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The upper Walbrook in the Roman period

by Catharine Maloney
with Dominique de Moulins

1990

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The Upper Walbrook valley in the Roman period

Frontispiece River landscape similar to the upper Walbrook as it may have been in prehistoric times

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The upper Walbrook valley in the Roman period

by
Catharine Maloney

Environmental analysis edited by
Dominique de Moulins

Illustrations by Hester White

contributions by B Davies and J Groves (finds);
E Allison, A Davis, J Hillam, H Kenward, R Preece,
E Robinson, C de Rouffignac and
R Scaife (environmental)

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Front cover: Reconstruction by John Pearson of the upper Walbrook at 15–35 Copthall Avenue in the mid 2nd century

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Summary

This study traces the history of the upper Walbrook valley in the City of London from prehistoric to late Roman times by examining the evidence from six sites excavated in 1981-84. The report consists of ten parts: an introduction (Part 1); a study of the site evidence (Parts 2-6); a summary of the finds (Part 7); a multidisciplinary environmental analysis for one of the sites (Part 8); dendrochronology (Part 9) and the conclusions (Part 10).

The Walbrook was a network of southward-flowing streams, which converged into a main channel in the middle of the City before entering the Thames. Part 2 examines the evidence for the stream in its natural state. Streambeds were located at three of the sites in the study. At 15-35 Copthall Avenue a major tributary on the western side of the valley was identified; at 23 Blomfield Street a north-south section though the main stream was recorded, while waterlain sands and gravels at 4-6 Copthall Avenue were either part of the main stream or another tributary. Evidence from these sites has indicated modifications to the courses of the streams as previously proposed by Merrifield and RCHM. Within the wide valley of the upper Walbrook in the City, major streams had eroded their own valleys through the Thames Terrace Gravels and into London Clay as far north as Blomfield Street. The width of these valleys was in excess of 22m, 35m and 44m. For the first time, detailed information about one of the streams was provided from the excavation of the western tributary at 15-35 Copthall Avenue. Here the stream had created a wide arc as it altered direction from a west-east to north-south course. Up to 0.65m of valley fill had accumulated, with primary deposits consisting of gravels when the stream was fast-flowing, followed by the evenly-laid sandy silts of a much slower regime immediately prior to the early Roman period. By that time the silts had been colonised by trees and vegetation as the stream shifted eastwards. At 23 Blomfield Street only truncated sands and gravels of the main stream were recorded; although at 4-6 Copthall Avenue the presence of a stream was marked by the complete erosion of the Thames Terrace Gravels, very little deposition had occurred: a maximum of 0.3m of clayey gravels and sands and gravel.

Part 3, Period I concerns the development of the valley by the Romans who initiated a planned programme of reclamation and drainage in the late Ist-early 2nd century, though it may have begun at an earlier date on the sides of the valley. The streams were canalised by timber revetments or banks and marshy ground within the individual valleys was reclaimed by the dumping of clay or gravel. Streamlets were infilled or canalised and incorporated into a network of drainage channels which presumably linked up with the streams. At least two major north-northeast to south-southwest roads were constructed through the valley, postulated extensions of the Flavian street grid in the city. At 15-35 Copthall Avenue one of the roads apparently curtailed the western tributary. Gravel or timber paths were connected to the roads and provided access from within the valley. These roads were main routes from the centre of the city, probably to the cemeteries and possibly also to areas of maket gardening to the north.

Part 4 covers the 2nd and 3rd centuries (Period II) when many of the early drainage channels were infilled and buildings were erected on the now extensive, reclaimed land. These were generally constructed in the first half of the 2nd century, though one at 43 London Wall is dated to the early 3rd century and three at 4-6 Copthall Avenue are dated to the mid-late 3rd century. There is no precise dating from the demolition of the buildings, but it seems clear that they continued to be occupied in the 3rd century, with those at 4-6 Copthall Avenue possibly into the 4th century. Timber and clay were the materials used for buildings constructed on reclaimed ground, often on piles. Masonry buildings seem to have been confined to the higher ground overlooking the streambed. At 15-35 Copthall Avenue a number of complex hearths, ovens and scorched brickearth floors, confined to one half. of a building, suggest that industrial activity was carried out here, with the other half perhaps domestic quarters. It is proposed that the expansion of the city was not the only reason for the development of the upper Walbrook, but also the need for an industrial area well served by communications and a water supply. An extensive metalled surface was laid out on the drier ground beside the former tributary at 15-35 Copthall Avenue, while the buildings were restricted to the damper reclaimed land, possibly because it was convenient to the supply of water. Drainage and water supply were initially maintained though there are signs that at some time during this period they were neglected. The roads were maintained; that at 15-35 Copthall Avenue appears to have been realigned further to the north. By the end of the 2nd century, however, the roads must have been affected by the construction of the defensive wall and were possibly linked with an intramural road. Evidence from a recently excavated site adjoining 4-6 Copthall Avenue to the north seems to indicate that the road hereabouts was disused by the late 3rd century.

Part 5 covers the activities of the later 3rd century and 4th century and the eventual abandonment of the upper Walbrook valley (Period III). Two sites, 15-35 Copthall Avenue and 43 London Wall appear to have been abandoned in the 3rd century for a period of fifty years or more but in the early/ mid 4th century were re-occupied. At 15-35 Copthall Avenue, a series of pits - sharing a number of characteristics - may have had industrial functions; they were associated with a gravel surface linked with the road. Nevertheless, when this activity ceased, here and on all the other sites, the digging of drainage ditches and/ or raising of the ground level implies that the ground was becoming wet. It is suggested that inside the City this was caused by a lack of maintenance of the man-made drainage system; the area was finally abandoned by the Romans in the 4th or mid-late 4th century. North of the city, where marshy conditions seem to have commenced not long after the construction of the defensive wall at the end of the 2nd century, it appears that the culverts which allowed the streams through the wall were unable to cope with the

quantity of material being carried down-stream and that much of this material may itself have derived from the reclamation dumps and embankments.

The Walbrook continued to influence this area of the City until relatively modern times and Part 6 is a summary of post-Roman development. The marsh seems to have begun forming in the Roman period outside the city wall, and eventually spread southwards above reclaimed ground in the former valleys of the streams. Re-occupation occurred as early as the Saxon period at Telegraph Street but not until the late 11th–early 12th centuries at 15-35 Copthall Avenue and 43 London Wall, where the cutting of ditches and dumping of clay successfully drained the ground by the 12th/13th centuries. Industrial activities, particularly leather and metalworking, were concentrated in this part of the city in medieval and post-medieval times. North of the defensive wall the marsh, after many attempts, was finally adequately drained in the 17th century.

Part 7 summarises the finds evidence. Most of the artefacts were deposited in the upper Walbrook valley as part of the reclamation process in ground raising dumps. Except in Period III, there were, in particular, large amounts of organic rubbish. Two sources for these artefacts are apparent: the households and workshops of the city generally, and leather and glassworking industries sited nearby. A glass furnace has recently been found on the west side of the valley. Finds from one of the buildings at 15-35 Copthall Avenue were, on the whole, typical of a household but there is some evidence that could associate the building with leatherworking and smithing. There is nothing to suggest that the stream was used for ritual purposes, as has sometimes been supposed, or that markets were set up in the area. When the coins, leatherwork and general finds assemblages from the sites in this study are compared with those from previous excavations in the Walbrook valley, it becomes clear that in the past finds were retrieved selectively; hence, any reference about the use of the area which is based on such collections, should be examined with caution.

In Part 8 the environmental evidence from 15-35 Copthall Avenue is considered. A multidisciplinary study consisting of analyses of seeds, pollen, insects, molluscs, ostracods and parasites (no diatoms were found in any of the samples taken) was made for the site of 15-35 Copthall Avenue in order to reconstruct the environment at various periods and suggest people's activities. Attempts were made at obtaining information from comparable periods and contexts using all or most of the types of evidence. Some general questions were answered by this environmental investigation: the changes in wetness through time, the type of vegetation and the degree of human impact could be traced as well as more detailed questions about individual contexts such as the conditions prevailing in the stream.

In the prehistoric period, all the evidence indicated that the environment was marshy and fairly natural and that the stream was clear and permanent.

The pollen and seeds from the samples of Period I, the earliest Roman period, suggested wet grassland or woodland with marshy areas. Cereal grains and chaff were also present. The insect fauna of Period I was varied and included a high proportion of common aquatics and strong synanthropes such as grain beetles and woodworms. They indicated a persistently wet environment and a strong human presence at the same time. Very few mollusc remains and no ostracods were recovered; this reinforces the picture of a less clean water environment in the channels than previously.

Similarly, both mollusc and ostracods were missing from the contexts of Period II, the Roman period associated with the buildings. The pollen and seed evidence gave comparable results, reflecting damp and disturbed conditions, while the insect assemblages were typically urban with outdoor species also present. The other contexts from Period II, pits, occupation surfaces and hearths, included ruderals indicating a fair amount of disturbance and many seeds of Gramineae especially in the occupation layers and hearth fills, probably reflecting the wide use people made of straw. Parasite eggs were found in one occupation layer. The evidence for human occupation and disturbance was therefore the predominant characteristic in this period. However, no real drying out of the environment could be ascertained.

The molluscs from the ditches in Period III included species suggesting stagnant water. No ostracods were found in the samples in this period. The insect assemblages were made up of outdoor, aquatic and synanthropes. The plant remains indicated a disturbed and muddy environment and damp conditions still existed but to a lesser extent than in other periods.

In Period IV, the mollusc and ostracod assemblages had very similar types of indicators including active swimming species and species typical of slow-flowing water. The molluscs were from a well-oxygenated, plant-rich environment and the ostracods indicated a semi-permanent or water-filled ditch. Similar conditions were shown by the insects: no synanthropes were present and the decomposer component was very small. Instead, the aquatic element, the water-side taxa especially, was well represented. The seeds of Period IV included fewer seeds of plants of the purely disturbed environment but on the other hand, more damp-loving and aquatic species than in the preceding period. It was also thought from an assemblage of possible segetal taxa that agriculture may have taken place in the area. But the overall picture for Period IV is that of a marsh undisturbed by human influence where sluggish water was running.

Résumé

Cette étude retrace l'hisroire de la vallée de la Walbrook dans la Cité de Londres de la Préhistoire à l'époque romaine tardive. L'étude porte sur six sites fouillés entre 1981 et 1984. Le volume comprend dix parties: une introduction (lère partie); l'étude des sites (2ème à 6ème parties); un résumé des objets archéologiques (7ème partie); une analyse multidisciplinaire de l'environnement de l'un des sites (8ème partie); la dendrochronologie (9ème partie) et les conclusions (10éme partie).

La rivière Walbrook était formée par un ensemble de ruisseaux coulant vers le Sud et convergeant au milieu de la Cité pour former un seul cours avant de se jeter dans la Tamise. Le ruisseau nature1 est décrit dans la deuxième partie de ce volume. Son cours a été retrouvé dans trois des sites de cette étude. Au 15-35 Copthall Avenue, un affluent important venant du côté. ouest de la vallée a été retrouvé et au 23 Blomfield Street, on a relevé le cours principal dans sa partie nord-ouest tandis que les sables et graviers de 4-6 Copthall Avenue représentaient le cours principal ou un autre affluent. Les indices obtenus sur ces sites montrent que le cours des ruisseaux a été modifié comme l'avait déjà pensé Merrifield et RCHM. Dans le bassin de la partie supèrieure de la Walbrook au nord de la Cité à partir de Bloomfield Street, des ruisseaux importants ont creusé leur propre vallée à travers les graviers d'une terrasse de la Tamise et l'argile londonienne. La largeur des ces vallées est de 22m, 35m et 44m au moins. Pour la première fois, des indices détaillés sur l'un des ruisseaux ont été fournis par les fouilles d'un affluent de la rive droite au 15-35 Copthall Avenue. Là, le ruisseau décrit une large courbe et change sa direction Est-Ouest pour couler du Nord au Sud. Des sédiments d'une épaisseur allant jusqu'à 0,65m se sont accumulés là, les couches de base sont faites de graviers formés quand le cours d'eau était rapide et sont recouverts par des limons sableux déposés régulièrement quand le régime du ruisseau est devenu beaucoup plus lent juste avant la période romaine ancienne. A cette époque, les arbres et la végétation ont colonisé le limon et le ruisseau a commencé à couler vers l'est. Au 23 Blomfield Street, on a seulement relevé les sables et graviers tronqués du cours principal; bien qu'au 4—6 Copthall Avenue la présence du cours d'eau soit marquée par l'érosion totale des graviers de la terrasse de la Tamise, la déposition y a été faible, elle est d'une épaisseur maximum de 0.3m de graviers argileux, de sable et de graviers.

La troisième partie Porte sur le développement de la vallée par les Romains. Ceux sont eux qui les premiers ont conçu un programme d'assèchement et de drainage à partir de la fin du premier siècle et du début du deuxième, bien qu'il soit possible que ce programme ait cornmencé plus tôt sur les bords de vallée. Les cours d'eau furent canalisés avec des revêtements de bois ou des talus, et les marécages entre les vallées ont été assêchés en y déchargant de l'argile et des graviers. Les petits ruisseaux ont été bouchés ou canalises et ils ont été inclus dans un système de canaux de drainage qui devaient sans doute rejoindre les cours d'eau. Au moins deux routes dont l'une orientée nord nord-est à sud sud-ouest ont été construites dans la vallée elles représentent sans doute le prolongement des rues quadrillées de la ville de 1'époque flavienne. Au 15-35 Copthall Avenue, une de ces routes semble coupcr l'affluent de la rive droite. Des sentiers en gravier ou en bois rejoignaient les routes et fournissaient une voie d'accès à partir de l'intèrieur de la vallée. Ces roules représentaient les voies principales venant du centre de la ville, menant probablement vex-s les cimetières et peut-être aussi vers les zones maraichères situées au nord de la ville.

La quatrième partie Porte sur les deuxième et troisème siècles (Période II); à cette époque beaucoup de canaux d'origine se sont trouvés bouchés et l'on a construit sur une grande partie des terres assêchées. Les bâtiments ont été construits pendant la première moitié du deuxième siècle mais l'un d'eux au 43 London Wall est date du début du troisième siècle et trois autres au 4-6 Copthall Avenue sont datés du milieu ou de la fin du 3éme siècle. On n'a pas pu obtenir de dates précises pour la démolition des bâtiments mais il est clair que ceux-ci ont continué à être occupés au 3ème siècle; ceux du 4–6 Copthall Avenue ont peut-être été utilisés jusqu'au 4ème siècle. Le bois et l'argile étaient les matèriaux utilisés dans la construction, souvent sur pilotis, des bâtiments placés sur les terres assêchées. Les bâtiments en pierre semblent avoir été placés uniquement sur les hauteurs surplombant le cours d'eau. Au 15–35 Copthall Avenue, on a retrouvé un certain nombre de foyers, de fours et de sols en terre brulée dans une moitié du bâtiment seulement, ce qui fait penser que la se passait l'activité artisanale et que peut-être les piéces d'habitation se seraient trouvées dans l'autre moitié. Nous pensons que l'expansion de la ville n'a pas été l'unique raison du développement de cette partie de la vallée de la Walbrook mais qu'il y a eu aussi un besoin de créer une zone industrielle bien desservie par les routes et par l'eau. On a construit une étendue empierrée sur les terrains les plus secs parallèles à l'affluent trouvé au 15-35 Copthall Avenue, tandis que l'on a placé les bâtiments aux endroits partiellement asséchés peut-être parce que l'accès à l'eau y était plus facile. Ix drainage et l'arrivée d'eau ont d'abord été bien entretenus mais certains détails montrent qu'a un moment donné pendant cette période ils ont été négligés. Les routes étaient entretenues, celle de 15–35 Copthall Avenue par exemple semble avoir été retracée plus au nord. A la fin du 2ème siecle, cependant, les routes semblent avoir été affectées par la construction du mur de défense et ont peut-être été reliées entre elles par une route intra-muros. Des indices obtenus récemment dans un site voisin du 4-6 Copthall Avenue au nord semblent indiquer que la route passant à cet endroit a été abandonnée à la fin du 3ème siècle.

Dans la 5ème partie de ce texte, on a décrit les évènements a la fin du 3ème siècle et au 4ème siècle et l'abandon définitif de la haute vallée de la Walbrook (Période III). Il semble que deux sites, 15-35 Copthall Avenue et 43 London Wall, ont été délaissés au 3ème

siècle pendant une pèriode de cinquante ans ou plus ont été réoccupés au debut ou au milieu du 4ème siècle. Au 15-35 Copthall Avenue, on a retrouvé une série de fosses qui se ressemblaient en plusieurs points et l'on pense qu'elles avaient peut-être eu une fonction industrielle; elles se trouvaient près d'une surface empierrée jointe à la route. Mais lorsque l'on a cessé d'utiliser ces fosses, à cet endroit comme sur tous les autres sites, le creusement de fossés de drainage ainsi que la surélévation du sol indiquent que le sol recommençait à être humide. On a donc émis l'hypothèse que la cause de ce retour à des conditions humides était que l'entretien du drainage artificiel dans la Cite avait cessé. Cette partie de la ville a finalement été abandonnée au 4ème siécle, peut-être dans la deuxième moitié du 4ème siècle. Au nord de la ville, là où les conditions marécageuses semblent avoir commence à exister peu après la construction du mur de défense à la fin du 2àme siècle, il semblerait que les conduits souterrains qui canalisaient les ruisseaux sous les murs n'ont pu remplir leur fonction à cause de la quantité de matière transportée par le cours d'eau et que beaucoup de cette matière provenait peut-être des remblais d'assêchement.

La Walbrook a continue à influencer cette partie de la Cité jusqu'à une époque relativement récente et dans la 6ème partie de cette étude, l'on a fait un résumé de cc qui s'y est passe après la période romaine. Le marécage qui avait commence à se former à l'époque romaine à l'extèrieur des murs de la ville, s'est alors étendu vers le sud sur les terres qui avaient été assêchées dans les anciennes vallées des ruisseaux. Cette partie de la ville a été réoccupée dès la période saxonne a Telegraph Street mais pas avant la fin du llème ou du debut du 12ème siècle à 15-35 Copthall Avenue et au 43 London Wall; la on a constaté que les fessés et les dépôts d'argile drainaient bien le sol aux 12ème et au 13ème siecles. Le travail du cuir et du métal était concentre dans cette partie de la ville au Moyen-Age et dans la période suivante. Au nord du mur d'enceinte, le marécage a été finalement asséché au 17éme siècle après bien des essais infructueux.

On trouvera un resume des objets archéologiques dans la 7eme partie de ce volume. La plupart des objets avaient été deposes dans les remblais destinés à surelever le sol pour assêcher les terrains dans le bassin supèrieur de la Walbrook. A toutes les époques sauf pendant la Période III, les depots étaient surtout formés de matière organique. Les objets provenaient de deux sources: d'une part les maisons et ateliers de toute la ville et, d'autre part, les industries du cuir et du verre des environs immédiats. Un fourneau destine a la fabrication du verre a été récemment retrouvé à 1'Ouest de la vallée. Des objets provenant d'un des bâtiments du 15-35 Copthall Avenue étaient dans l'ensemble typiques des maisons d'habitation mais certains indices font penser que ce bâtiment servait plutôt au travail du cuir et du metal. Rien n'indique que le ruisseau ait été utilise pour des activites religieuses ou rituelles comme on l'a quelquefois pensé ou qu'il y avait des marchés dans cette partie de la ville. Quand l'on compare les pieces de monnaie, le travail du cuir et les objets en general qui proviennent des sites traités dans cette étude avec ceux des fouilles faites auparavant dans la vallée de la Walbrook, il est clair que les objets ont été autrefois ramassés d'une maniere selective; il en découle que l'on doit traiter avec prudence les conclusions sur la fonction de cette partie de la ville fondles sur de telles collections.

Dans la 8ème partie, l'on trouvera une étude sur l'environnement de 15-35 Copthall Avenue. Cette etude, d'ordre multidisciplinaire, comporte l'analyse des restes de plantes, du pollen, des insectes, des mollusques, des ostracodes et des parasites (aucun diatome n'a été preserve) retrouvés sur le site de 15-35 Copthall Avenue. Cette etude vise à décrire l'environnement du site aux diverses époques ainsi que certaines activities des habitants. A cet effet on a tenté d'obtenir des indications provenant de piriodes et de contextes comparables en se servant de tous les indicateurs qui y ont été préservés. Certaines des conclusions que l'on a tirées sont d'ordre general et portent sur les changements d'humidité d'époque en époque, le type de vegetation aux diverses périodes et les effets de l'impact des activities humaines sur l'environnement; elles sont plus detaillees lorsqu'elles décrivent les contextes individuels et l'état du cours d'eau.

Pendant la période préhistorique, tout semble indiquer un environnement naturel, plutôt marécageux dans lequel un cours d'eau propre et clair est present toute l'année.

Les pollens et les graines retrouvés dans les échantillons de la Période I, la période romaine la plus ancienne, proviennent de près humides ou de bois entourés de marecages. Des graines de céréales et des fragments de son ont aussi été retrouvés dans ces échantillons. Les restes d'insectes de la Période I étaient varies et comprenaient une proportion élevée d'espèces aquatiques et synanthropes comme par exemple certains scarabées et des vers de bois. I1s indiquent en même temps un environnement toujours humide et une forte presence humaine. Peu de restes de mollusques (et aucun ostracode) ont été retrouvés ce qui laisse à penser que l'environnement aquatique était devenu plus pollué.

On n'a retrouvé ni mollusque ni ostracode dans les échantillons de la Période II qui est celle des bâtiments de l'epoque romaine. Les pollens et les graines ont donné des résultats comparables: la presence d'espèces adventistes montrent que le sol était humide et bouleversé par l'activité humaine; d'autre part les insectes appartenaient pour la plupart au groupement urbain, certains d'entre eux appartenaient au groupement dit de plein air. Les autres contextes de la Période II: les fosses, les sols d'occupation et les foyers comprenaient des plantes ruderales et de nombreuses graines de graminées, surtout dans les couches de sols d'occupation et de foyers, ce qui indique sans doute un usage répandu de la paille. Des oeufs de vers parasitaires ont été retrouvés dans un des sols d'occupation. L'effet humain est la caractéristique principale de cette époque mais il n'est pas possible d'affirmer que le sol soit alors devenu vraiment plus sec.

