmer & Grab*.	Bramble seed		3	22	2	23	36	FHSW
Sambucus nigra L.	Elderberry seed	+ + + + +	31	9	60	45	31	DFHSWn
ii) % of total plant remains		**65**	**76**	**35**	**31**	**50**	**57**	

iii) Aquatics & semi-aquatics		**349** / **10**	**388** / **11**	**488** / **16**	**495** / **19**	**509** / **26**	**641** / **34**	**Habitat**
Carex sp.	Sedge (trigonous) nutlet	20	19	89	19	36	4	GMP
Carex sp.	Sedge (biconvex) nutlet			6		9		GMP
Caltha palustris L.	Marsh marigold achene				2	2		MPR
Eleocharis subg. *Palustres*	Spike-rush nutlet			2		2	5	GwMPR
Montia fontana L.	Blinks				1			PRw
Myosoton aquaticum (L.) Moench	Water chickweed seed	+ + + +	12	3	+ + + +	+ +	1	MPRn
Polygonum hydropiper (L.) Spach	Water pepper achene							PRws
Ranunculus flammula L.	Lesser spearwort achene			1		2		PR
R. sceleratus L.	Celery-leaved buttercup achene	1	5	1	1		18	GwPR
Schoenoplectus lacustris (L.) Palla	Common club rush						1	PRs
Cladoceran Ephyppia	Water-flea (*eg Daphnia*) egg cases	+ +	+				+ + + +	
iii) % of total plant remains		**27**	**13**	**23**	**31**	**4**	**24**	

Table 12. *(Continued)*

iv) **Arable & ruderal weeds**		**349** **10**	**388** **11**	**488** **16**	**495** **19**	**509** **26**	**641** **34**	**Habitat** **preferences**
Aethusa cynapium L.	Fool's parsley					3		CD
Agrostemma githago L.	corn cockle seeds {+frag.}	[1]			3	7{++}		A
Ajuga reptans *L.*	Bugle			1				GwW
Atriplex patula/prostrata	Orache seed	6	1	17	146	157	6	CD
Bromus sp.	Chess caryopsis				(1)			AD
Bupleurum rotundifolium L.	Thorow-wax					3		Ac
Chelidonium majus L.	Greater celandine	2	1					HDY
Chenopodium album L.	Fat hen seed	28		17	14	3	1	CDn
Chenopodiaceae	Mineralised embryo	2						CD
Chrysanthemum segetum L.	Corn marigold					8		AD
Cirsium/Carduus sp.	Thistle achene					[17]		CDG
Daucus carota L.	Wild carrot					3		DG
Euphorbia helioscopia L.	Sun spurge seed		2					CD
Fallopia convolvulus (L.) A.Love	Black bindweed				2	4		AD
Fumaria officinalis L.	Common fumitory			1	1			CD
Galium aparine L.	Cleavers					3		CD
Ilex aquifolium L.	Holly					1		HSW
Lapsana communis L.	Nipplewort achene					12		CDH
Persicaria maculosa/lapathifolia	Redshank/pale persicaria achene							Cwo
Poaceae	Grass caryopsis				(3)[4]	[7]		CDG
Polygonum aviculare L.	Knotgrass achene			30		10		CDo
Primulaceae							2	
Prunella vulgaris L.	Self-heal nutlet					26		DGWo
Ranunculus repens/acris/bulbosus	Buttercup achene			73	19[11]	225	4	DG
Raphanus raphanistrum L.	Wild radish seed					6		CD
R. raphanistrum	Wild radish capsule frag.					2		CD
Rhinanthus minor L.	Yellow-rattle				[10]	[28]		G
Rumex sp.	Dock achene			9	[37]	[130]	2	CDG
R. acetosella L.	Sheep's sorrel			1			4	