Les mollusques provenant des f'osses de la Période III comprenaient des espèces typiques des eaux stagnantes. Aucun ostracode n'était present dans les échantillons de cette période. Les insectes appartenaient à des espèces dites de plein air, des espèces aquatiques ou synanthropes. Les restes de plantes indiquaient des sols perturbés et boueux; les conditions humides sont donc toujours en evidence mais peut-être à un degré moindre qu' à d'autres époques.

Pendant la Période IV, les mollusques et les ostracodes comprenaient des indicateurs aux habitats et comportement semblables: ils appartenaient à des espéces de nageurs actifs et à des espèces typiques d'un cours d'eau au regime lent. Les mollusques provenaient d'un environnement bien aéré et riche en plantes et les ostracodes d'un fossé où l'eau était présente en permanence. Les insectes indiquaient des conditions semblables: aucune espèce synanthrope n'était présente et il y avait peu de déecomposcurs. Par ailleurs, les espéces aquatiques étaient nombreuses. Les graines de la Période IV comprenaient moins d'espèces ruder-ales mais plus d'espèces hydrophytes. Un certain nombre d'espèces adventistes messicoles indiquaient peut-être la presence de terres cultivées dans les environs. Mais en general, pendant la Période IV, l'environnement n'est pas trouble par les habitants de la villa et il est celui d'un marécage à travers lequel coule un lent cours d'eau.

Zusammenfassung

Diese Arbeit beschäftigt sich mit der Geschichte des oberen Walbrook Tals in der City of London von der prähistorischen bis zur spätrömischen Zeit. Hierzu werden die Ergebnisse von sechs Ausgrabungen zwischen 1981 bis 1984 zugrunde gelegt. Der Bericht zerfällt in zehn Kapitel: Einleitung (1); Darstellung der Ausgrabungsergebnisse (2-6); Zusammenfassung der Fundgegenstände (7); Multidisciplinäre Umwelts-analyse einer der Ausgrabungen (8); Dendro-Chronologie (9) und Schlußfolgerungen (10).

Die Walbrook bestand aus einem Netzt von südwärts fließenden Bächen und Flüssen, die sich in der Mitte der City zum Hauptgewässer vereinigten bevor sie die Themse erreichten. Teil 2 untersucht die Spuren der Flüsse in ihrem natürlichen Zustand. Drei der Ausgrabungen enthielten Flußbetten. Ein größerer Nebenfluß wurde in 15-35 Copthall Avenue auf der Westseite des Tales gefunden. Während in 23 Blomfield Street ein Nord-Südschnitt durch den Hauptfluß vorliegt, könnte der Flußbettsand und Kies in 4-6 Copthall Avenue sowohl zum Haupt- als auch zu einem anderen Nebenfluß gehört haben. Die Funde von diesen Grabungen haben gezeigt, daß der Lauf des Flusses sich verändert hat, wie von Merrifield und RCHM schon früher angenommen wurde. In dem weiten Tal der oberen Walbrook, nördlich hinauf bis Blomfield Street, hatten größere Bäche ihre Betten durch die Kiesterrassen der Themse bis hinunter in die Lagen des Londoner Tons ausgewaschen. Die Breite dieser Täler erreichte mehr als 22m, 35m und 44m. 15–35 Copthall Avenue hat zum ersten Mal Einzelheiten über einen westlichen Nebenfluß geliefert Hier wo der Fluß seinen Lauf von West/ Ost nach Nord/ Süd änderte, bildete er einen weiten Bogen. Bis zu 0.65m starke Kiesschichten lagerten sich in einem schnell fließenden Bach ab, während später gleichmäßiger Treibsand und Schlamm auf einen viel langsameren Fluß kurz vor Beginn der früh-römischen Periode hindeuten. In dieser Zeit war das Marschland schon mit Bäumen und anderer Vegitation bewachsen, denn der Fluß hatte sich nach Osten verlagert. In 23 Blomfield Street haben auf Grund späterer Baueingriffe nur kleine Stücke der Sand und Kieslagen überlebt. Obwohl in 4-6 Copthall Avenue der Flußverlauf durch die totale Auswaschung des Themsetalkieses belegt ist, hatte sich bier sehr wenig Material (0.3m toniger Kies und Sand) angesammelt.

Teil 3, Periode I zeigt die Entwicklung des Tales während der römischen Zeit, in der ein gezieltes Programm der Landgewinnung und Kanalisierung verwirklicht wurde. Dies geschah wahrscheinlich im späten ersten bis frühen zweiten Jahrhundert, entlang der Ufer jedoch mag es früher begonnen haben. Die Flußarme wurden mittels Holzverschalungen oder Dämmen entlang der Ufer kanalisiert und die Marschen innerhalb der einzelnen Täler wurden durch Auffüllen von Kies und Tonerde trockengelegt. Die Bäthe wurden entweder eingefüllt oder kanalisiert und in das Drainagesystem, das wahrscheinlich mit den Flüssen verbunden war, eingegliedert. Mindestens zwei größere von Nordost nach Südwest verlaufende Straßen wurden durch das Tal gebaut, bedingt durch notwendig gewordene Erweiterungen des Straßensystems der Stadt. In 15–35 Copthall Avenue verschmälerte dies wahrscheinlich den westlichen Nebenfluß. Kies- und holzbelegte Pfade verbanden die Straßen mit dem Tal. Die Straßen führten wahrscheinlich vom Zentrum zu den Friedhöfen und möglicherwcise auch zu den Marktgärten im Norden.

Teil 4 behandelt das zweite und dritte Jahrhundert (Periode II), während denen viele der früheren Drainagen eingeebnet und Gebäude auf den beträchtlichen Flächen des gewonnenen Landes errichtet wurden. Dieses geschah hauptsächlich in der ersten Hälfte des zweiten Jahrhunderts, außer in 43 London Wall, wo ein Haus erst ins frühe dritte Jahrhundert datiert wurde, und drei andere in 4-6 Copthall Avenue, die erst aus dem mittleren bis späten dritten Jahrhundert stammen. Es gibt keine genaue Zeitangabe für das Ende der Bauphase, aber die Häuser scheinen durchgehend bis ins dritte Jahrhundert, die in Copthall Avenue wahrscheinlich bis ins vierte Jahrhundert bewohnt gewesen zu scin. Die Baumaterialien auf dem gewonnenen Land waren aus Holz und Tonerde, die Fundamente standen oft auf Pfeilern. Steingebäude befanden sich nur auf dem höheren Gelände mit Blick über das Flußtal. Eine Reihe komplizierter Herde, Öfen und verbrannter Fußböden in einer Hälfte eines Hauses in 15–35 Copthall Avenue lassen auf industriellen Gebrauch schließen, während der Wohnteil sich in der anderen Hälfte des Hauses befunden haben mag. Man glaubt daß die Ausweitung der Stadt nicht der einzige Grund für die Bauentwicklung an der oberen Walbrook war, sondern

eher der Bedarf für ein Industriegebiet, das gute Verbindung und Wasserversorgung hatte. Auf dem trocknen Land nahe den früheren Nebenflüssen in 15-35 Copthall Avenue wurde eine weitläufige Kiesfläche angelegt, während die Gebäude, wahrscheinlich wegen der Nähe zum Wasser, auf dem neu gewonnenen, feuchteren Land standen. Während anfänglich die Drainagen und Wasserzufuhr gut unterhalten wurden, gibt es Anzeichen, daß sie nach einer gewissen Zeit vernachlässigt wurden. Die Straßen aber wurden weiter ausgebessert und die Strecke, die durch 15–35 Copthall Avenue verläuft, wurde in nördlicherem Winkel neu verlegt. Am Ende des zweiten Jahrhunderts müssen die beiden Straßen jedoch vom Bau der Verteidigungsmauer betroffen und wahrscheinlich hinter der Mauer anschließend verbunden worden sein. Durch eine neuere Ausgrabung auf dem Nachbargrund, in 4–6 Copthall Avenue ist bekannt, daß die Nutzung dieser Straße hier im späten dritten Jahrhundert aufhörte.

Teil 5 behandelt die Aktivitäten des späten dritten und vierten Jahrhunderts und das Aufgeben des oberen Walbrook Tales (Periode III). Zwei Gegenden, 15–35 Copthall Avenue und 43 London Wall scheinen im dritten Jahrhundert 50 Jahre oder länger unbewohnt, jedoch im frühen und bis zur Mitte des vierten Jahrhunderts wieder besiedelt gewesen zu sein. Eine Anzahl von Gruben in 15–35 Copthall Avenue weist gleichartige Besonderheiten und auf industrielle Nutzung hin. Sie mögen mit einem kiesbedeckten Platz und einer angrenzenden Straße in Verbindung gestanden haben. Am Ende dieser Art der Nutzung gibt es überall Anzeichen, daß der Boden nasser wurde, da entweder neu drainiert oder weiter aufgeschüttet wurde. Der Grund hierfur mag die Vernachlässigung des Drainagesystems innerhalb der City gewesen sein. Die Gegend wurde endgültig im vierten oder Mitre bis späten vierten Jahrhundert von den Römern verlassen. Im Norden der Stadt wurde es bald nach dem Bau der Verteidigungsmauer am Ende des zweiten Jahrhunderts sumpfig. Es scheint, daß die Wasserdurchlässe in der Stadtmauer nicht mehr das Treibgut bewältigen konnten, das möglicherweise auch von den früher angelegten Aufschüttungen und Dämmen gestamt haben mag.

Die Walbrook hat weiter fast bis in die heutige Zeit diese Gegend der City beeinflußt. Teil 6 (Periode IV) ist die Zusammenfassung der nachrömischen Zeit. Außerhalb der Stadtmauer hatte sich der Sumpf langsam nach Süden ausgebreitet und das früher gewonnene Land überschwemmt. In Telegraph Street finden sich Zeichen für eine Neubesiedlung in der Sachsenzeit. Aber erst im 11. und 12. Jahrhundert (in 15-35 Copthall Avenue und 43 London Wall) scheinen die Entwässerungsgräben und Erdaufschüttungen der Drainierarbeiten zum Erfolg geführt zu haben. Jedenfalls waren hier in mittel- bis spätmittellalterlicher Zeit Leder- und Metall-verarbeitende Industrie konzentriert. Die Marsch nördlich der Verteidigungsmauer wurde nach vielen Anläufen erst im 17. Jahrhundert erfolgreich trocken gelegt.

Teil 7 befaßt sich mit den Fundgegenstäden aller Grabungen. Während die meisten Funde in den Aufschüttungen der Landreklamierung aus großen Mengen organischen Abfalls bestehen, ist dies in Periode III nicht der Fall. Sie stammen hauptsächlich aus zwei Quellen, den städtischen Haushalten und Werkstätten im allgemeinen und auch aus der benachbarten Leder- und Glasindustrie. Vor Kurzem wurde ein Glasschmelzofen auf der Westseite des Tales gefunden. Aus einem der ehemaligen Gebäude in Copthall Avenue waren die Funde im ganzen typisch für einen Haushalt, einiges jedoch weist auf Lederverarbeitung und Schmiedebetrieb hin. Es gibt keine Anhaltspunkte, daß der Fluß fur rituelle Zwecke benutzt wurde, wie es früher vermutet wurde, oder daß es in der Gegend Märkte gegeben hat. Wenn man die Münzen, das Lederwerk und die anderen jetzigen Funde mit denen früherer Ausgrabungen an der Walbrook vergleicht wird einem klar, daß damals nur eine Ausgewahl einbehalten wurde. Daher müssen alle Äußerungen, die auf diesen Funden beruhen, mit Vorsicht betrachtet werden.

Im Teil 8 wird das Umweltmaterial aus 15–35 Copthall Avenue untersucht. Um etwas über die Umwelt und die menschlichen Aktivitäten in den verschiedenen Zeitabschnitten herauszufinden, wurden Samen, Pollen, Insekten, Mollusken, Ostrakoden und Parasiten analysiert (es wurden überhaupt keine Diatome gefunden), und die Forschungsergebnisse vergleichbarer Zeiträume und Einzelheiten wurden herangezogen. Hieraus ergaben sich einige generalisierende Aussagen über den Wechsel des Nassergrades, der Pflanzenarten und des menschlichen Einflusses auf die Gegend, als auch der Bedingungen im Fluß.

In der vorgeschichtlichen Zeit weist alles darauf hin, daß die Gegend marschig und recht unberührt war und daß die Flüsse ganzjährig klares Wasser führten.

Pollen und Samen zufolge bestand das Land während Periode I, der frühen römischen Zeit, aus nassem Grasland oder Gehölzen mit marschigen Teilen. Es gab auch Getreidesamen und Spreu. Die Insekten Fauna war vielfaltig, mit einem hohen Anteil der üblichen Wasserinsekten und starken Synanthropen wie Getreidekäfern und Holzwürmern. Sie weisen auf eine durchgehend nasse Umwelt mit gleichzeitig starker menschlicher Präsenz hin. Es gab nur wenig Molusken und keine Ostrakoden. Dies bestärkt den Eindruck eines weniger sauberen Wassers als vorher.

Ebenso fehlten Molusken und Ostrakoden in den Lagen der Periode II, der römischen Zeit der Bebauung. Pollen und Samen weisen ähnlich auf eine feuchte und gestörte Umwelt hin mit typisch städtischen Insekten. Die restlichen Lagen der Periode II gesammelt aus Gruben, Oberflächenansammlungen und Feuerstellen enthielten ‘Ruderals’ die auf starke menschliche Aktivitäten schließen lassen. Viele Kornsamen, besonders in Lagen, die sich während der Nutzung der Gebäude ansammelten, und von Feuerstellen deuten auf den reichen Gebrauch von Stroh hin. Auch Parasiteneier wurden in einer Lage gefunden. Die Periode II ist daher im wesentlichen durch Besiedlung und andere menschliche Eingriffe gekennzeichnet, während deren das Land nie richtig austrocknete.

Die Mollusken in den Gräben der Periode III enthalten Arten, die in stehenden Gewässern leben. Es wurden keine Ostrakoden gefunden. Von Insekten fand man sowohl Freiland- und Wassergattungen als auch

Synanthropen. Die Pflanzen ließen immer noch auf eine feuchte Umwelt schließen, wenn auch in geringerem Maße als früher.

Die Molusken und Ostrakoden der Periode IV sind sich sehr ähnlich, sie bestehen sowohl aus schwimmenden Arten als auch solchen, die in langsam fließendem Wasser leben und deuten auf eine sauerstoff- und pflanzenreiche Umwelt, und die Ostrakoden auf einen halb- oder ganzzeitlich wasserführenden Graben hin. Auf ähnliche Umstände weisen die Insekten hin: es gab keine Synanthropen, man hätte sie finden müssen, denn der Zersetzungsanteil in der Erde ist sehr klein. Auf das überwiegende Wasserelement weist auch die Ufer taxa hin. Die Samen zeigen eine deutliche Zunahme von Sumpf- und Wasserpflanzen, während die 'Kultur' pflanzen abnehmen, wenn man von segetal taxa absieht, die auf landwirtschaftliche Nutzung hinweisen könnte. Im ganzen kann man sich die Landschaft als ungestörte Marsch mit langsam fließendem Wasser vorstellen.

1. Introduction

This report attempts to examine the early development and environment of the upper Walbrook valley in the City of London in the 1st to 4th centuries. It is based on the results of archaeological investigations of 1981-4 mainly in the western half of the valley at 2-3 Cross Key Court/ 15-35 Copthall Avenue/ 43-49 London Wall, 4-6 Copthall Avenue, 8 Telegraph Street and 23 Blomfield Street, an area which in recent years has been, and continues to be, subject to redevelopment. These sites provided evidence of the prehistoric streams of the Walbrook, and of the development, decline and changing environment of the area in the Roman period. For the first time detailed information about the nature of the prehistoric streams was forthcoming. This is important for, as this study will attempt to prove, interference in the natural drainage pattern during the Roman period radically altered the Walbrook valley, causing the stream to flood and eventually creating a marsh which was not completely drained until the 17th century. A study of the prehistoric stream and its environment not only provides part of the background to the early history of London but also highlights one aspect of the Roman achievement which, although it ultimately failed, nevertheless provided an impetus for the eventual reclamation of the whole of the Walbrook valley in the City.

Geological and topographical background (Figs 1 and 2)

London occupies part of the London Basin, a broad syncline of Chalk filled in the centre with Tertiary sands and clays; in the City, and indeed most of London, this Tertiary series or bedrock consists of London Clay. Above the bedrock lie the Pleistocene (Quarternary) fluvial deposits of the River Thames arranged in flights or steps of terraces. These terraces represent the remains of former floodplains of the river, the highest being the oldest with each terrace becoming progressively younger down the valley side. The complexity of the Pleistocene sediments in the Thames Valley has made the identification and correlation of the terrace sequence difficult and many attempts have been made, the most recent being that of the Geological Survey (1982) and Gibbard (1985 and 1988).

Only three of the terraces are relevant in the area encompassed by the City, and of the first a very little survives at the south edge of the second terrace (1 on Geological Survey, *ibid,* sheet TQ 38 SW). The second terrace (2 on Geological Survey) is that upon which most of the City is built (Fig 1). Data obtained from numerous archaeological sites in the City indicate that the surface level of this terrace lies at between *c* 9-11m OD. It is identified by Gibbard, Whiteman and Bridgland as the Wolstonian (367,000-128,000 BP) Mucking Gravel (1988, 3). The third terrace (3a on the Geological Survey) was traditionally classified as Taplow but Gibbard has shown that it is earlier than the gravels found at Taplow, Buckinghamshire and which he identifies as the Corbets Tey Gravel (ibid) (also belonging to the Wolstonian stage). The southern edge of this terrace is situated in the northwest of the modern City, aligned northeast-southwest but outside the limits of the Roman city. Its surface is located at a level of *c* 15-16m OD.

The second terrace (Mucking Gravel) is, in the City, overlain by a sandy silt termed brickearth which formed in the late Devensian stage (32,000-10,000 BP) and is considered to be a combination of loess and waterlain deposits (*op cit,* 1985, 57). Its surface is generally found at a level of between 10.5-12.5m OD. These sediments formed an important source of building material in London in all periods.

In the City the terraces were dissected by the Fleet river and, to a lesser extent, the Walbrook, consisting of a network of streams which rose to the north, and a stream on the eastern side of the City. At the south edge of the 3rd terrace (Corbets Tey Gravel) London Clay is almost exposed, resulting in a spring line (Bentley 1987, 333-4 and fig 4). The main stream of the Walbrook, from flowing south-east through this terrace at Hoxton and Shoreditch, altered course to a south-westerly direction when it met the 2nd terrace (Mucking Gravel) and thence virtually followed this spring line into the City. It is probable that it was this spring line which also fed many of the tributaries of the Walbrook, the majority of which seem to have flowed into it from the west *(ibid* and Geological Survey, 1936). The valley was consequently widest in its upper reaches, its west side in the City broad and gentle, its east, steep, narrowing towards the Thames in the south (Fig 2). Although not as large as the Fleet river, the Walbrook was topographically important due to its dissection of the second terrace (Mucking Gravel) which created in effect two hills, Ludgate to the west and Cornhill to the east. Because of this it influenced the development of the city from Roman to post-medieval times, its morphology often determining the course of the major streets which crossed it. From the medieval period its main course also formed the boundary of most of the adjacent wards and parishes. Today it is channelled underground and only its outlet into the Thames at Dowgate can be seen.

Previous work in the Walbrook (Fig 2)

Archaeological recording in the Walbrook was carried out during construction work in the 19th and early 20th centuries. In the area outside the City observations were made on a number of sites. At 1-6 Finsbury Circus (Fig 2, Site 1) a depression 12m wide was considered to be a poorly-defined streambed with pebbly grey clay above the Thames terrace gravels; its fill, overlying the clay, was an extensive 0.3m thick layer of reeds containing Roman objects beneath a marshy deposit of medieval date (Lambert 1921, 97-8, 106-8). To the east at Eldon Street (Fig 2, Site 4) an east-west aligned stream was recorded, cutting through the gravel with a timber gutter along its south side and a Roman cremation urn on its south bank (Lambert 1921, 94-7, 107).

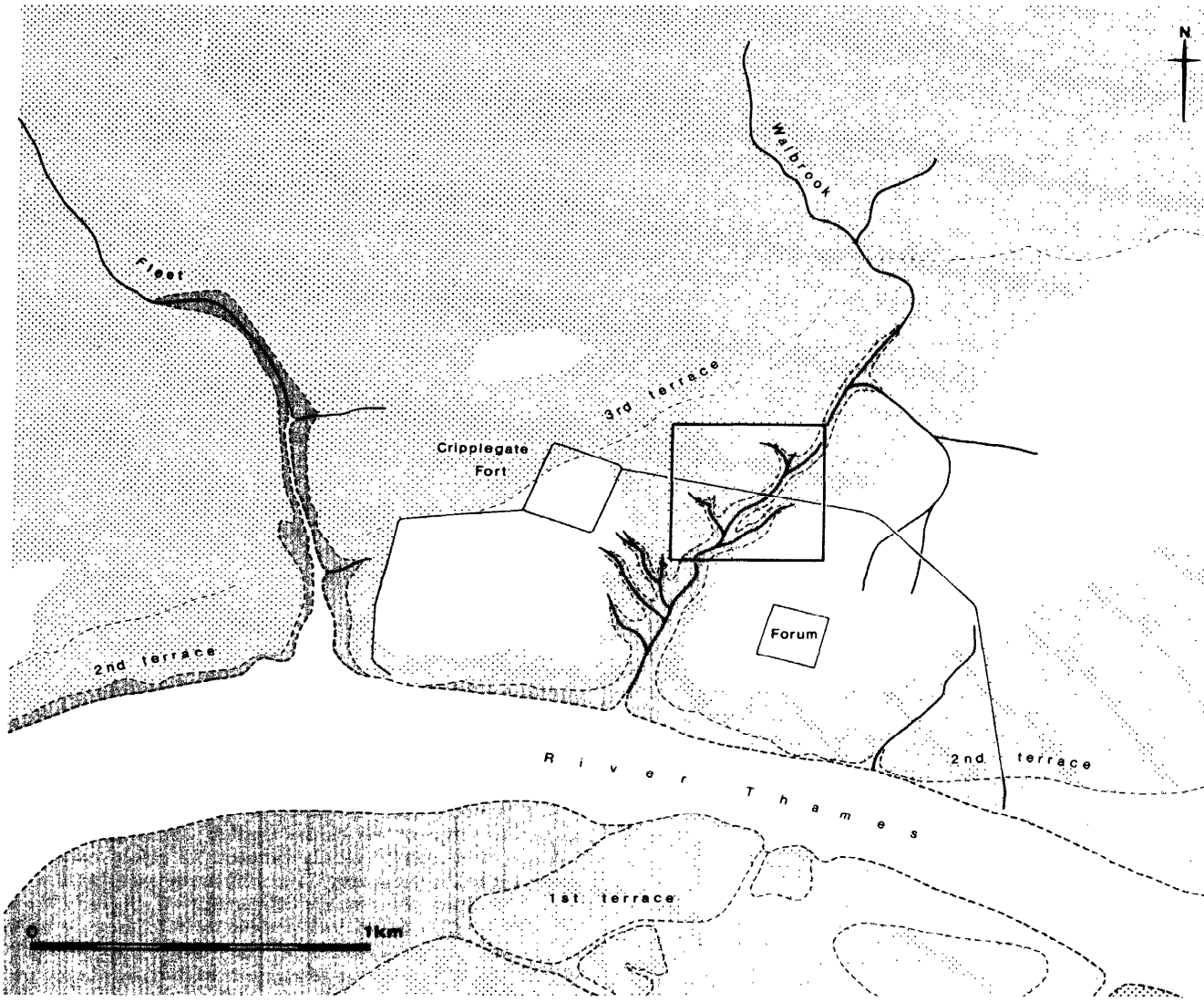
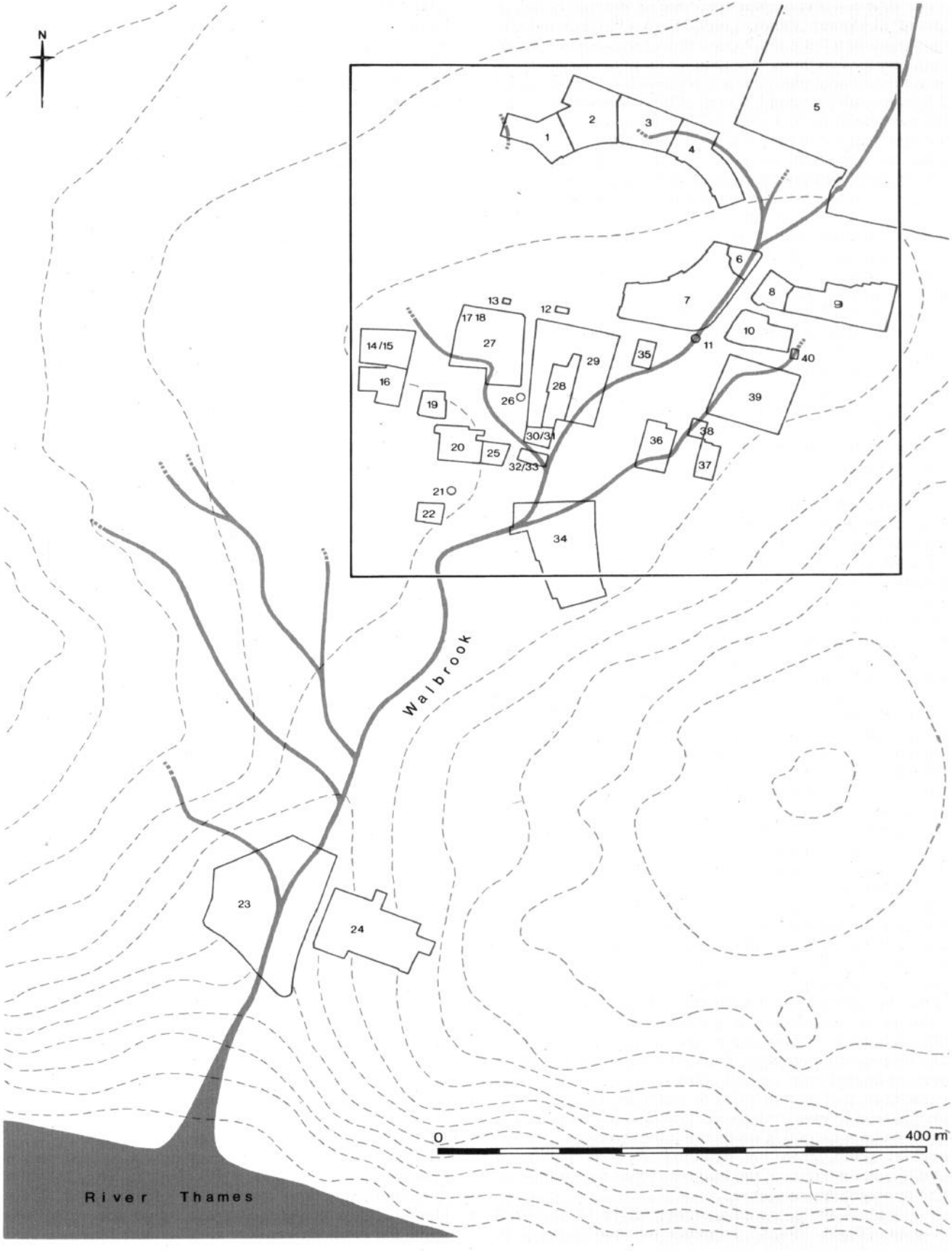


Fig 1 Geology of the City of London and surrounding area, showing Thames Terraces (stippled), brickearths (light grey) and alluvium (blue-grey). Intermittent traces of 1st terrace located along southern edge of 2nd terrace. Also shows limits of Roman town, main Roman features and study area. Based on Geological Survey (1936 and 1982), modified by D Bentley. Position of both banks of R Thames approximate. Scale 1:20,000

Fig 2 The study area in relation to the Walbrook and location of sites referred to in text, based on Ordinance Survey map Londinium *(1983). Contours at 3ft intervals, (based on I841 survey). An accurate survey of Roman ground levels has yet to be compiled*

Key to Sites referred to in text:

(1) 1-6 Finsbury Circus; (2) Riverplate House/7-11 Finsbury Circus; (3) 12-15 Finsbury Circus; (4) 26-31 Eldon Street; (5) Broad Street Station (Broadgate); (6) Finsbury House/23 Blomfield Street; (7) 4 London Wall Buildings and 23 Blomfield Street; (8) 46-7 New Broad Street; (9) 35-45 New Broad Street; (10) Blomfield House/ 85-6 London Wall; (11) London Wall and west corner of Blomfield Street; (12) London Wall opposite No 57; (13) London Wall opposite Nos 45-50; (14) 55-61 Moorgate (1929); (15) 55-61 Moorgate (1987); (16) 49-53 Moorgate/72-4 Coleman Street; (17) 43 London Wall; (18) 44 London Wall; (19) 30 Moorgate; (20) 20-8 Moorgate, 1-4 Copthall Close, 10-11 Great Swan Alley; (21) Telegraph Street; (22) 8 Telegraph Street; (23) Bucklersbury House; (24) St Swithins House; (25) 5-7 Copthall Avenue; (26) Copthall Avenue; (27) 15-35 Copthall Avenue, 45-9 London Wail, the Coleman Street Ward School, Cross Keys House, 2-3 Cross Key Court; (28) Rear of London Wall; (29) 52-62 London Wall; (30) 10-12 Copthall Avenue (1906); (31) 10-12 Copthall Avenue (1987); (32) 4-6 Copthall Avenue (1904); (33) 4-6 Copthall Avenue (1984); (34) Angel Court; (35) 2 Throgmorton Avenue; (36) 9-19 Throgmorton Avenue, 21 Austin Friars; (37) 13-14a Austin Friars; (38) 22 Great Winchester Street; (39) Winchester House, Great Winchester Street; (40) All Hallows Churchyard, London Wall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A major stream was recorded at the north end of Blomfield Street (Reader 1903, 181-3) (Fig 2, Site 7). It consisted of a 0.3m thick deposit of sand, with 1.5m of sand and silt above, merging into peat. Apparently shallow, its west bank was not well defined and situated 21m west of Blomfield Street. This stream was traced further south at 4, London Wall Buildings, but here 'compartments' of timber planks set against piles driven into the stream fill were also recorded (Reader 1903, 187-96). The compartments were filled with 'earth and rubbish' above which horizontal timbers had been placed to form platforms. One of the structures consisted of two platforms separated by a plank-lined channel or tank, the latter filled with waterlain sands. Some years later an approximately north-south alignment of timber posts was recorded on the east side of Blomfield Street at 46-7 New Broad Street (Fig 2, Site 8), possibly marking the eastern edge of the valley here (RCHM 1928, 147). When the defensive wall was built at the end of the 2nd century, this stream was provided with a culvert through the wall (Fig 2, Site 11), replaced at a higher level when the original had become blocked up (RCHM 1928, 87-9 and Merrifield 1965, 306-7). Large numbers of human skulls have been found during excavation work in the Blomfield Street area (RCHM 1928, 15-16).

Inside the city wall the most westerly observations of a stream within the upper valley of the Walbrook were made at 55-61 Moorgate (Dunning 1929a, 199) (Fig 2, Site 14). Here gravel, presumably Thames terrace gravel, thinned out towards the eastern side of the site and was cut by shallow east-west running channels revetted with posts and planks. The channels were filled with grey mud and organic matter and covered by 1.5m of black mud containing Roman objects including leather and, in its upper levels, 4th century pottery.

The presence of a stream or streams is implied by black silts and/or peat at 30, Moorgate (Fig 2, Site 19) where black peaty silt overlay Thames terrace gravels (Hume 1951) and at 5-7 Copthall Avenue (Staff of the Guildhall Museum 1965, 135-6) (Fig 2, Site 25). Nearby the ground sloped rapidly down to the east at 20-8 Moorgate (Cottrill 1936) (Fig 2, Site 20). Just to the south in Telegraph Street, possibly at 11-16 (Fig 2, Site 21) two streams or ditches were recorded cutting into the Thames terrace gravels (Cottrill 1934).

One of the most extensive investigations was carried out by A Lane-Fox (1867, xxi-lxxxiii) at a site to the rear of London Wall on the east side of Little Bell Alley, the forerunner of Copthall Avenue (Fig 2, Site 28). He recorded 'Thames ballast' inclining north-south, overlain by 1.7-2.1 m of peat containing Roman remains, interspersed with 'kitchen middens'. A layer of 'blue mud' was also noted within the peat. Driven into the Thames ballast were numerous piles, some associated with planking, aligned north-south and east-west in curved rows and also circular clusters; from the sections it is clear that some at least had been inserted from a higher level in the peat. The peat was assumed to have been a natural growth during the Roman period and its great depth was puzzling. Seventeen human skulls were recovered, the majority from the bottom of the stratigraphic sequence.

Just to the south of this site, at 10-12 Copthall Avenue (Fig 2, Site 30) trenches for wall-footings in 1906 revealed London Clay overlain by 'undisturbed loam' at the west end of the site which gradually gave way to a streambed in the east (Norman & Reader 1906, 232). A depth of 1.5-1.8m of black mud then covered the site, within which a number of piles were noted. Earlier observations in 1904 at 4-6 Copthall Avenue to the south (Fig 2, Site 32) were similar, and from these two sites it was concluded that a main tributary of the Walbrook lay beneath Drapers' Gardens (Header 1906, 231-2). The redevelopment of the latter in the 1960s unfortunately went unrecorded. Also in Copthall Avenue, formerly Little Bell Alley (Fig 2, Site 26), a City Sewers Plan of 1851-2 records planking and piles (RCHM 1928, 115).

A stream flowing along the eastern side of the valley was located more recently at Great Winchester Street (Fig 2, Site 38) in a series of east-west shafts (Gould 1951, 151-54). In one shaft 7.3m deep the sub-soil of grey-blue clay was overlain by a layer of compressed vegetation with black clay above. Roman pottery was recovered from the lowest levels and a timber pile was observed in another shaft to the west. A 'dirty gritty soil' recorded in a western shaft may have been stream fill; 4m to the east the eastern edge of the valley was located as Thames gravels at a depth of 3.6m. Further north, at Winchester House (Fig 2, Site 39), black silt noted in the western half of the site must have been associated with this eastern tributary (Marsden 1963). It was probably this stream which was recorded by Norman and Reader as a depression, *c* 7.6m wide and *c* 0.9m deep, in the Thames terrace gravels beneath the defensive wall just west of All Hallows Church; in the footings of the wall, above this depression, a culvert was located (Fig 2, Site 40) (1906, 209-11 and pls xxv-vi).

In the early part of this century, when much of the evidence was obtained, the Walbrook was believed to consist of a probably tidal stream with little pre-Roman deposition and, in the north, of a valley 30.5m - 36.6m wide. During the Roman period, it was thought, buildings were erected on timber earth-filled platforms or on piles in or towards the sides of the streambed, with the stream itself canalised between the structures. Dumping would also have restricted the width of the stream, which was then revetted and provided a solid base for later buildings (RCHM 1928, 16). The marsh, noted everywhere in the upper Walbrook valley up to a depth of 2.7m, formed - it was argued - when the construction of the defensive wall effectively dammed the streams. Inadequate culverts through the wall supposedly became choked up resulting, north of the wall, in the accumulation of water and the creation of a swamp. Inside the city walls the checked stream would initially have been transformed into 'a sluggish almost placid water'. Further obstruction to a free-flowing stream was thought to have been caused by the many pile structures erected in the stream and by the dumping of refuse. Eventually, 'the water which spread itself-along the north of the wall would have soaked under it, causing a broad swamp to exist also to the south of the wall for some distance' (Reader 1903, 183-4).

In more recent times excavations downstream at Bucklersbury House in 1953 (Fig 2, Site 23) have modified these early conclusions (Grimes 1968, 92-7). Here Grimes established that though the valley was wide the main stream was shallow and no more than

4.26m wide. This in fact refers to the canalised stream in the Roman period; as regards the prehistoric streambed, the published section is not very clear *(ibid,* fig 23a and b). The valley appears to have been wet and development during the Roman period was confined to revetting the channel of the stream as the water level repeatedly rose and caused the banks to flood. Behind the stream was a succession of dumps and floor surfaces, the latter related to timber structures. By the mid-late 2nd century the streambed had silted up and the revetment collapsed. Thereafter the ground continued to be raised but the stream was not revetted. This period is associated with the appearance of stone as well as timber buildings, including the temple of Mithras, now dated to the middle of the 3rd century (Merrifield 1983, 183). The latter continued in use until at least the mid 4th century. On the Bucklersbury House site, away from the stream, Grimes also found evidence of leatherworking.

This pattern, of repeatedly raising the ground level and revetting the channel of the stream to combat the rising water level, was confirmed further north at Angel Court in 1974 (Blurton 1977, 14-26) (Fig 2, Site 34). Here a feeder of the Walbrook was located, its revetted or banked sides replaced at intervals as the stream continually silted up and flooded. This sequence spanned the late lst/ early 2nd century - late 4th century when the area flooded and was abandoned. The dating does not, however, fully agree with that from Bucklersbury; the sequence at Angel Court suggests that the stream continued to be canalised while that at Bucklersbury fell into decay in the mid-late 2nd century and became, as Merrifield suggests 'a mere runnel' (1965,87). In other areas of the Angel Court site another streambed, timber drains and timber and stone structures were recorded but for these there are neither levels nor reliable dating evidence.

Uses of the Walbrook valley

Definite evidence of leather and ironworking in the Walbrook valley was found at Bucklersbury but otherwise Merrifield (1965, 93) considered that, in the 1st and 2nd centuries, the banks of the Walbrook were used by craftsmen and traders, the numerous artefacts found on sites in the Walbrook resulting from their activity. Flimsy huts or booths seemed to represent the only form of building although, in the 3rd century, buildings of stone and timber,-sometimes with mosaic floors, suggested that the lower reaches of the Walbrook had become a desirable residential area.

The presence of so many objects cast into the stream was also partly explained in terms of votive offerings (Merrifield 1983, 101-2; Marsden 1980, 74) but a recent examination of evidence from the lower Walbrook concludes that the majority of artefacts were derived from the dumping of rubbish which served to raise the banks of the stream (Wilmott, forthcoming). The large number of human skulls found in the upper Walbrook are an exception to this. Most of these were found by workmen in the late 19th and early 20th centuries in or near the stream, and it was generally accepted that they were victims of the Boudican massacre in AD 60 (RCHM 1928, 15; Merrifield 1983, 56-7). A detailed examination of the skulls has, however, flawed this explanation and suggested in its stead, an association with the Celtic cult of the head, possibly involving votive offerings to the Walbrook (Marsh & West, 1981, 86-97; Bradley & Gordon, 1988, 503-7).

Background to the excavations

(Figs 2-4; Pls 1 and 2)

Redevelopment of properties in the upper Walbrook valley began in the 1980s, an area by and large untouched since the early part of this century. The Department of Urban Archaeology, Museum of London, recognised the archaeological potential of the area and initiated a series of investigations.

The first of the redevelopment proposals concerned a block of properties on the north-west corner of Copthall Avenue which included 15-35 Copthall Avenue, 45-49 London Wall, the Coleman Street Ward School, Cross Keys House and 2-3 Cross Key Court (Fig 2, Site 27 and Fig 3). Bore-hole surveys from the site were promising; in particular that from the unbasemented building, 2-3 Cross Key Court, suggested the location of a tributary of the Walbrook with archaeological stratigraphy above it intact up to ground level. This site offered, for the first time, the opportunity of examining under controlled conditions the nature of the stream and its environment and development from Roman to modern times. Formal excavations here also provided a control for a subsequent stage in which the recording of a much larger area would be confined to observations.

In 1981, the developer, Commercial Union Properties Ltd, permitted and generously financed excavations within the standing building of 2-3 Cross Key Court (OPT 81 TQ 3275 8148). A trench 3m x 15m was excavated to a depth of 7m over a period of one year (Plate 1).

The redevelopment of the whole site was undertaken in 1983-4 by Robert Fleming and Co Ltd, who funded the watching brief observations (KEY 83). Basements had destroyed the upper levels of the archaeological sequence but below them the mainly Roman strata were almost free of intrusions. The watching brief took place in two phases. In the first, archaeological recording was undertaken in exploratory holes and trenches for preliminary ground works. During the second and more important phase, the ground level was reduced in excess of 4m of which 3m consisted of mainly Roman deposits. In an area 60 x 50m the excavation of the site was completed at great speed and by working round the clock in seven and half days: archaeological recording was therefore limited (Plate 2).

These two sites are known as the *Copthall Avenue* excavations; 2-3 Cross Key Court being the site of the controlled excavation, while 15-35 Copthall Avenue/ 45-49 London Wall/ Cross Keys House represents the watching brief area. Hereafter both these sites will be referred to as *15-35 Copthall Avenue,* the controlled excavation and the watching brief respectively.

At 23 *Blomfield Street,* Finsbury House (FIN 81 TQ 3283 8155) (Fig 2, Site 6; Fig 3) refurbishment of

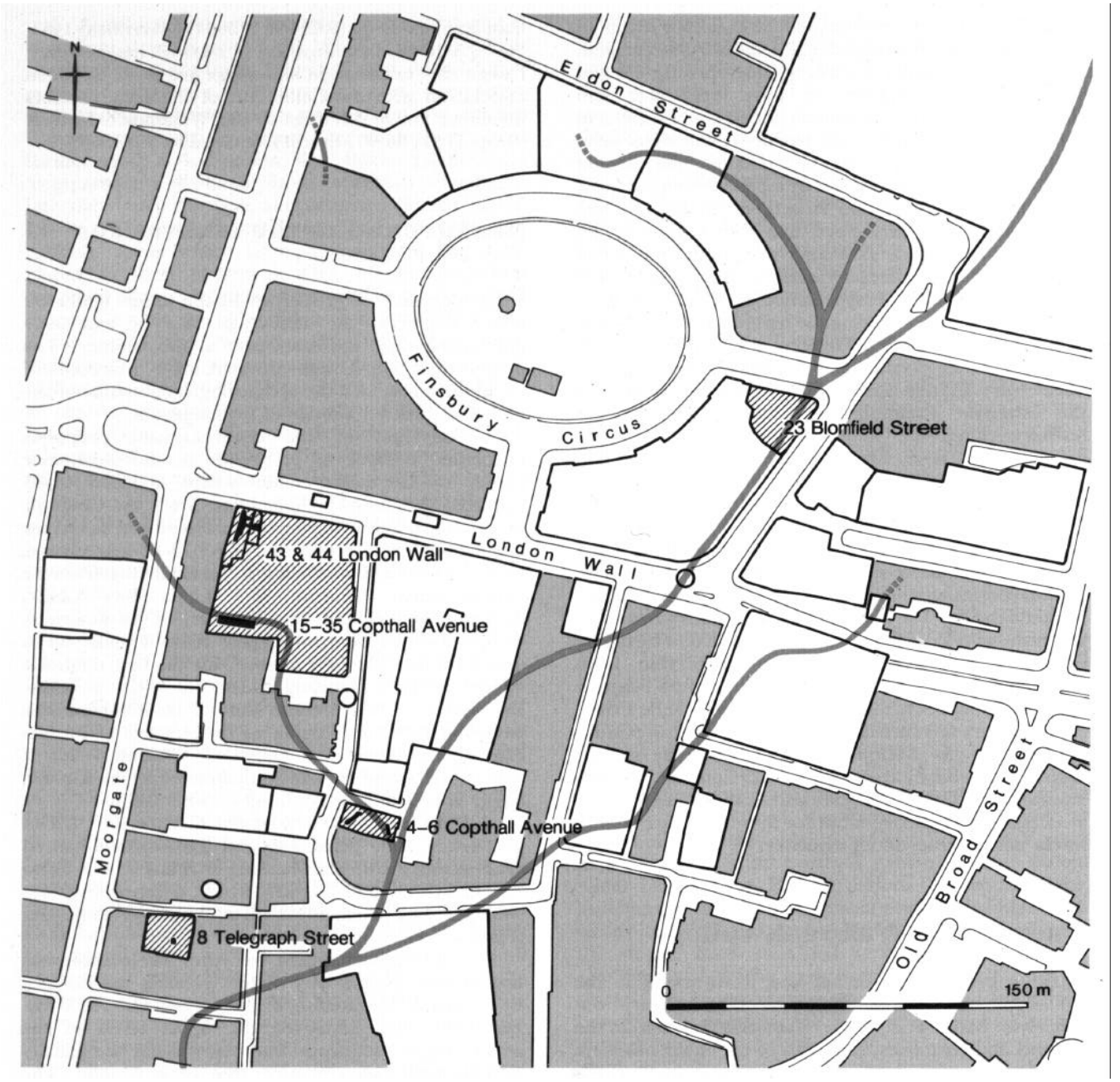


Fig 3 Plan of the study area showing modern streets and buildings (tone), six study area sites (hatched), maximum extent of areas of controlled excavation (black), sites referred to in text (blank). The outline of sites is extent at the time records were originally made, and not necessarily the same as that finalised by redevelopment. Reproduced from the 1987 Ordnance Survey 1:1250 map, with the permission of the Controller of HMSO, Crown copyright reserved.

the building involved total interior demolition and a certain amount of ground works. It was hoped that the position of the streambed found by Reader in 1903 would be located, together with any subsequent Roman activity. Machine excavation on the site was monitored in October 1981 but it was apparent that most of the strata had been disturbed.