Table 12. (Continued)

iv) Arable & ruderal weeds		**349** **10**	**388** **11**	**488** **16**	**495** **19**	**509** **26**	**641** **34**	**Habitat preferences**
Silene vulgaris Garcke	Bladder campion			8[1]	7	15		
Silene sp.	campions	1						
Solanum nigrum L.	Black nightshade seed					1		CD
Sonchus asper (L.) Hill	Prickly sow-thistle achene	1						CDY
S. oleraceus L.	Smooth sow-thistle achene							CDY
Stellaria media (L.)Villars	Common chickweed seed	1		2	1	2		Co
Stellaria gramineae L.	Lesser stitchwort seed						3	G
S. holostea L.	Greater stitchwort			1				HW
Thlaspi arvense L.	Field penny-cress				[2]			AD
Torilis sp.	Hedge-parsley					5		CDGH
Umbelliferae					[5]	[6]		
Urtica dioica L.	Stinging nettle achene	23	25	29	3		1	CDn
Valerianella dentata (L.) Pollich	Narrow-fruited cornsalad			1	1	1		AD
Verbena officinalis L.	Vervain			1				DGc
Veronica hederifolia L.	Ivy-leaved speedwell					1		Co
Viola sp.	violet		1					
iv) % of total		**8**	**11**	**42**	**38**	**46**	**19**	
TOTAL (waterlogged + mineralised)		**c.835**	**278**	**451**	**c.713**	**c.1527**	**121**	
Soil volume (litres)		**30**	**15**	**30**	**27**	**50**	**15**	
Total Plant frags. per litre		**24**	**19**	**15**	**26**	**27**	**8**	
Number of waterlogged/mineralised plant taxa		**16**	**14**	**29**	**31**	**50**	**17**	

waterlogging, from an external examination of the thick-walled mericarp (seed coat), but it was only the thin-walled internal tissues that had been preserved by mineralisation. These plant remains will be of great value in providing information about this incompletely understood process.

Because of this combination of preservation by waterlogging and mineralisation it was not always possible to tell how much mineralisation had taken place with some taxa, *eg* docks, unless every seed had been broken open. It is possible that many of the remains marked as waterlogged (no brackets) had been partially mineralised, since organic debris and moisture had clearly been readily available in the ditch for most of its period of infilling. It is obvious from the range of edible taxa present, and from the recovery of coprolites from [509] and [488], that faecal material was a major component of the waste deposited in the ditches. Because of differences in preservation down the profile it is difficult to determine whether or not the amount of faecal waste deposited changed across the four phases represented (Phases 6, 7, 8, and 10). It should be noted that these preservational differences may also have affected the range of taxa present. What is clear is that non-native fruits such as fig (*Ficus carica*) and grape (*Vitis vinifera*) were being consumed, although grape seeds were not recovered from the Phase 10 sample. The fragment of possible walnut shell (*Juglans regia*) was too small for a positive identification to be made, but walnuts have been recorded from London from the Roman period (Willcox 1977) onwards, and their presence was confirmed in the pollen record (Scaife, above).

A variety of other definite and possible food plants and/or medicinal plants was also represented. These include strawberry (*Fragaria vesca*) (Phase 8 only), apple/pear (*Malus sylvestris* & *Malus/Pyrus*) (Phases 6 and 7), sloe (*Prunus spinosa*) and possible bullace (*P. domestica* cf. *insititia*) (Phase 6), blackberry (*Rubus* sect. *Glandulosus*) (all except Phase 10) and elderberry (*Sambucus nigra*) (all samples). It is also possible that native fruits such as blackberry and elderberry were being used as dye-plants, as they produce purple/grey and violet colours respectively. Elderberry seeds were particularly numerous in [349] (Phase 10), and this does not appear to be due to preservation biases (loss of more delicate seeds through drying out) as is sometimes the case.

The presence of hemp (*Cannabis sativa*) (Phases 6 and 7), flax (*Linum usitatissimum*) (Phase 6), pot marigold (*Calendula officinalis*) (Phase 6), and caper spurge (*Euphorbia lathyris*) (Phase 7) seeds, albeit in low numbers, provides evidence for the use of these plants, since none of the species are native to the British Isles. Although hemp and flax are fibre plants, their presence amongst faecal waste suggests that it was their medicinal and/or culinary properties that were being exploited in this case. Hemp or cannabis has long been used to ease pain. Grieve (1931) mentions an infusion of hemp seeds as being particularly useful in easing gynaecological pains. Flax seeds contain linseed oil, which has a variety of medicinal uses and can be used as a varnish. Grieve (*ibid*) gives details of a poultice being made of crushed seeds, alone or with mustard (*Brassica* sp.) which soothes ulceration. Linseed oil is also useful as a remedy for coughs and colds, and urinary infections. Flax seeds have also been eaten as a food, sometimes mixed with grain. Pot marigold has been recorded from a number of medieval sites across the British Isles, primarily from urban waterlogged contexts (*eg* Whitefriars, Norwich (Murphy 1983); Reading Abbey, Berkshire (Carruthers 1997)). The flower heads can be used to treat headaches and fevers, made into ointments and eyewashes, and used as a flavouring for soups and stews and as a food colouring (Grieve *ibid*). Caper spurge is a more poisonous herb, but the seeds and roots can be used, with caution, as a purgative. Grieve (*ibid*) notes that in France 12 to 15 seeds are taken at a time for this purpose.