In 1983 another listed building at *8 Telegraph Street* (TEL 83 TQ 3271 8136) (Fig 2, Site 22; Fig 3) was refurbished and an opportunity to carry out a small excavation in the area of a proposed lift shaft was made possible and funded by the developers, Phoenix Assurance. An area 2.5m x 2.3m and 4.7m deep was excavated over a period of five weeks.

Three sites in close succession followed in 1984. At *43 London Wall* (LWA 84 TQ 32718153) (Fig 2, Site 17; Fig 3), the developers, M J Gleeson Group Plc funded a ten-week excavation within the standing building. The site measured 14.5m x 2.8m divided into four areas (A-D) and was excavated to a depth of 2m. At *4-6 Copthall Avenue* (CHL 84 TQ 3279 8140) (Fig 2, Site 33; Fig 3) archaeological investigations, after demolition, were financed by London and Paris Properties Ltd. Two trenches were machine excavated and recorded in October 1984. This was followed by a watching brief as trial trenches and reduction of the ground level took place in an area 22m x 12m. The final part of the Copthall Avenue/London Wall investigations were then carried out in December 1984-January 1985 at *44, London Wall* (LDW 84 TQ 3272 8153) (Fig 2, Site 18; Fig 3), financed again by Robert Fleming & Co Ltd. An area 3.8m x 3.4m was excavated to a depth of 2m in a two-week period (Fig 4).

Fig 4 4-6 Copthall Avenue: a trench being recorded during the watching brief

In addition to the sites in the study area, a number have since been excavated in the upper Walbrook valley and, where relevant, their results included in this report. Five of these were situated outside the Roman city: *River-plate House/7-11 Finsbury Circus* (Fig 2, Site 2) (Askew 1988, RIV 87), 12-15 *Finsbury Circus* (Fig 2, Site 3) (Askew 1989, FIB 88), *Broad Street Station* (the Broadgate development, Fig 2, Site 5), where a series of excavations and recording of sections on this very large site were undertaken in 1985 (Malt 1987, LSS 85), 35-45 *New Broad Street* (Fig 2, Site 9) (Woodger 1988, NEB 88) and *Blomfield House/85-6 London Wall* (Fig 2, Site 10) (Sankey 1989, BLM 87). Inside the city wall, *49-53 Moorgate/ 72-4 Coleman Street* was excavated in 1986 (Fig 2, Site 16) (Spence 1988, MOG 86) while the site to the north, *55-61 Moorgate/75-9 Coleman Street* (Fig 2, Site 15) was re-examined the following year (Drummond-Murray 1988, MGT 87). Another site recently re-examined was *10-12 Copthall Avenue* (Fig 2, Site 31) (Lees 1989, COV 87). On the east side of the valley excavations took place at *9-19 Throgmorton Avenue/21 Austin Friars* (Fig 2, Site 36) (Durnford 1988, TRM 86) and *13-14a Austin Friars* (Fig 2, Site 37) (Dyson 1988, AUF88)

Organisation of the report and figure conventions (Fig 5)

In Parts 2 - 5 of this report evidence from these sites is examined and its implications for the development and decay of the whole of the upper Walbrook valley in the Roman period considered. Part 6 commences with detailed evidence of the marsh at 15-35 Copthall Avenue in the immediate post-Roman period, because this formed naturally over a long period of time and was probably a direct consequence of Roman land management in the area; thereafter, post-Roman activity is summarized.

The evidence presented here is based on the site archive reports in the Museum of London. Of these the author wrote those for 15-35 London Wall and 44 London Wall (Maloney, C 1987), 23 Blomfield Street (1983), and 4-6 Copthall Avenue (1985); P Chitwood wrote 8 Telegraph Street (1983); and R Malt and C Spence that for 43 London Wall (1985) (this last site supervised by A Willmott). The evidence from all the sites has been grouped into *Periods* which are based on major changes in land use and broad contemporaneity. Thus evidence for the Walbrook in prehistoric times is presented in Part 2; Period I (Part 3) represents the earliest activity, that of reclamation and drainage in the early 2nd century; Period II (Part 4), the settlement of the area from the early-mid 2nd century to the 3rd century; Period III (Part 5), a decrease in activity followed by a resumption of drainage due to increasingly wet ground in the 4th century, and Period IV (Part 6),

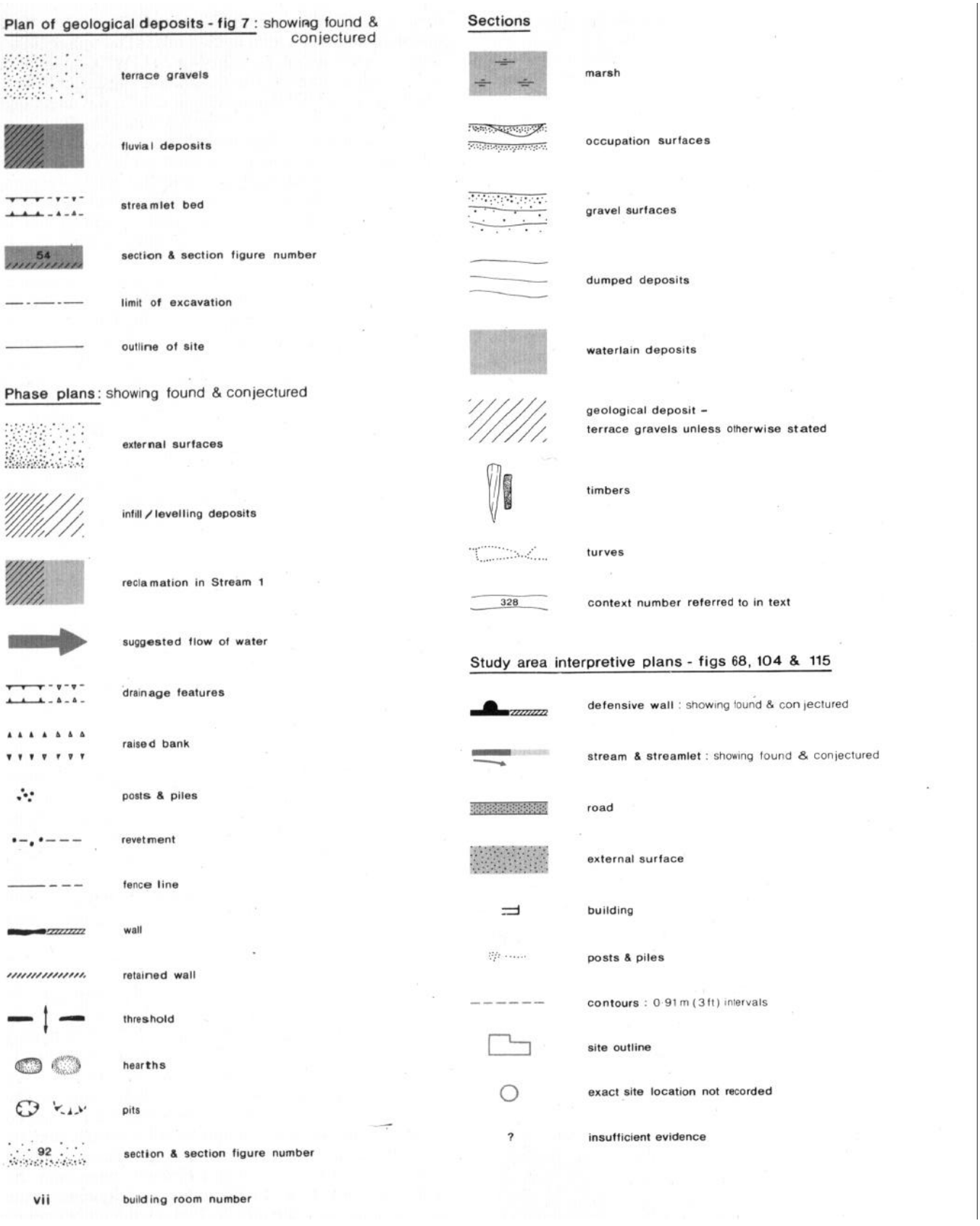


Fig 5 Key to drawing conventions

the post-Roman development of the area (where this survived). The detailing of the stratigraphic sequence for Periods I-III is followed by a brief analysis of the dating evidence. Within the framework of the Periods, each site has its own, unique phasing structure and letter references for buildings but the identification of streams and roads respects the study area. Part 7 is a summary finds report; the multidisciplinary environmental evidence for 15-35 Copthall Avenue is examined in Part 8, Part 9 is a report on the dendrochronology and the conclusions are presented in Part 10.

In the text the terms ditch, gully, drain and channel - as well as stream - are used to denote drainage courses. A ditch or gully will refer to a watercourse that has been dug in the-ground, the difference between the two being that the former is larger, while drain will define a watercourse that is both flat-bottomed and lined or revetted with timber. The term channel will, in general, describe a watercourse which formed a stream, phase or part of a stream; it will also be employed when a drainage feature is not - or not clearly - cut into the ground surface but had been constructed by the erection of parallel banks.

Context numbers which appear in italics denote those that are discussed in the Summary Finds Report (Part 7) and those that were sampled for environmental and dendrochronological analysis (Parts 8 and 9).

The drawings within this report follow conventions developed and standardised by the Department of Urban Archaeology, the majority of which fall into the categories of location maps and plans, 'phase' plans, sectionsand interpretative 'period' plans. In this report the varied range of drawings has necessitated the use of different scales, although the number has been kept to a minimum and the same scale used within each drawing category. Figures 1-3 are the location maps and plans, 1 and 3 being presented at scales of 1:20,000 and 1:2500 respectively; Figure 2 is a location map and since its purpose is to identify the sites discussed in the report and illustrate their setting within the Walbrook valley it has no scale. On this map, sites marked with a circle cannot be located exactly. The phase plans, including the plans of sections (Figs 7b, 44b), are all presented at a scale of 1:200. They represent the evidence for each phase of a particular site with the exception of those for 15-35 Copthall Avenue (Figs 7a, 44a, 84 and 110) where, not only has relevant information from adjacent sites been included, but also evidence presumed to be of different phases which could not be identified over the whole of the site because of the nature of the watching brief (see p 5). The sections are at a scale of 1:40 and orientated south-north or west-east: a few are reproduced to scale from photographs. A thick line marks the period divisions which are identified for general reference at the side of the section. Interpretative period plans (Figs 25, 68, 104, 115), including that of the natural topography (Fig 25) are presented at a scale of 1:2500; two other comparative plans of the natural topography are at 1:5000 (Figs 26, 27). The remaining drawings which do not fall into the above categories include a wall reconstruction, a column sample, seeds, tables and diagrams; these are separately scaled.

Symbols used for the drawings vary according to their category, (see Key, Figure 5) though the symbols employed in Figures I-3 are identified in the captions). The outlines of the sites and excavated areas as presented in Figure 3 are used consistently throughout the phase and interpretative period plans: the outline of the excavated area shown on the phase plans always depicts the maximum area of controlled excavation, while the outlines of the sites which appear on the period plans depict the area of redevelopment. Relevant evidence from a section is represented in plan as a notional 0.2m wide strip which employs the same graphic symbol as that of the planned evidence; individual sections can be found in the report by reference to the number - which is a figure number - beside the strip, the number being situated on that side from which the section is viewed.

The way in which evidence is conjectured is also standardised. On the phase plans structural features, such as buildings and drains, are extended a notional 0.5m in the absence of supporting evidence but can be extended further where evidence exists; for example, floors recorded beyond the walls of a building or room of a building, walls implied by the position of-an external surface, repetition of basic features such as buildings and alleys (Fig 84) and linear features such as roads, paths and streams. On the interpretative period plans selected site evidence is re-presented without further conjecture apart from roads and streams which are projected and apparent alignments continued. Other relevant features, such as the defensive wall, are also included. Relevant information from those sites not part of the study are annotated and where there is a lack of, or inconclusive evidence, a question mark is substituted.

Dating evidence and finds

(Fig 6)

As on some other sites in the Walbrook valley, the waterlogged reclamation dumps exposed during the controlled excavation at 15-35 Copthall Avenue yielded large quantities of pottery, glass, metalwork, leather fragments and wood. The other sites - where the trenches opened were smaller, or where only a watching-brief not a formal excavation was possible - were comparatively much less productive.

These finds have at least three quite separate research potentials: for imposing an absolute chronology on the stratified site sequences; for providing information about the functions of specific structures or features, or about the character of settlement in the area as a whole; and for improving knowledge of individual finds or groups of finds - whether it be their date, function or geographical distribution. The raw data for the third of these tasks, the extensive finds catalogues and illustrations that are published in traditional site reports, have been omitted from the present volume since its primary theme is geographical and historical. Many items will be published in forthcoming major volumes on finds from London excavations as a whole (see below), and, in the meantime, copies of detailed archive reports on the pottery (Davies 1986a-b; 1987a-c) and small finds (Groves 1987) may be obtained on written request from the Archive Officer at the Museum of London.

Code	Pottery Ware
AHFA	Alice Holt/Farnham
AHSU	Alice Holt/Surrey
BB1	Black-Burnished Ware 1
BB2	Black-Burnished Ware 2
BBS	Black-Burnished style
C186	Camulodunum type 186 amphora
C189	Camulodunum type 189 amphora
C306	Camulodunum type 306 D rim bowl
CALC	Calcite Gritted Ware
CGBL	Central Gaulish Black Ware
CGOF	Central Gaulish Other Fabrics
CGWH	Central Gaulish White Ware
COLC	Colchester Colour-Coated Ware
COMO	Colchester mortarium
DR20	Dressel type 20 amphora
EIFL	Eifelkeramik
EPON	Ceramique à l'Eponge
FMIC	Fine Micaceous Ware
G238	Gillam type 238 & developed mortaria
GROG	Grog-tempered Ware
H70	Haltern 70 amphora
HOO	Hoo Ware
HWC	Highgate Wood C Ware
KOAN	Koan amphora (Dressel 2-4)
KOLN	Koln (Cologne) White Ware
LCWS	Local Coarse White Slipped Ware
LOEG	Local Eggshell Ware
LOMA	Local Marbled Ware
LOMI	Local Mica-dusted Ware
LONW	London-type Ware
LRMA	Biv amphora
LVRW	Late Oxidised Ware
MHAD	Much Hadham Ware
MICA	Mica-Dusted Ware
MOSL	Moselkeramik
NGGW	North Gaulish Grey Ware
NKGW	North Kent Grey Ware
NKSH	North Kent Shelly Ware
NVCC	Nene Valley Colour Coated Ware
NVMO	Nene Valley mortaria
OXCC	Oxfordshire Colour-Coated Ware
OXMO	Oxfordshire White Ware mortarium
OXRC	Oxfordshire Red Colour Coated Ware
PE47	Pelichet type 47 amphora
PORD	Porchester D Ware
PRW	Pompeian Red Ware, 1
PRW3	Pompeian Red Ware, 3
RDBK	Ring-and-dot beaker
SESH	South Essex Shelly Ware
VCWS	Verulamium Region Coarse White Slipped Ware
VRG	Verulamium Region Grey Ware
VRMA	Verulamium Region Marbled Ware
VRMI	Verulamium Region Mica-Dusted Ware
VRR	Verulamium Region Red Ware
VRW	Verulamium Region White Ware

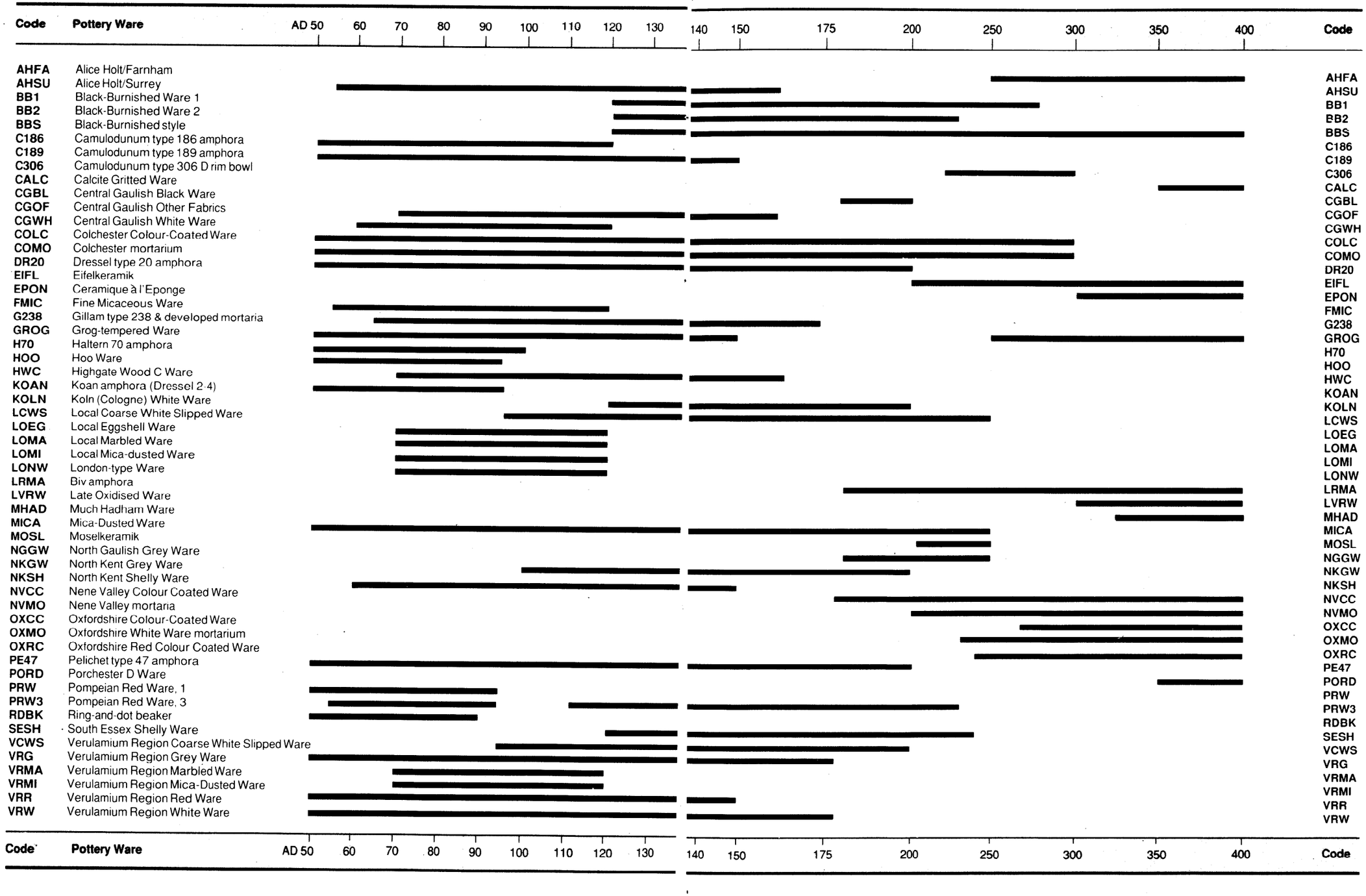


Fig 6 Summary of the main pottery wares found on the sites in the upper Walbrook valley

The second of the objectives outlined above, that of assessing functions, 'status' and 'character', is the task of Part 7. The dating evidence is summarised in three tables with associated commentary (one for each of the three main periods of Roman land use) and appears in Parts 3-5, immediately after the description of the features of each period and before the discussion. The information presented here includes dendrochronology (see below, p. 116), coins (identified by Jenny Hall, Museum of London) and stamped samian (identified by Brenda Dickinson). Unstamped samian, which was not found in such quantities as on many London sites, can add little to refine the main dating framework, and for this reason the tables contain no listing of the forms and sources. In most cases it is the coarse pottery which is the key indicator, although because of its sheer diversity it is also one of the most difficult groups of material to summarise adequately. The early Roman pottery (pre-Flavian - Antonine) from these sites, together with that from sites West and East of the Walbrook (see Perring & Roskams forthcoming; Williams forthcoming), is to be published in a companion volume in the present series (Davies & Richardson forthcoming); work on a second volume, covering the later period, is in progress. These volumes will contain detailed descriptions of fabrics, a full catalogue of forms, and information about the characteristic composition of assemblages of different date. Here, therefore, it seems appropriate to include in the Tables only a list of the main constituent wares (those clearly residual have been excluded), the date range assigned to the group as a ceramic assemblage and, in the case of the 15-35 Copthall Avenue site, data about the size of each group, expressed as a weight in kilograms. A key to the ware codes themselves is provided in Figure 6, which also shows the date range currently assigned to each ware. This information, it is hoped, will be sufficient for the reader to understand why each phase has been dated as it has, and, should there be in the future any major revisions of ceramic dating, for the reader to attempt some limited reassessment of the chronological scheme.

Fig 7a Combined plan of the natural topography of 15-35 Copthall Avenue, 43 and 44 London Wall showing extent of terrace gravels (stippled) and conjectured extent of valley floor and streamlines (blue-grey). Hatched lines refer to recorded stream fill. Numbers refer to figure numbers of sections. (See also Fig 7b)

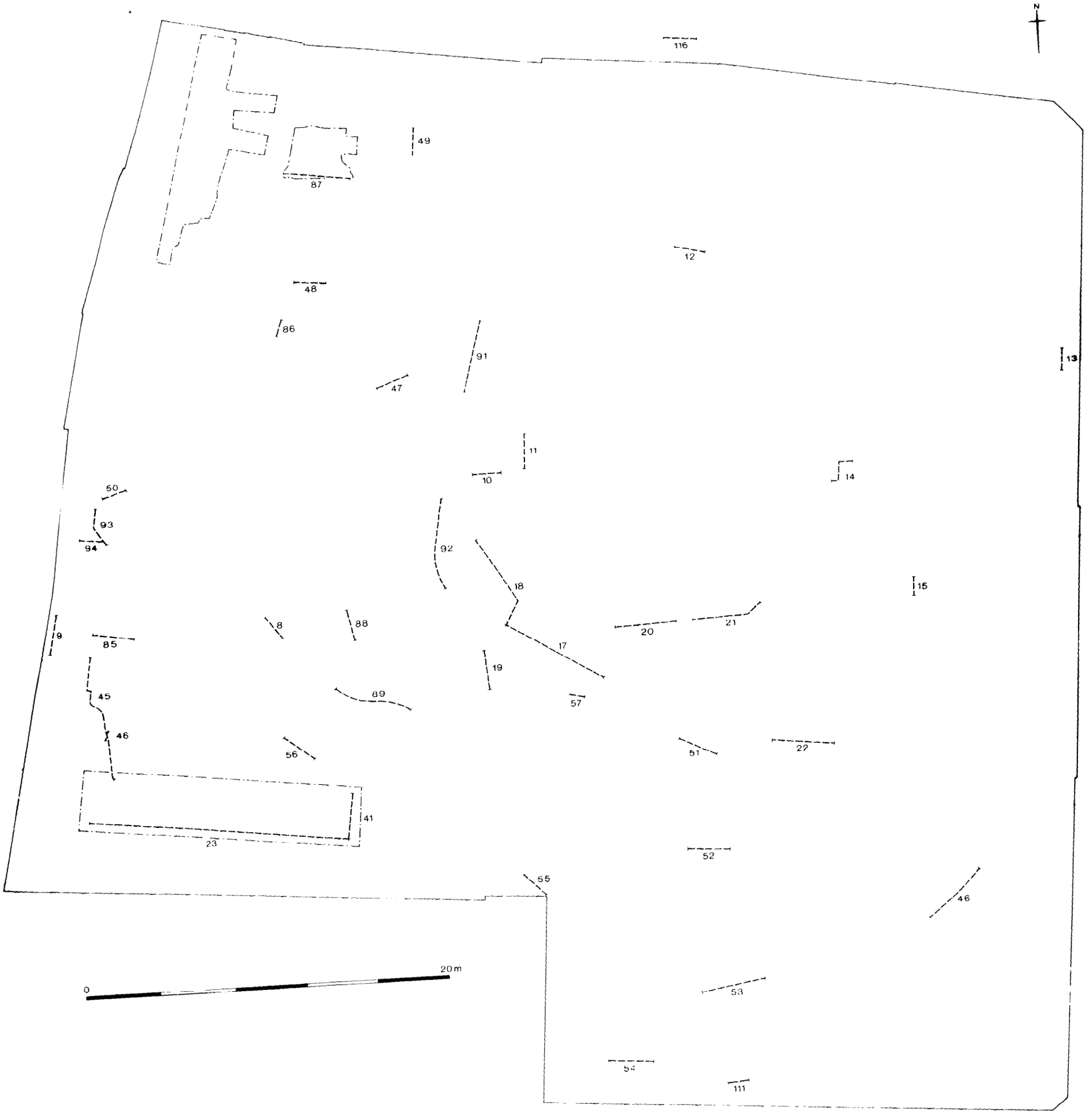


Fig 7b 15-35 Copthall Avenue and 44 London Wall: plan of sections

2. The Natural Topography

In the upper Walbrook valley the sub-soil consists of sandy gravels of the 10m floodplain terrace (Mucking Gravel) of the River Thames (hereafter referred to as terrace gravels) which overlies stiff fissured London Clay (p 1). The brickearth (p l), having been eroded by the stream, only survives at the edge of the main or individual valleys.

The recent excavations have confirmed that the pre-Roman ground surface sloped gradually down to the south. No levels are available on undisturbed terrace gravels at 23 Blomfield Street (Site 6) but further north, at Broadgate (Site 5 Malt 1987), a maximum level of 10.6m OD was recorded and further south maximum levels of 9.5m OD at 35-45 New Broad Street (Site 9 Woodger 1988) and *c* 8.3m OD at 85-86 Blomfield Street (Site 10 Sankey 1989). At 43 London Wall (Site 17) terrace gravels lay at a maximum height of 8.6m OD while at the most southerly site in the area of study, 8 Telegraph Street (Site 22), a level of 6.7m OD was recorded. There was also a very gentle incline down from the west towards the centre of the valley: 8.1m OD at 15-35 Copthall Avenue (Site 27) and 7.7m OD further east in London Wall (Site 12). Further west, however, towards the edge of the Walbrook valley at 55-61 Moorgate (Site 15), terrace gravels were recorded at 7.5m OD sloping down towards the valley of a stream in the east (p 22) (Drummond Murray 1988). The east side of the valley was more abrupt than the west: at 13-14a Austin Friars (Site 37) it seems that the brickearth capping survived at a level of 8.62m OD (Dyson 1988).

Major tributaries of the Walbrook stream, revealed on three of the sites under consideration, cut through the terrace gravels down to and through London Clay. Examination of the evidence for these streams will be followed by a discussion of all the available information. The sites will be considered from west to east.

15-35 Copthall Avenue (Stream 1)
(Figs 7-23)

Geological deposits comprised orange and yellow sandy gravels overlying London Clay which, at its surface, had weathered to brown but was otherwise blue-grey in colour. The clay lay at a maximum level of 7.1m OD in the centre of the site where it was undisturbed; the terrace gravels, from a maximum level of 8.1m OD at the north end of the site, thinned out southwards until they terminated above the clay at *c* 6.5m OD (Fig 7). On the east side of the site however, the terrace gravels were continuous throughout the entire length of the site and a level of 7.5m OD on its eroded surface suggests that the ground here was almost level.

Above the terrace gravels a layer of clean brown silty sandy clay and fragments of plant material - possibly moss - was recorded in two sections (Figs 48, 49). A tributary of the prehistoric Walbrook (Stream 1) cut through the terrace gravels and London Clay at the south end of the site. The north edge was well defined (Fig 8) being traced for a distance of some 31m from the west edge of the site at which point it curved round to the south in a wide arc. The south and west edges of the tributary lay beyond the site but at the far western side of the site London Clay was recorded sloping down from south-north (Fig 9; Fig 45), while at the west end of the controlled excavation weathered London Clay was not significantly overlain by waterlain deposits (Fig 23). This seems to indicate that the edge of the tributary, before it turned, lay not far to the south.

Where the streambed appeared to have been undisturbed, London Clay was recorded at the western end of the site at 6.0m OD, at the far eastern side of the tributary at 6.7m OD, and in the south at 6.5m OD. In a section near the north-eastern edge of the stream, where it altered its course, valley fill was noted at 6.3m OD at the bottom limit of the section (Fig 21). The lowest levels on London Clay were however recorded at the eastern end of the controlled excavation, at 5.85m OD, and its surface continued inclining down to the east beyond the limits of the trench. London Clay was here overlain by 0.7m of valley fill. The greatest degree of erosion therefore took place hereabouts, and because there was no appreciable deposition at the western end of the site, implies that the stream initially flowed more or less southwards at this point.

In time the stream seems to have increased in width eastwards until its floodplain was *c* 37m wide. Waterborne deposits which were noted beyond the banks of the tributary, above the terrace gravels, could have resulted from flooding.

North of the tributary, cutting into but not through the terrace gravels, streamlets, with possibly another to the east, were recorded in nine sections. It was not clear whether seven of these (Figs 10, 11, 12, 13, 14, 15 and 16) exposed the streamlets in cross or longitudinal section though presumably the streamlets followed a general southward course. In the remaining two sections (Figs 17, 18), situated just beyond the north bank of the tributary, four streamlets were however examined in detail together with another just to the south where a streamlet (1), cutting through London Clay, had eroded a new channel (2) (Fig 19). They were between 1.35-1.8m wide x 0.4-0.6m deep, bowl or slightly V-shaped in profile. Levels from the bottom of these streamlets range from 6.56m OD in the south to 7.06m OD and 7.23m OD further north. Four could have been contemporary and still active immediately prior to the Roman period and of these two had not accumulated any fill though it is likely that that shown on Figure 18 replaced an earlier streamlet. All these streamlets, entering the main tributary from the north, must have added considerably to its volume of water. They may help to explain why a wide arc was eroded on the north east meander of the tributary and why there was more down-cutting of the bed here than further south.

Within the banks of the tributary, valley fill consisted of well-bedded mainly grey sands, fine gravels and silts often containing rootlets. Near its banks bands or lenses of yellow and orange gravels and brown clay

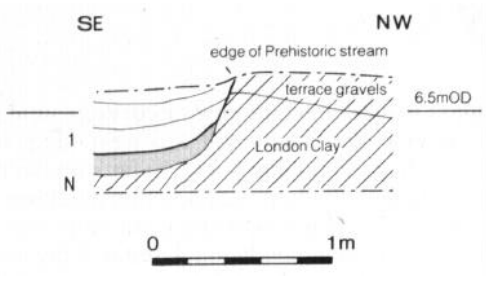


Fig 8 15-35 Copthall Avenue, watching brief: section

could be identified as terrace gravels and London Clay respectively, eroded from the banks but not carried in suspension in the stream (Fig 9).

A complete section through the streambed was not possible but two east-west sections situated towards the east side of the streambed were 7m and 9m in length (Figs 7, 20, 21, 22). They revealed that a width of at least 6m and 9m of stream fill had been deposited prior to the Roman period.

In the more northern of the two sections (Figs 20, 21) the west bank of the stream at this point was overlain by brown sandy gravels and grey-dark brown fine gravels (Fig 20). Further east buff-yellow gravel streaked with black sand, orange sand and banded light brown gravels all sloped down quite steeply to the east, implying that the eastern edge of the stream was still some way off (Fig 21). The sequence in the second section (Fig 22), situated *c* 8m to the south, was even clearer. There was no suggestion of any stream banks and the level surface of London Clay was overlain by pale orange yellow and grey streaked sand, pale yellow sand, dirty yellow sand and very fine gravels, and black organic silty clay, The earliest of these was traced westwards for a distance of nearly 9m. The sequences recorded in both these sections were truncated by artificially-cut channels which may imply a running stream at the beginning of the Roman period. This evidence would indicate a wide and shallow stream.

Although the streambed was recorded in many sections during the watching brief, the evidence was often only partial, and could not be recorded in detail for lack of time. A close examination was therefore only possible under the conditions of the controlled

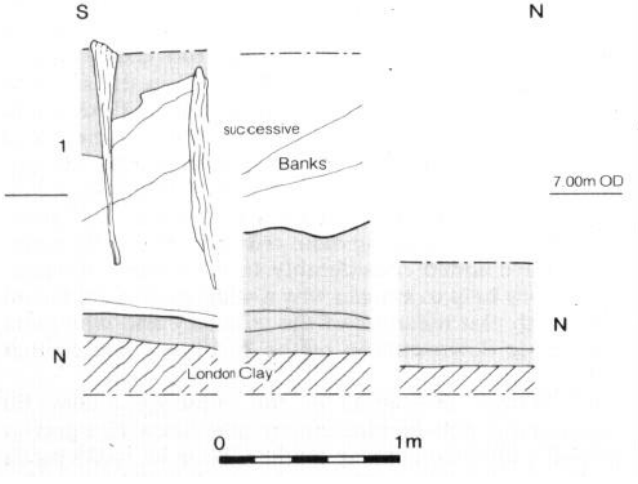


Fig 9 15-35 Copthall Avenue, watching brief: section

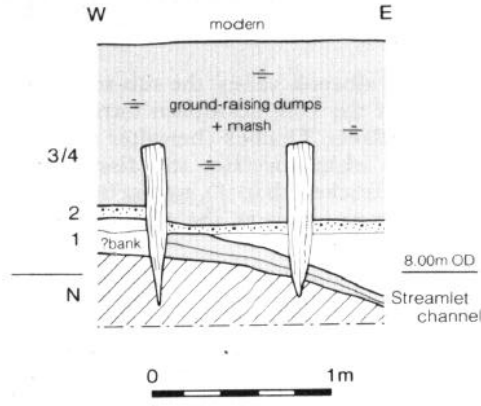


Fig 10 15-35 Copthall Avenue, watching brief: section

excavation. This demonstrated the fairly complicated history of an aggraded streambed which occupied the eastern two-thirds of the trench, and whose character changed during the course of its life.

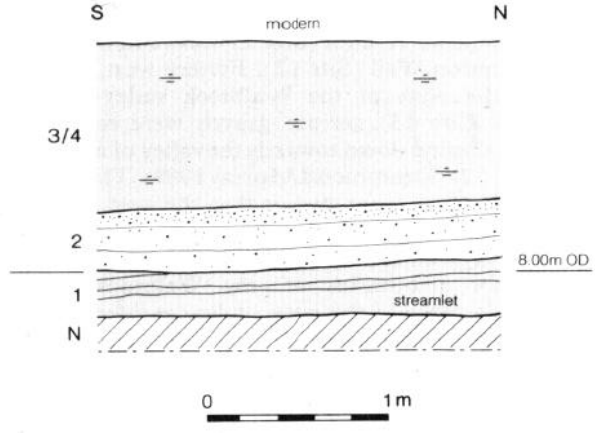


Fig 11 15-35 Copthall Avenue, watching brief: section

At the west end of the trench (Fig 23), the disturbed surface of London Clay lay at a maximum level of 6.6m OD and, as already noted (p 15), had accumulated very few waterlain deposits above it. This was cut by a channel 3m wide and 0.5m deep, orientated northwest-southeast, which contained brown fine gravelly sand and rootlets (OPT *785-6).* Its western edge was truncated by another channel cutting from a higher level. This was 0.6m-1.1m wide and c 0.4m deep,

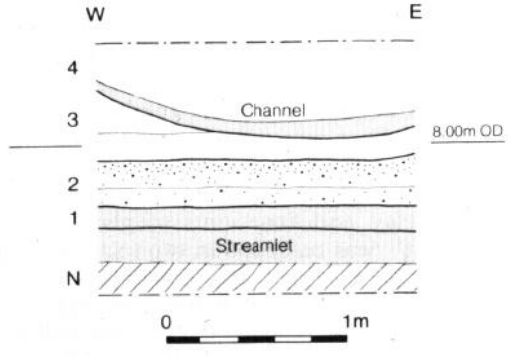


Fig 12 15-35 Copthall Avenue, watching brief: section

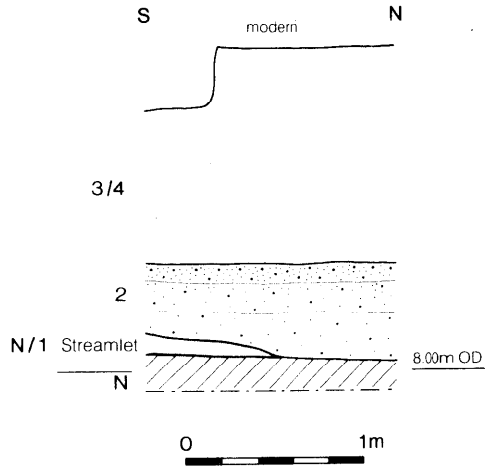


Fig 13 15-35 Copthall Avenue, watching brief: section

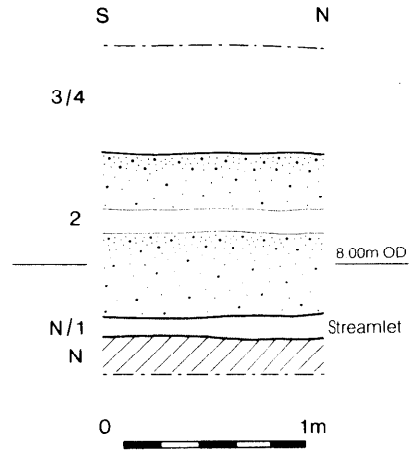


Fig 15 15-35 Copthall Avenue, watching brief: section

with two branches from the west and north meeting and flowing southwards (OPT *731).* Within this channel lay brown fine gravels but more mixed organic clay deposits at its edges, the latter suggestive of flooding (OPT *711, 706, 705, 694, 703, 700, 692, 689, 675, 676, 673).* The two uppermost deposits, (OPT *676* and *673),* contained charcoal, leather and bone fragments.

To the east of channel 786 and sloping down to the east above weathered London Clay (Fig 23) were a series of brown/ grey/ dark grey gravel-based deposits containing rootlets (OPT *733-37, 739, 740, 742, 775, 776).* These accounted for a maximum depth of 0.5m. The last of these layers *(742)* overlay the edge of the channel.

A sequence of blue-grey/ grey/ brown/ yellow-brown sand and silt-based deposits, also containing rootlets, then overlay the eroded surface of the gravelly deposits (OPT *732, 741, 726-28, 730, 720, 654, 723).* These were more horizontally bedded and extended further west than those below. A small channel (OPT 780) and possibly a second one cut through these sediments and were in turn sealed by a silty clayey layer (OPT *710, 717).* A depth of up to 0.35m of these silts had accumulated.

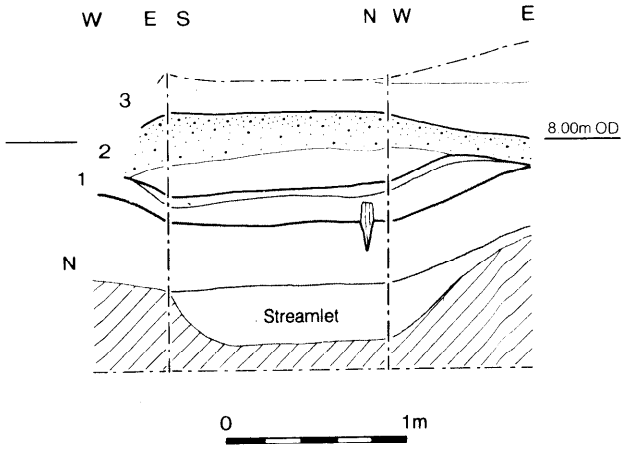


Fig 14 15-35 Copthall Avenue, watching brief: section

A third distinctive and more mixed group of deposits overlay the sands and silts at their western end. The majority of these were organic sandy silty clays, grey and brown-dark brown in colour. They included plant material - often still green - and the root systems and stumps of willow or poplar trees (see Fig 30); some layers contained a few small fragments of charcoal, glass and shell (OPT *724, 722, 674, 719, 712, 838, 718, 704, 707-709, 702, 715, 701, 829),* (Fig 23). These deposits formed a surface which had a decided slope from 6.7m OD in the west to 6.3m OD in the south-east. The tree stumps were situated on the higher ground aligned in a north-northeast/ south-southwest direction.

The earliest sequence of gravelly deposits in the main stream towards the east end of the trench indicates various phases of erosion, deposition and probable changes in direction of flow, although the general direction appears to have been south to south-east. Their character suggests a fairly fast-flowing stream. How this sequence related to the northwest-southeast orientated channel further west (OPT *786)* is not clear. Because they both cut through the weathered clay the western channel may have been contemporary, flowing, like the main stream, to the south but since it was very different in character it is likely that the western channel pre-dated that to the east, at a time when the stream was faster flowing. It had, however, filled up before the last of the gravelly deposits were laid down in the main stream.

The second phase of the stream - horizontally bedded silts and sands - implies a mainly depositional period and a slower rate of flow and/ or a change in the direction of flow. This is consistent with its progression westwards above the north-west to south-east channel. The two small channels (OPT *780)* within the sequence suggest a temporary erosion of the streambed, perhaps occurring during periods of heavy rainfall.