The remaining taxa placed in the category of probable economic plants in Table 12 are native weeds and hedgerow shrubs that could have merely been growing in the locality, as they often inhabit areas of grassland and disturbed ground. However, the large numbers of seeds in at least one of the samples examined, along with the confirmed presence of faecal waste in these deposits, suggests that the plants were probably being exploited for their culinary and/or medicinal properties. In addition, most of these taxa have been shown to have been used medicinally, and are commonly found in deposits from medieval religious establishments where they were probably cultivated in physic gardens (*eg* hemlock and henbane: Waltham Abbey (Moffat 1987); hemlock: Dominican Priory, Oxford (Robinson 1985); hemlock and caper spurge: Paisley Abbey, Scotland (Dickson 1996)).

White horehound (*Marrubium vulgare*) has long been valued as a medicinal herb, being an effective treatment for coughs and lung trouble (Grieve *ibid*). Gerard and Culpepper mention a syrup made from fresh leaves. Common mallow (*Malva sylvestris*) leaves and flowers can be used as external fomentations and poultices, and can be boiled and eaten as a vegetable. The seeds or 'cheeses' are also edible (Grieve *ibid*). Hemlock (*Conium maculatum*) and henbane (*Hyoscyamus niger*), although deadly poisonous, have long been used as medicinal plants. Hemlock is a sedative and antispasmodic. Seeds and other parts of the plant have been used to cure a variety of complaints, from dog bites to epilepsy (Grieve *ibid*). Henbane is an antispasmodic, hypnotic, and mild diuretic, which has been cultivated as a crop plant due to its medicinal value. The seeds are said to have ten times the strength of the leaves; they have been used to ease toothache, and were smoked in a pipe as a remedy for neuralgia and rheumatism (Grieve *ibid*). It is more difficult to confirm whether the final taxon, *Brassica* sp/*Sinapis* sp, was used medicinally or as a condiment, as this group of plants includes common wasteground weeds such as charlock as well as mustard, cabbages *etc*. The large number of part-mineralised seeds (219) in [509], however, does suggest that it was more than just a local weed. Black mustard (*Brassica nigra*) is probably native, and has been cultivated in gardens since at least the 16th century (Tusser 1580). Medicinally, the crushed seeds have been used in poultices to soothe inflammations, as well as for respiratory complaints. As mentioned above, it can also be combined with other plants such as flax to improve their efficacy.

The wide range of medicinal plant species recovered from these ditch samples suggests either that the local inhabitants were of poor health, or that a physic garden or hospice of some sort existed in the vicinity for much of the medieval period. Other sites that have produced this type of assemblage are usually religious establishments, such as Reading Abbey (Carruthers 1997), Waltham Abbey (Moffat 1987), and the Dominican Priory, Oxford (Robinson 1985). It is also possible that the high level of use of medicinal plants is related to status, since presumably tonics, infusions, and ointments would have be obtained at some cost in an urban setting.

The remaining *c*.40 to 70% of the plant remains in each sample were aquatics/semi-aquatics and ruderal weeds. The aquatic/semi-aquatic taxa were primarily marginals, some of which grow in seasonally exposed, often polluted, muddy areas (*eg* blinks, *Montia fontana* and water chickweed, *Myosoton aquaticum*) (Haslam *et al* 1975). The range of taxa was not large, and the percentages of total seeds were, on the whole, low. This suggests that the ditch did not contain standing water for long periods of time allowing a well-developed aquatic flora to become established, but probably experienced periodic episodes of waterlogging due to poor drainage.