In its final stages, organic material and clays were introduced into the waterlain sands and silts on the west side of the streambed. Willow or poplar trees and plants grew on the higher ground on a north-northeast/ south-southwest alignment. The stream therefore appears to have shifted eastwards again, its west bank now formed by alluvial deposits, and colonised and stabilised by trees and vegetation. Some of the fills of the stream may

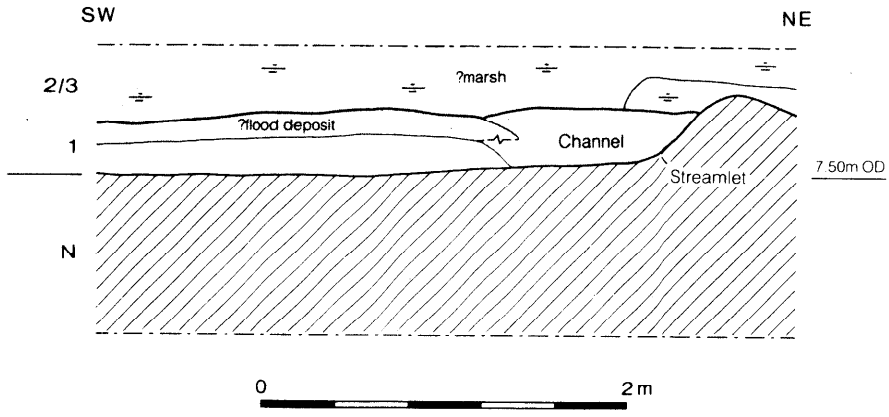


Fig 16 15-35 Copthall Avenue, watching brief: section

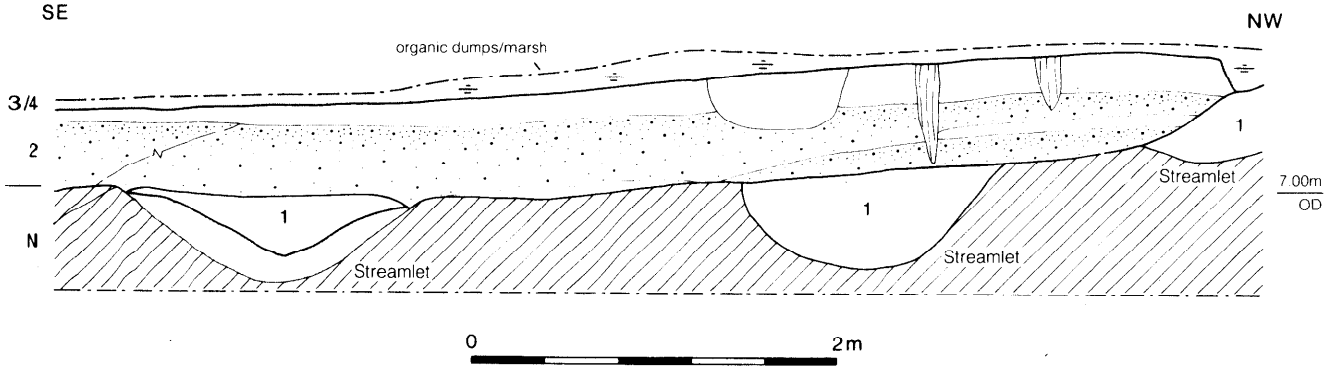


Fig 17 15-35 Copthall Avenue, watching brief: section

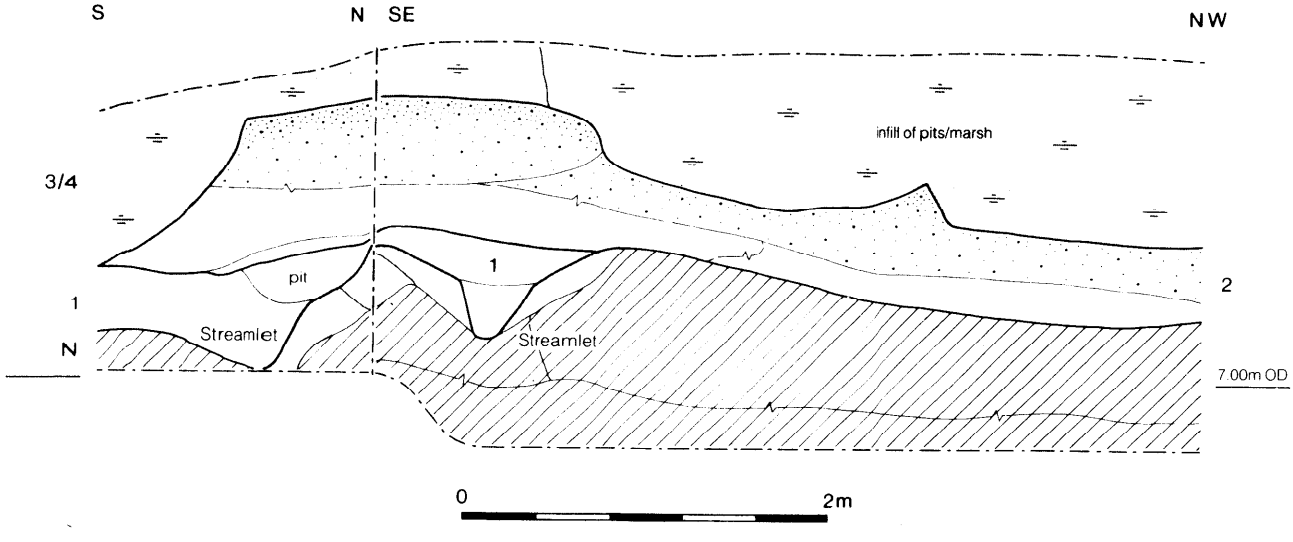


Fig 18 15-35 Copthall Avenue, watching brief: section

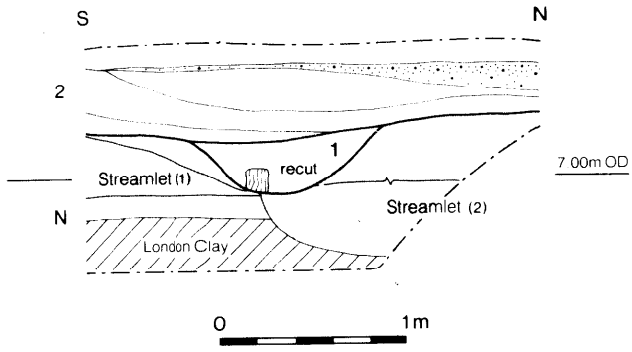


Fig 19 15-35 Copthall Avenue, watching brief: section

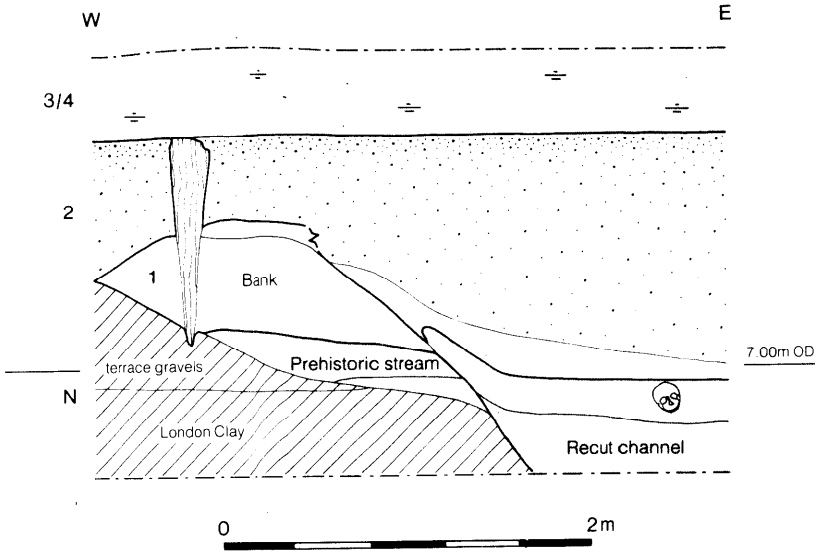


Fig 20 15-35 Copthall Avenue, watching brief: section

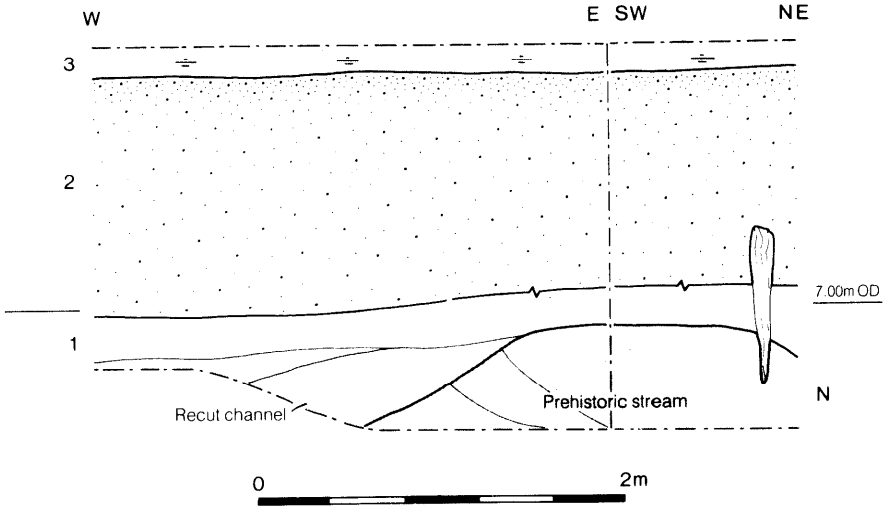


Fig 21 15-35 Copthall Avenue, watching brief: section

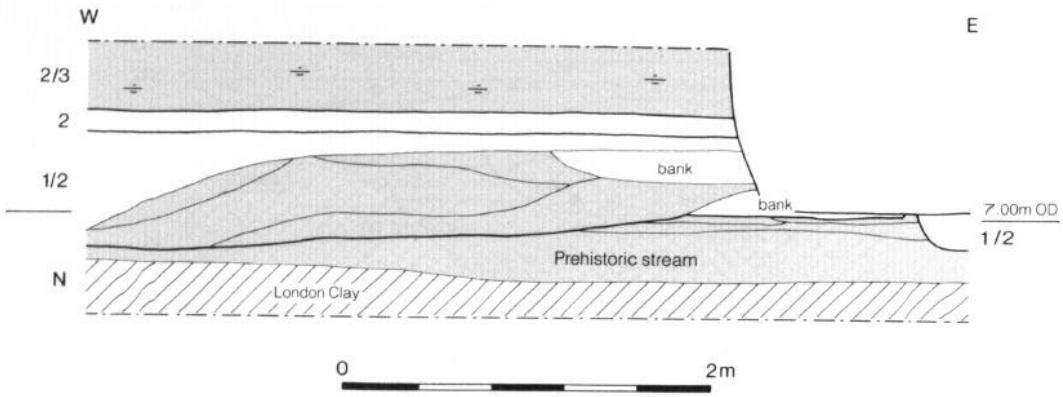


Fig 22 15-35 Copthall Avenue, watching brief: section

of course pre-date the bank, the formation of both being a continuous and gradual process. The forked channel to the west (OPT 731) could have been broadly contemporary with this stage of the stream, converging on it to the south. This suggestion is supported by the presence of a little cultural material in the west channel and in the latest deposits of the main stream. It was these deposits which produced the only datable material from the sequence of stream fills: glass fragments and a shale bracelet which are loosely dated to AD 40-200 (p 42).

The preserved vegetation and wood and the organic matter noted on the west side of the streambed in its final stage, are indications of a waterlogged site. They suggest that prior to and during' the early part of the Roman period, the recently formed west bank of the stream remained wet. Analysis of macroscopic remains, molluscs, ostracods and insects supports these conclusions, indicating a stream which flowed through a marshy area. It also confirmed that the environment was in a fairly natural state.

4-6 Copthall Avenue (Stream 2)

A thorough investigation of natural stratigraphy on this site was not possible but evidence was obtained from two bore-hole probes at the west and east of the site and from two sections (not shown).

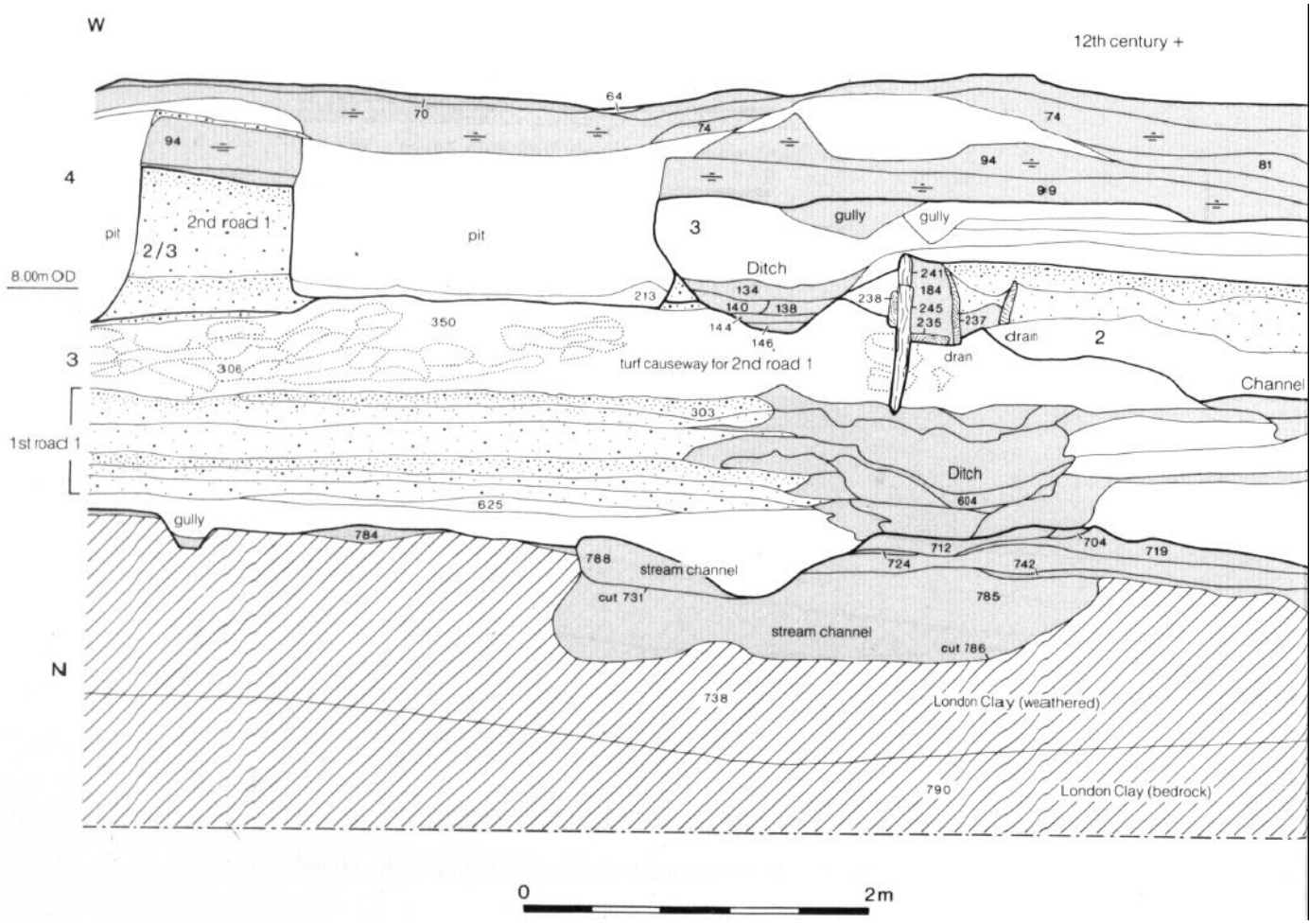


Fig 23 15-35 Copthall Avenue, controlled excavation: south section

Valley fill, consisting of grey clayey gravel and sand or gravel and coarse grey sand, lay at 6.1m OD in the west and 6.3m OD in the east. Below, London Clay was located at 5.8m OD (west) and 5.96m OD (east) but rose to 6.3m OD at the south end of the site where it was not overlain by stream deposits.

The lack of terrace gravels indicates that the entire site had been subject to erosion by a stream (Stream 2). The fill of this stream was at maximum 0.3m deep; levels from the bottom of the stream were slightly lower in the west than in the east but there was more deposition in the east. The differences were perhaps not great enough to be of much significance but, together with the lack of deposition at the south end of the site, may hint at a stream which immediately prior to the Roman period flowed north-east to south-west across the site.

23 Blomfield Street (Stream 3)
(Fig 24)

The limited watching brief on this site revealed sub-strata in only one, north-south aligned, section located 7m from the east edge of the site (Fig 24). Layers of yellow-buff sand and fine washed gravels were recorded above London Clay. These were probably stream fills (Stream 3). The surface of London Clay was recorded at a maximum level of 6.46m OD in the north, dropping suddenly to 6.26m OD at the south end of the section where there seems to have been more vigorous erosion. The stream gravels had been truncated at 6.6m OD, a maximum depth of 0.36m surviving.

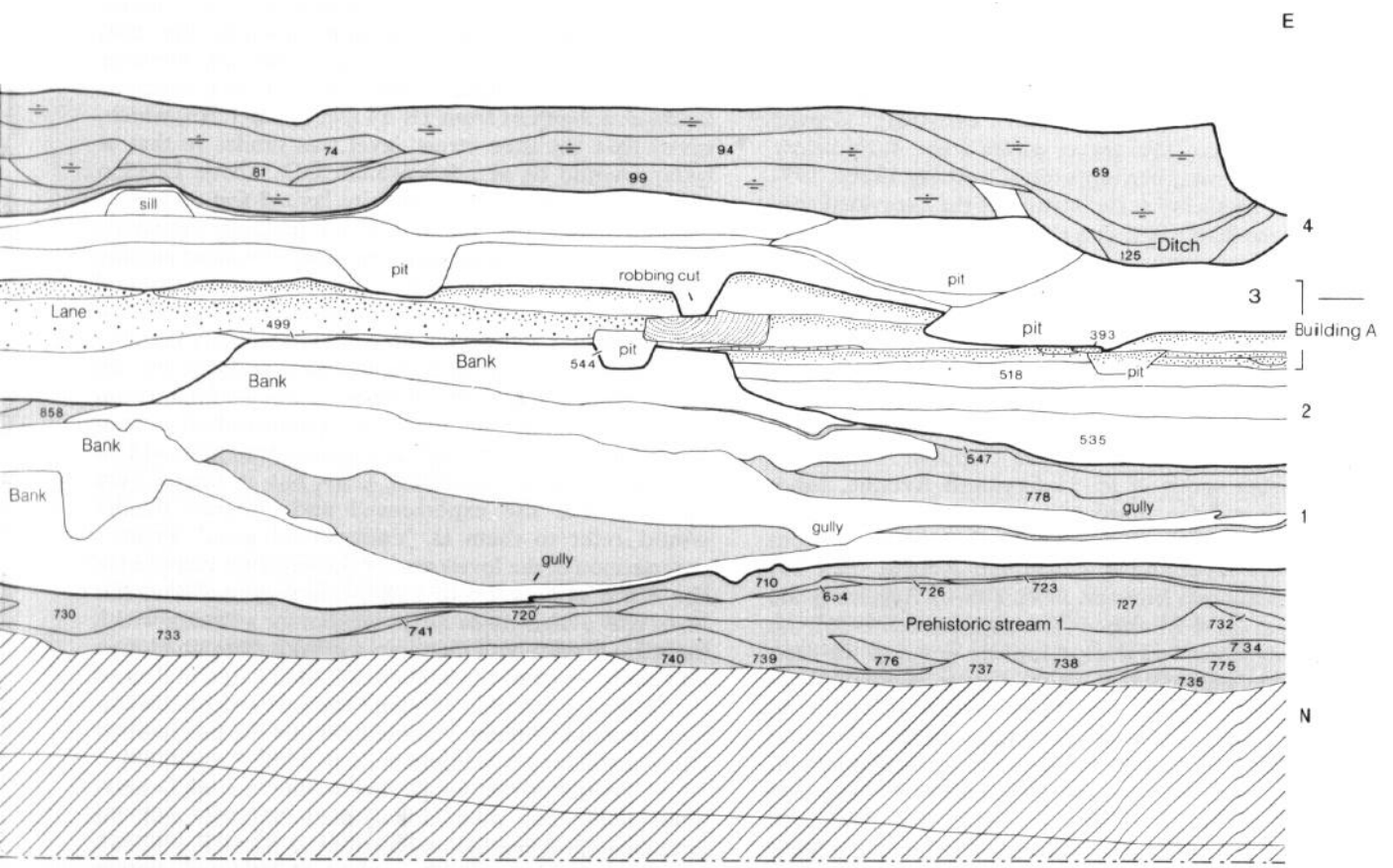
Discussion (Figs 25-7)

Stream 1 at 15-35 Copthall Avenue

The presence of a major western tributary of the prehistoric Walbrook cutting into terrace gravels and London Clay was demonstrated at the south end of 15-35 Copthall Avenue. It flowed eastwards before turning to the south, a course remarkably close to that of a tributary marked on the Geological Survey map of 1936 (N 5) (Fig 26) but at variance with that proposed by the Royal Commission (RCHM 1928, plans C and D) and Merrifield (1965, map) based on the ward boundary (Fig 27). If the ward boundary followed a tributary of the Walbrook its course must have been much altered by the medieval period (see Part 6).

The bed of the stream here was at least 15m wide across its western 'arm', and 44m east-west across the turn. Valley fills occupied a depth of up to 0.65m and a width of up to 9m in the west, for a distance of 37m across the turn of the valley, but it is difficult to assess the size of the running stream at any one time; the evidence suggests that it could have been at least 9m wide at the time that London was founded.

The edges of the tributary were well-defined though subject to erosion and occasional flooding. Within the depression, London Clay with virtually no waterlain sediments above it formed the west and presumably south bank of the stream at the point where it changed direction. Here evidence from the controlled excavation implies that the stream was initially fast-



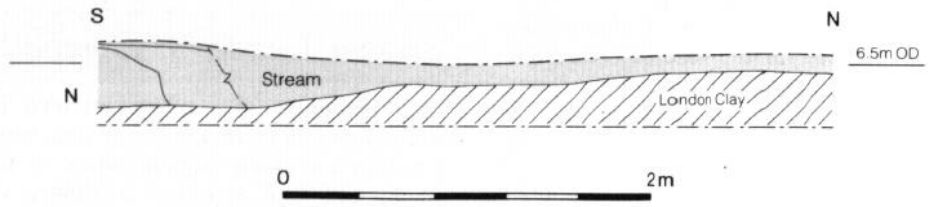


Fig 24 23 Blomfield Street: north-south section through Stream 3

flowing with much erosion and deposition of gravels. This was succeeded by a decrease in velocity when level sandy silts were laid down. Finally the stream shifted eastwards and its erstwhile bed was colonised by water- and damp-loving trees and vegetation, forming in its turn a new bank which nevertheless remained wet. During this final phase the presence of man in the area is detectable from the inclusion of fragments of glass, pottery and charcoal in the deposits.

The north bank of the stream was contiguous with the north side of the valley. Formed by erosion of the terrace gravels and London Clay, it was traced eastwards across the site for a distance of 31m where it curved round to the south. The greater depth of erosion and deposition in the west, together with the evidence from the controlled excavation which demonstrated the progression of the stream eastwards, suggests that the change of course gradually worked its way from west to east. A number of streamlets located to the north of the valley no doubt helped to erode the wide bend. These streamlets cut through the terrace gravels but not the underlying clay.

Evidence possibly of the same stream has been located to the west and south. At 55-61 Moorgate (Site 14) (Dunning 1929b), shallow east-west aligned channels were cut into gravel which was c 4.9m below street level. It was then reported (Dunning 1929a, 199) that river gravels lay at the bottom of the excavated area in the eastern half of the site, though there is no mention of them in the excavation report. A recent excavation on the same site (Site 15) confirmed that terrace gravels were present in both halves of the site though they sloped from 7.5m OD in the west to 6.7m OD in the south-east (Drummond-Murray 1988). This west-east slope, together with the evidence for later drainage systems, suggests the existence of a nearby stream, possibly the one located at 15-35 Coptball Avenue.

To the south of 15-35 Copthall Avenue, black peaty silt has been noted above terrace gravels at 30 Moorgate (Site 19) (Hume 1951) at a depth of 4.2m below street level and at 7 Copthall Avenue (Site 25) (Staff of Guildhall Museum 1965,135-6). Adjoining the latter site, at 20-8 Moorgate (Site 20) (Cottrill 1936), the ground was observed sloping rapidly down to the east. As with the channels at 55-61 Moorgate, these deposits may have been associated with later drainage activity, but it also seems likely that the incline of the strata and the deposits were related to the length of a stream found at 15-35 Copthall Avenue, or in the case of 30 Moorgate and even of Nos 55-61, to a branch of the stream. An eastward slope was also noted on the terrace gravels during excavations at 8 Telegraph Street (Site 22); this may have been related to the Copthall Avenue tributary. The course of the Copthall Avenue tributary (Stream 1) could thus have flowed more or less southwards to Tokenhouse Yard (Fig 25) though see below (p 24) for a different interpretation.

Stream 2 at 4-6 Copthall Avenue

Grey sands and gravels above London Clay indicated the streambed of a tributary of the prehistoric Walbrook further to the east. Because of the limited recording opportunities, it was not certain whether these deposits represented a shallow stream or the edge of a much deeper one perhaps situated to the east of the site, although the London Clay sloped very slightly down to the west. Earlier observations in 1904 on this site (Site 32) and that to the north at 10-12 Copthall Avenue in 1906 (Site 30) (Norman and Reader 1906, 231-2) suggest that the ground sloped down to the east. On the latter site (Site 30) Norman and Reader recognized the west side of a streambed, composed of washed gravel and sand which became deeper towards the east, overlying London Clay. It was not made clear however through what the stream cut. London Clay is stated as being at a depth of from 18-24 feet (5.5m-7.3m) which, given that the then street level was similar to that of today, would be at c 6.8m-5.0m OD. Above London Clay at the west end of the site lay c 3 feet (0.9m) of 'undisturbed loam' which shelved gradually eastwards where it gave way to stream deposits. The latter became deeper, up to 6-7 feet (1.8m-2.1m) towards the east end of the site. Because there is no indication of the location of the heights taken on London Clay, it seems reasonable to suggest that the greater depth was recorded at the east end of the site where the streambed was situated. It can thus be calculated that the layer of undisturbed loam in the west lay at c 7.7m OD. Terrace gravels would be anticipated above London Clay but it seems very unlikely that the experienced and accurate Reader would refer to them as 'undisturbed loam'. From a comparison of the levels and of the sequence recorded to the south at Nos 4-6 in 1984, it is suggested that this loam was a man-made embankment for a stream which had first removed all the terrace gravels through erosion and then, prior to the occupation of the area in Roman times, had gravitated towards the east end of the site. The absence of terrace gravels on this site has recently been confirmed by excavations in 1987 (Lees 1989).

To the north, properties to the rear of London Wall (Site 28) were demolished in 1866 and the archaeological features recorded by Lane-Fox (1867, xxi-1xxxiii). This was a large site, 55.8m from north to south and the information recorded was very imprecise;

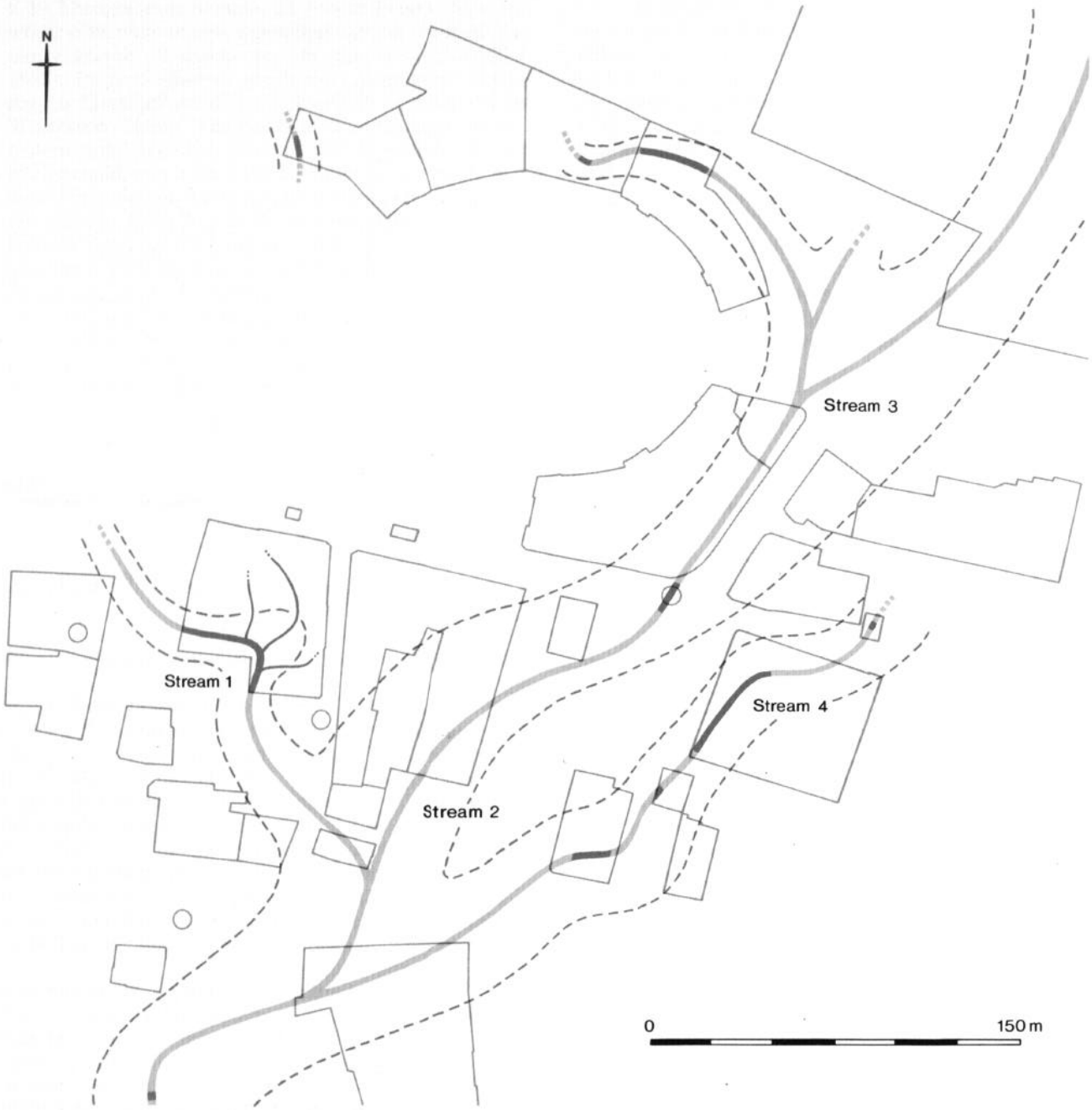


Fig 25 Suggested course of prehistoric streams in the upper Walbrook valley in relation to sites discussed in the study area. Blue represents found or observed stream, lighter blue, conjectured stream, and pecked lines the extent of the valleys

there are, as a result, serious difficulties of interpretation. No stream deposits were recorded. Terrace gravels described as 'gravel similar to Thames ballast' were apparently observed over the complete length of the site, which sloped down from north to south, but the stated depths of 17-22 feet (5.2m - 6.7m) or approximately 7.1m - 5.6m OD seem far too low. At these depths on the adjacent Copthall Avenue sites, London Clay was overlain by valley fill but it seems doubtful that Lane-Fox could have mistaken stream gravels for terrace gravels which in this area are generally quite distinctive. Because terrace gravels were located a short distance to the west at 15-35 Copthall Avenue and because, as already seen, they were not present at 10-12 Copthall Avenue to the south, it is considered likely that terrace gravels existed over much of Lane-Fox 's site but that they had thinned out before the south edge of the site. If the depth of deposits has to be accounted for, however, a stream or streams filled with eroded terrace gravels is implied. Test pits examined recently on this site have revealed fluvial deposits (D Lees LOW 88, pers comm).

The evidence from these three sites is thus inconclusive. Reader's information from 4-6 and 10-12

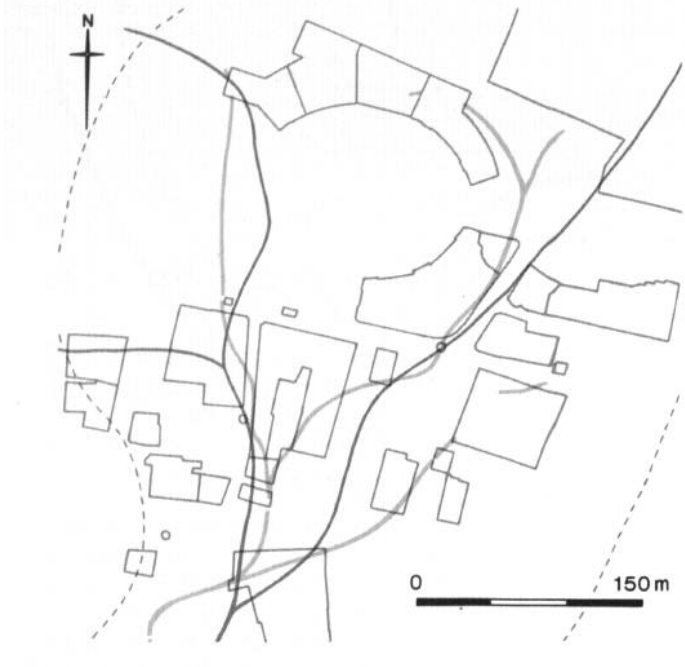


Fig 26 *The course of the upper Walbrook as conjectured on the Geological Survey of 1936*

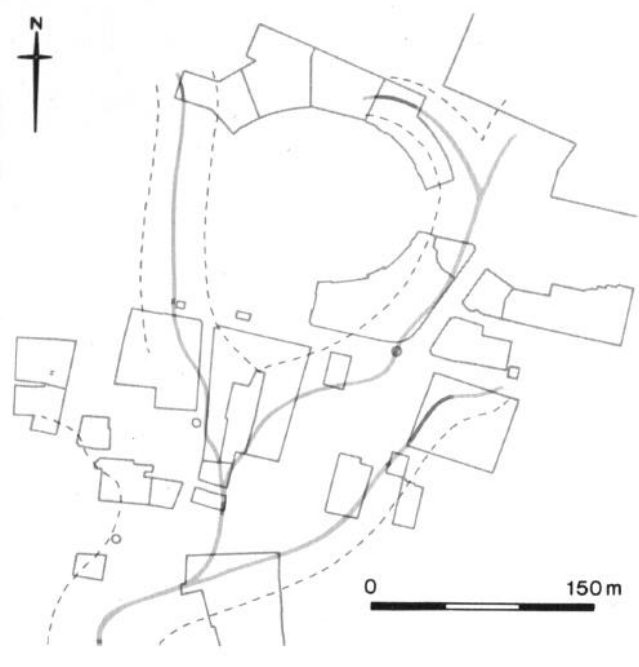


Fig 27 The course of the upper Walbrook, after Merrifield (1965)

Copthall Avenue indicates a north-south aligned stream. This could have been part of the main Walbrook (Stream 3) as suggested by RCHM (1928) and Merrifield (1965, map) (Figs 25, 27) but could equally have been part of a tributary with a more direct southerly route. It is also possible that it was connected with the western tributary (Stream 1): the southward slope of the terrace gravels at the south end of Lane-Fox's site (Site 28) may have marked the north bank of a stream which would then, presumably, have meandered southwards again. More recent evidence from Nos 4-6 is ambiguous but does allow for the possibility of a northeast-southwest course at this point, a course which is not inconsistent with the evidence from the sites to the immediate north.

To the south this stream could have joined with Stream 1 from 15-35 Copthall Avenue, and/or continued southwards to Tokenhouse Yard. If the north-south alignment is accepted, then it could have flowed southwards to Angel Court

Stream 3 at 23 Blomfield Street

Evidence of a prehistoric stream on this site confirmed that found at London Wall Buildings immediately to the south (Site 7) (Reader 1903, 181). Here the streambed was composed of a 0.3m thick layer of fine sand lying above terrace gravels, with 1.5m of sand and 'carbonaceous silt' above. At its deepest point the bottom of the stream was recorded at a depth equivalent to 6.7m - c 6.3m OD, if the street level was similar to that of today - and therefore compatible with the level of the stream at 23 Blomfield Street, although terrace gravels had been completely eroded at the latter site. The west side of the stream was noted as being shallow and poorly defined. Piles observed on the opposite side of the street at 46-7 New Broad Street (Site 8) (Waddington 1925) seem to confirm Reader's estimation of a valley 35-36m wide.

At the site of Broad Street Station (the Broadgate development) (Site 5) (Malt 1987) to the north, a shallow basin seems to have been formed by numerous streamlets which' cut into the terrace gravels and London Clay in prehistoric times. Over a distance of some 50m a depression was recorded which sloped from c 10.0m OD in the north-west to c 7.0m OD in the south-east. A succession of waterlain sands, gravels, clay and silts built up to a depth of approximately 1m. Channels varied in width up to 3.6m and their positions shifted over the course of time; probably more than one was active simultaneously.

Allowing for the different degrees of erosion in the streambed, there is consistent evidence for a major stream, perhaps braided, which flowed southwards from Broadgate and then ran parallel with Blomfield Street on its west side. A culvert through the defensive wall at the south end of Blomfield Street (Merrifield's W31, Site 11) marks the position of this tributary in the Roman period and is consistent with the alignment of the prehistoric stream.

Evidence for the course of this stream south of the defensive wall is lacking. It could have flowed south-west as suggested by Merrifield (1965) (Fig 27), but perhaps a more logical course would have been southwards to link up with the tributary noted at the east side of the Walbrook valley under a culvert through the defensive wall at All Hallows Churchyard (Site 40) (Norman & Reader 1906, 209-11 and pls xxv-vi), at 22 Great Winchester Street and at Winchester House (Sites 38 and 39) (Gould 1951, 151-4; Marsden 1963). The presence of a stream here was implied by the absence of terrace gravels above the London Clay which was overlain by a layer of compressed vegetation at a depth of 7.3m, sealed by alluvial mud. A streambed (Stream 4) was recorded during excavations in 1986 at

9-19 Throgmorton Avenue, 21 Austin Friars (Site 36) where a 3m wide stream was found cutting through the sandy gravels of earlier stream deposits (Durnford 1988). Its north-east to south-west alignment would suggest identification with those lengths noted in Great Winchester Street. The postulated confluence of the eastern tributary with that of the Blomfield Street stream could have been to the north or the south-west of 9-19 Throgmorton Avenue. Current excavations just to the south at 22-25 Austin Friars have exposed the east bank of Stream 4 (D Dunlop and D Shotliff AST 87, pers comm); the survival on this site of brickearth above the terrace gravels indicating that the east edge of the valley lay very close to the stream here. Brickearth was also located at 13-14a Austin Friars (Site 37), confirming the relative steepness of the Walbrook valley's eastern side in the Survey of 1841 (see Fig 2).

At Angel Court (Site 34) a feeder of the Walbrook was recorded in a section at the north end of the site (Blurton 1977, 16 and fig 2). It was only *c* 0.7m wide x 0.25m deep so that it is not likely to have been a continuation of Stream 4, judging by the evidence from 9-19 Throgmorton Avenue (above). This streamlet appears to have cut through natural brickearth at 6.9m OD which is a rather low level for brickearth. Scant attention was paid to the geological strata and therefore it is possible that the brickearth was in fact waterlain silts. On the west side of the site (Area B), where the confluence of the main stream (Stream 3) and the eastern tributary (Stream 4) is proposed, silts and gravels of the floodplain were observed, while some 30+m to the south natural gravels were recorded *(ibid,* 21-3). Levels were not noted.

3. Period I Reclamation and Drainage - Mainly Early 2nd Century

In the late Ist-early 2nd centuries there began a transformation of the upper Walbrook valley as the Romans sought to rationalise the natural drainage system and reclaim the low-lying ground beside the streams. Streams were reduced in width and their courses stabilised, altered or diverted. At the same time the depressions formed by the streams began to be filled in and a network of ditches provided for the displaced drainage. Two north-east to south-west aligned roads were constructed, forming main routes through the valley, and gravelled and timber paths provided access within the area itself.

The initial results of attempting to re-organise the natural drainage system were not successful and it is suggested that this, rather than a rise in the level of the Thames (Merrifield 1983, 146) caused the silting and flooding of the Walbrook. The necessary amends were made however, and control over drainage was eventually achieved by *c* AD 120.

Evidence from pollen, macroscopic and insect remains from 15-35 Copthall Avenue reflects the attention now given to this area by the Romans in an environment increasingly disturbed by dumping, the cutting of drainage ditches and construction and use of the road, but was nevertheless marginal in character. It also suggests a wet grassy landscape (Part 8, p 103).

15-35 Copthall Avenue: controlled excavation

Phase 1 - ?1st century AD (Fig 28)

Two drainage features represent the earliest activity on the site but may not have been contemporary (Fig 28). A small gully 0.2 - 0.3m wide and a maximum 0.2m deep, aligned north-east to south-west, cut into stream deposits. It was filled with waterlain silts and sands. East of this and parallel with it was a ditch, *c* 1.2m wide, 0.35m deep, which cut through an earlier prehistoric channel. Apart from one yellow-brown gravelly deposit on its eastern side, it contained no fills and was therefore either open for a short time or thoroughly cleared out. Two stakes on either side of the ditch may have been marking-out posts or part of a fence (OPT *696).* There was no datable material for this phase except a timber stake which post-dated *c* AD 34 (OPT 721, pp 118).

Phase 2 - early 2nd century (Figs 29, 30)

A series of dumps composed of dark brown silty clays, brown-grey organic clay containing leather off-cuts (Part 7, p82) and light blue-grey clay, infilled the Phase 1 ditch and levelled up the ground (Fig 29). They were capped by a layer of pebbles in a clay matrix which formed the base for the surface of a north-east to south-west orientated road. Composed of very compact pebbles in brown clay, the road surface lay at *c* 6.85m OD.

At the same time trees on the banks of the stream were cut down and a dump of clean light blue-grey clay with a little additional material infilled the stream and covered the banks, raising the ground level by as much as 0.4m to 6.8m OD in the west, level with the road, and 6.6m OD in the east.

To the east of the road a drainage system was laid out (Fig 29). This comprised a roadside ditch with two parallel ditches at right angles to it, one of which drained into the roadside ditch, while the other, embanked with grey-brown silty, sandy pebbly clay on its south side, drained south-eastwards (Fig 30). Yet another ditch drained eastwards (Fig 41a).

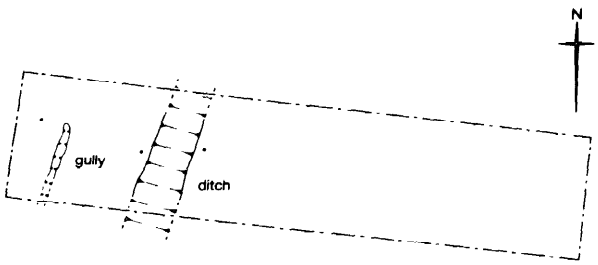


Fig 28 15-35 Copthall Avenue, controlled excavation: plan of Phase 1 features

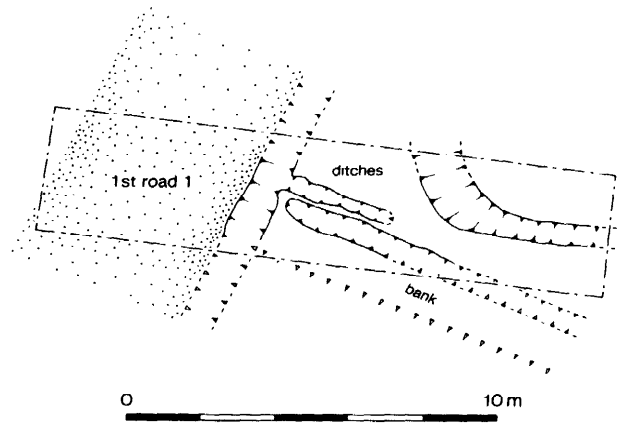


Fig 29 15-35 Copthall Avenue, controlled excavation: plan of Phase 2 features

Fig 30 15-35 Copthall Avenue, controlled excavation: view looking east of Phase 2 ditches cutting through clay infill of a tributary of the Walbrook. The ditch on the left drained into the roadside ditch, that on the right drained eastwards. In the foreground can be seen remains of sawn off trees. Scale in units of 0.10m

Phase 3 - early 2nd century *(Fig* 32)

All the Phase 2 ditches silted up. The eastern edge of the road was eroded and its ditch, although mostly truncated, showed signs of silting: very thin bands of tan and dark grey fine sands, and grey, brown and buff silts, sands, organic matter and pebbles. The two parallel ditches silted up with intermixed brown-grey silts, sands, clays and organic matter (OPT *646, 642),* (Fig 31). They eventually overflowed, causing localised flooding. The bank which bordered the southernmost ditch (Phase 2) was eroded and consequently, before the ditch had completely silted up, it was raised using redeposited silts, by at least 0.15m to a maximum level of 7.01m OD, the top retreating southwards as a result.