The range of weeds of cultivated or disturbed soils was quite wide, although in most cases the total numbers of seeds in this group were not great. Arable weeds such as corn cockle (*Agrostemma githago*) and corn marigold (*Chrysanthemum segetum*) may have been deposited amongst faecal waste as contaminants of bread. The presence of small fragments of corn cockle seed coat supports this suggestion, as the large seed was probably accidentally ground with corn to make flour. Although cereal bran fragments were not positively identified from these samples, the very fibrous nature of [509] suggested that it was probably present. This is the context that produced corn cockle fragments. The remaining weeds may have been deposited in other waste materials, such as hay, which could have been used for flooring, bedding, or fodder. Yellow rattle (*Rhinanthus minor*) is a typical hay meadow plant, and it was frequent along with other grassland taxa such as buttercups, self-heal, and grasses in [495] and [509]. No doubt, if faecal waste was being deposited some of the plant material had been used as toilet paper, although no large quantities of moss were preserved as is sometimes the case. Other weeds may have been growing in the area, particularly weeds of nutrient-rich wasteground soils such as stinging nettles (*Urtica dioica*), chickweed (*Stellaria media*), and docks (*Rumex* sp.). It is, of course, possible that a number of these commonly available weeds had been used for food or medicinally, as many of them can be eaten as leaf vegetables or the seeds mixed with corn to pad out soups, stews, and bread. In addition, many herbs such as self-heal have medicinal properties. However, it is only when unusually large quantities of seeds of these taxa are recovered that suggestions of specific uses can be made, because they are so commonly recovered from archaeological deposits of all types.

Charred plant remains were present in small quantities in [388] (7 cereal grains: bread-type wheat, barley, oat) and [509] (6 grains: oat, indeterminate cereal), but [495] produced 24 hulled wheat glume bases/spikelet forks in addition to 7 grains (bread-type wheat, indeterminate cereal). Both emmer (*cf Triticum dicoccum*) and spelt (*T. spelta*) were probably represented, although the emmer glume bases were too poorly preserved to be certain of their identity. Although no redeposited Roman ceramics were recorded from [495] (Frank Meddens, pers. com.), it is likely that the hulled wheat remains represent redeposited Roman crop processing waste, since there is no definite evidence for the cultivation of hulled wheats in the medieval period. There is plenty of evidence of Roman activity in the area, including the Roman boundary ditch and City Wall. The few bread-type wheat, barley, and oat grains recovered could be Roman or medieval.

The Saxo-Norman cess pit [641]

The Saxo-Norman cess pit (Feature [642]) contained the lowest concentration of plant remains (8 fragments per litre) and one of the lowest diversities (17 taxa) out of the six samples examined for this report. There were no indications that mineralisation had taken place, but this does not necessarily suggest that the pit contents had been insufficiently rich in minerals. In the author's experience (Jennings Yard, Windsor: Carruthers 1993), total waterlogging of faecal deposits at the time of deposition can prevent mineralisation from taking place. Cladoceran ephyppia (water flea *eg Daphnia* egg cases) were numerous in this sample, indicating that the deposit had been waterlogged at some point in its history. Conversely, the fact that the most numerous taxa, blackberry and elderberry, are tough-coated seeds could indicate that some loss of plant material may have occurred at a later date through drying out. This could have taken place post-abandonment, since several celery-leaved buttercup (*Ranunculus sceleratus*) achenes were present, and this is a plant of seasonally dry, often polluted mud. However, the absence of imported fruits such as fig and grape is unlikely to be due to differential preservation, as these, too, are thick-coated seeds. It suggests that the diet of the Saxo-Norman users had been more limited than that of the people who caused the pollution of the city ditch during the 13th to 16th centuries.

Conclusions

The medieval city ditch was found to contain a wide range of waterlogged and mineralised plant remains. All of the samples examined showed evidence for the presence of faecal waste, the predominant component of four out of the six samples being plants of economic importance. 'Luxury' fruits such as fig and grape were present in the medieval ditch samples, but only hedgerow fruits were found in the Saxo-Norman cess pit. However, differences in preservation made comparisons across the phases difficult.

Medicinal plants appear to be well represented in the medieval ditch samples, suggesting either that the people responsible for producing the faecal waste were in poor health, or possibly that some sort of hospice or physic garden was located in the vicinity.

The remaining plant taxa from the ditch consisted of:

a) marginals and aquatics which indicated that the ditch had been waterlogged, but probably only periodically;

b) arable and wasteground weeds, some of which were probably deposited in faeces as contaminants of cereal products. Some other types of waste, such as hay, may be represented. The local vegetation probably reflected the high nutrient content of the soils, being predominantly nettles, docks, chickweed, and Chenopdiaceae.

Most of the charred cereal remains recovered probably represent small amounts of redeposited Roman crop processing waste.

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