The banks of the ditch to the north were also raised by the dumping of mainly brown and dark grey clay to a maximum level of 6.87m OD (Fig 41a). Grey-black sands, silts, clays and organic material in bands and 'swirls' filled the ditch which was then re-cut.

The whole area east of the road - including the banks - finally flooded, the evidence suggesting-that flood deposits accumulating above the easternmost ditch gradually intermingled with those further west which were more rapidly deposited.

Phase 4 - early 2nd century *(Fig 32)*

The road was resurfaced at *c* 6.95m OD and its ditch recut. Two timber uprights were set just inside the east edge of the road; the tops of both were chamfered with a mortise on their east sides, suggesting that they were re-used timbers (OPT *485, 679).* Organic silty sandy clays (Fig 23) accumulated in the ditch and erosion and flooding of the road edge resulted in a second re-surfacing at *c* 7.00m OD. Silting in the ditch and erosion continued however until the ditch overflowed, the sediments encroaching some way onto the road.

The Phase 3 bank was heightened some 0.25m and extended northwards above one of the silted up ditches. A substantial timber post associated with this rebuild may have helped to stabilise the bank (OPT *276).* At the foot of the bank, now composed of sandy gravel, the east-west ditch was apparently recut to allow drainage into the roadside ditch. This may have been connected with a possible ditch to its north: both were severely eroded. Probably at the same time as the roadside ditch, these ditches became choked up, causing flooding at the foot of the bank. A temporary measure to assist the drainage of the flooded area was then provided by a small gully which drained south-east (Fig 23).

Phase 5 - early-mid 2nd century
(Figs 33, 34)

A poor quality surface of coarse sandy gravel above levelling layers raised the road to 7.18m OD, sloping down to the east.

In a north-east to south-west orientated section to the west of the trench two squared upright timbers may have marked the western edge of a ditch.

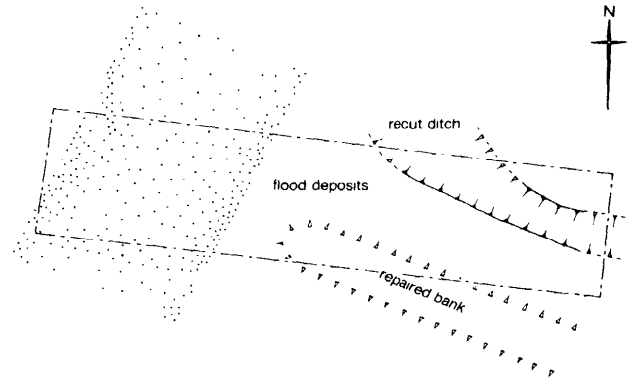


Fig 31 15-35 Copthall Avenue, controlled excavation: plan of Phase 3 bank rebuild and ditch recut

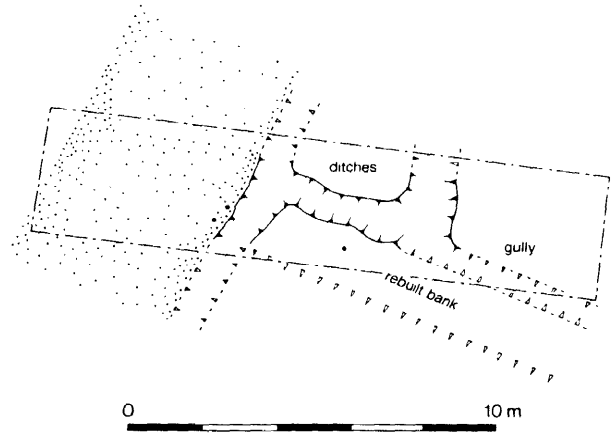


Fig 32 15-35 Copthall Avenue, controlled excavation: plan of phase 4 features

The ditch along the eastern side of the road was recut but both its west and east banks were angled towards the gully to the east (below). Its north-west edge was revetted with a post and plank structure. It would thus seem that the greater volume of water had been received into the ditch from the east rather than from the north. After the road was repaired and some silting had occurred in the ditch, a small embankment was formed along its western edge, probably upcast from the ditch.

The Phase 4 gully was infilled and the area levelled up for a rebuilding of the bank which was advanced northwards again. A much eroded ditch at the foot of the bank was recut after it had silted up and overflowed (Figs 33, 34). This recut was fed by a severely eroded southward draining ditch, probably a replacement of that of Phase 4 but whose immediate predecessor could not be recognized. These ditches are likely to have drained into the roadside ditch. Further east another drainage channel was cut at the foot of the bank, draining eastwards. It is possible that it replaced and completely destroyed an earlier one. Eventually the

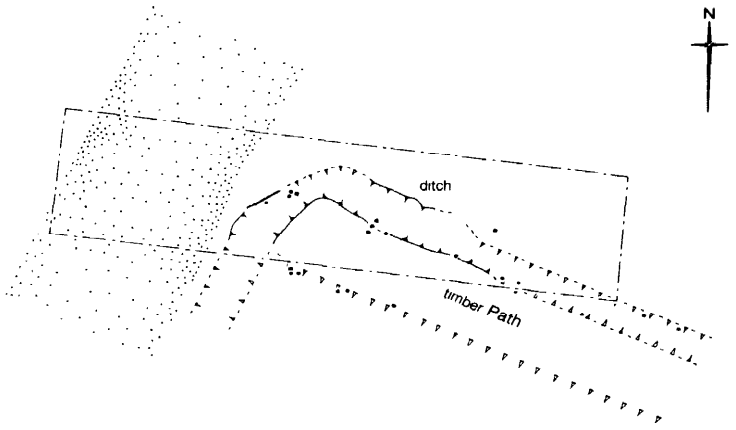


Fig 33 15-35 Copthall Avenue, controlled excavation: plan of Phase 5 features

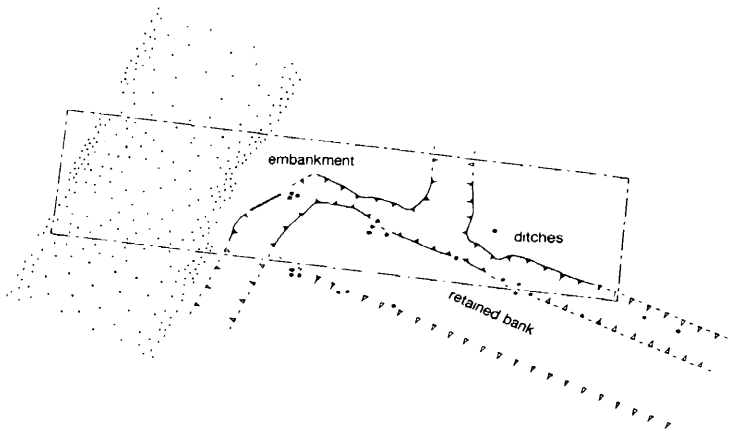


Fig 34 15-35 Copthall Avenue, controlled excavation: plan of Phase 5 recut ditch and embankment

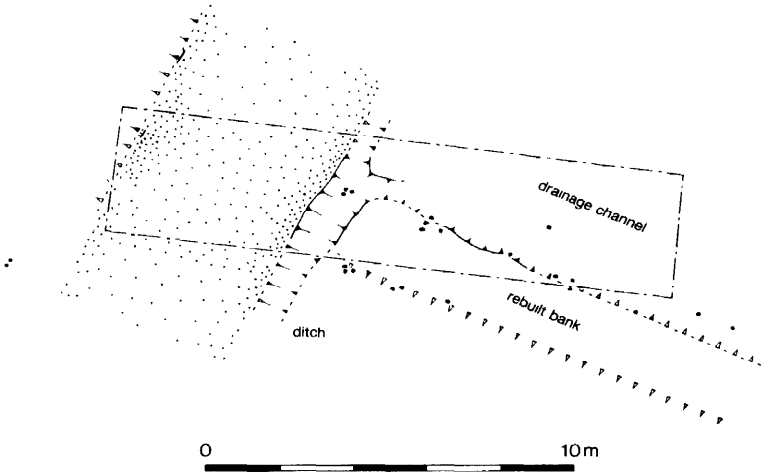


Fig 35 15-35 Copthall Avenue, controlled excavation: plan of Phase 6 features

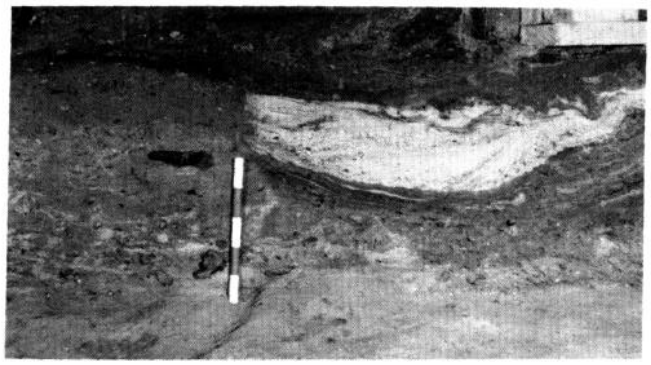


Fig 36 15-35 Copthall Avenue, controlled excavation: section through eastern roadside ditch (Phases 2-6), looking south. Scale in units of 0.10m

ditches overflowed and a layer of brown organic silts was deposited as the whole area north of the bank was flooded (OPT *601),* (Figs 23, 41),

A possible timber platform or raised path was erected above the bank. Two groups of three and three single oak piles (OPT *249 250, 261, 318, 319, 320, 407* and *408* were sampled for dendrochronological analysis) formed a north-west to south-east alignment along the north edge of the bank and extending to the west edge of the roadside ditch (Fig 33). Four of these piles were inserted into the bank prior to its rebuilding. The groups of three adjacent piles, 2.15m apart, were triangular or approximately rectangular in cross-section, 1.94-1.7m in length; the tops of the piles were weathered at a maximum level of 8.17m OD (west), 8.12m OD (east). Further east, the three single piles, 1.8m and 1.2m apart, were triangular or rectangular in cross-section, *c* 1.5m in length. They had been reused in a later building and the levels recorded on the top of the piles may not therefore be original: 7.95m OD descending in stages eastwards to 7.78m OD. A fourth pile was recorded during the watching brief. Also reused in the Period II building, was a substantial stake which

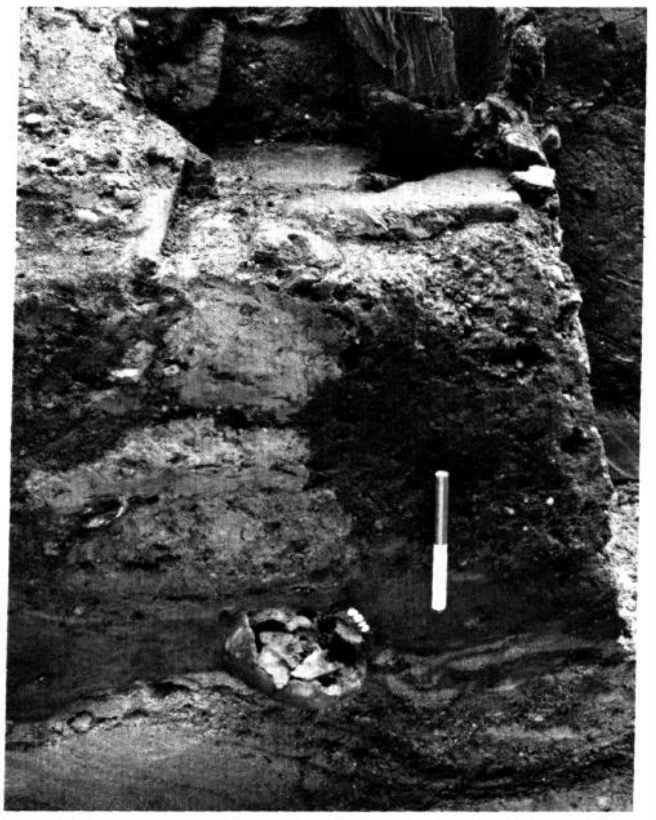


Fig 37 15-35 Copthall Avenue, watching brief: section, looking north, showing human skull at top of eastern roadside ditch (Phase 6) and, below, turf bank of Phase 7. Scale in 0.10m units

was positioned to the north of the recut channel (OPT *410);* its function was not obvious.

The south side of the timber path was also recorded during the watching brief. It consisted of a group of three piles, triangular in cross-section, their

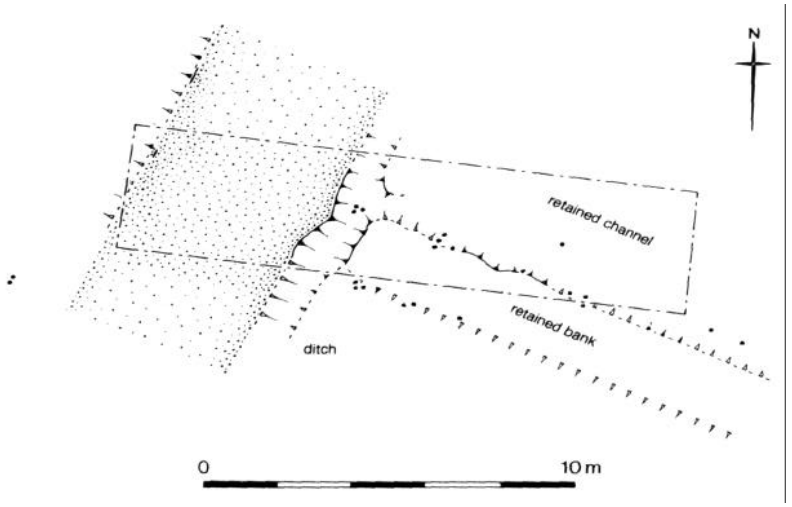


Fig 38 15-35 Copthall Avenue, controlled excavation: plan of Phase 6 recut ditch

tops at a maximum level of 8.16m OD; two adjacent piles, triangular and sub-rectangular in cross-section, their tops at a maximum level of 7.86m OD; and a single pile, rectangular in cross-section, its top at 7.44m OD. The path would thus have been *c* 2m wide and at least 9m in length, the groups of triple or double piles apparently being the main load-bearing supports of the structure. Nothing survived of the superstructure, which had been dismantled, but at a suggested level of c 8.2m OD would have comfortably cleared the latest bank rebuild. How it related to the road, which was at a substantially lower level, is not clear.

Phase 6 - early-mid 2nd century

(Figs 35-41)

The road was relaid though to an even poorer standard than before and involved little more than successive dumps of material to maintain a dry surface. The roadside ditch was recut and realigned alongside the road. In the extreme northwest corner of the site, a wattle fence or revetment, was erected which suggests that it marked the east side of a ditch. Clear signs of water action were recorded in this corner of the site. The ditch on the east side of the road was filled mainly with sand washed off the road (OPT *604),* (Figs 35, 36). It overflowed and the road was raised to a level of *c* 7.45m OD though it seems to have suffered quite severely from successive flooding and erosion. Again the ditch was recut and, after it had silted up a small gully was either naturally or deliberately formed in the centre of the ditch (Fig 23).

In an east-west section to the immediate south of the trench, three deposits were identified as fills of this ditch. On the surface of one of these lay a human skull discoloured blue-black (Fig 37).

To the east of the roadside ditch the Phase 5 bank was raised to 7.78m OD and now formed the south edge of a major channel which included virtually the whole area of the site to its north (Figs 35, 38 and 39). This channel would have been at least 2.8m wide, connecting at right angles with the ditch. Within the channel were a number of thin waterlain deposits interleaved with material washed off the bank and which had formed concentric rings around the Phase 5 piles (Fig 40). They consisted of dark grey/ black, bluish/ black and brown organic silts and clays - the organic matter sometimes amorphous, sometimes structured - and bands of yellowish or grey-yellow fine-grained sand OPT *547, 562, 563, 564, 583, 588, 589, 591, 593),* (Plate 3; Figs 23; 41). These deposits suggested a fluctuating or a reduced rate of flow, indeed a species of mollusc identified in this channel implies that it may have become stagnant (Part 8, p 103). The variety of finds recovered from this channel are indicative of casual disposal (Part 7, p 82): leather - including shoes - worked wood, bone fragments and worked bone, hazelnuts, pine cones, whole marine shells, large fragments of charcoal and pottery.

Fig 39 15-35 Copthall Avenue, controlled excavation: Phase 6 embanked channel with one of the pile supports for a path, looking south-east. Scale in 0.10m units

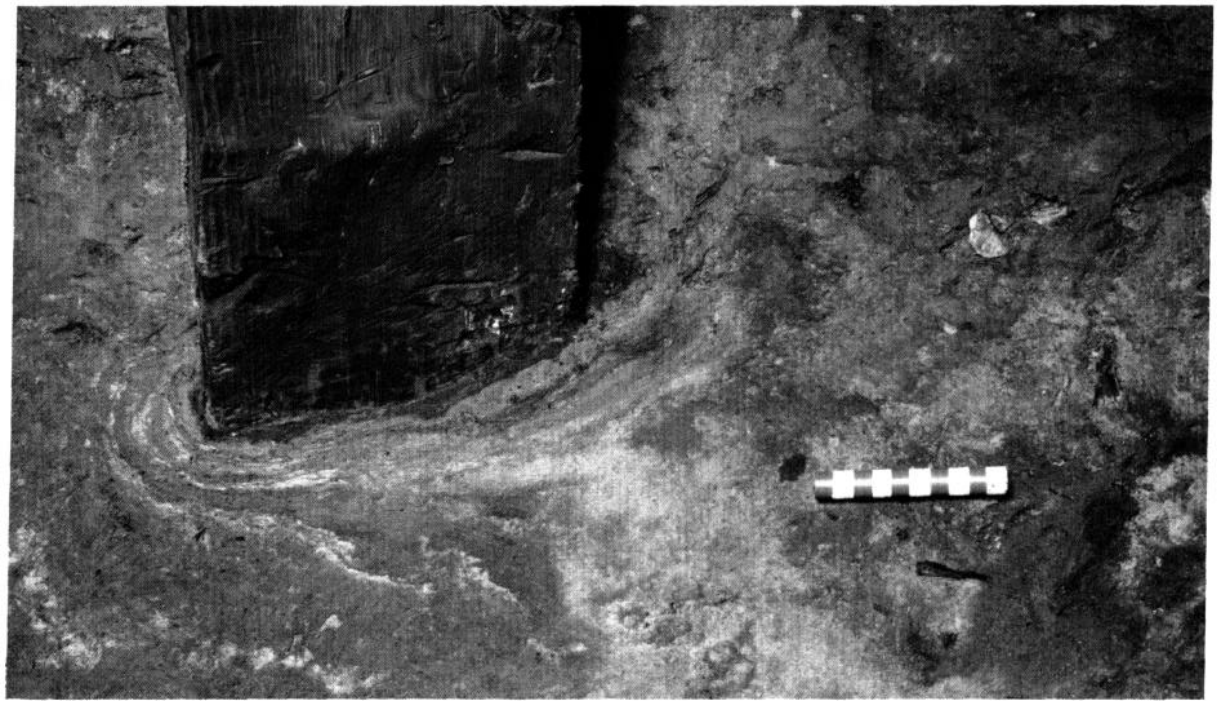


Fig 40 15-35 Copthall Avenue, controlled excavation: detail of pile against bank of Phase 6 channel showing eddying effect around it. Scale in 10mm units

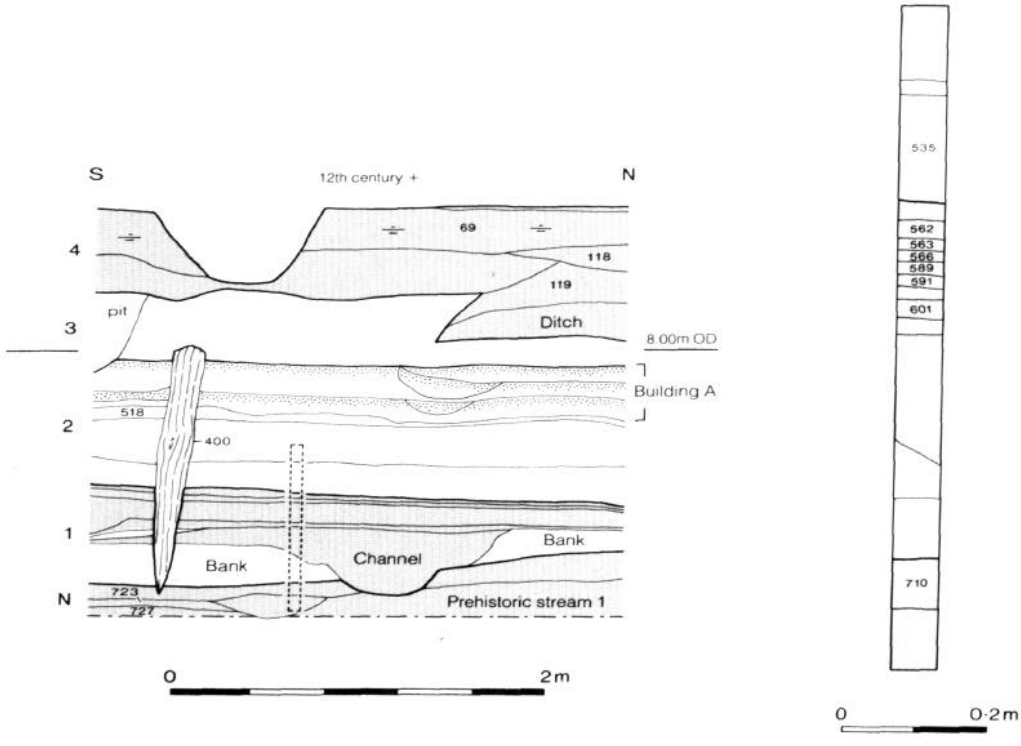


Fig 41 15-35 Copthall Avenue, controlled excavation: east section (a). Broken lines mark position of column sample for environmental analysis, shown enlarged (x4) in (b)

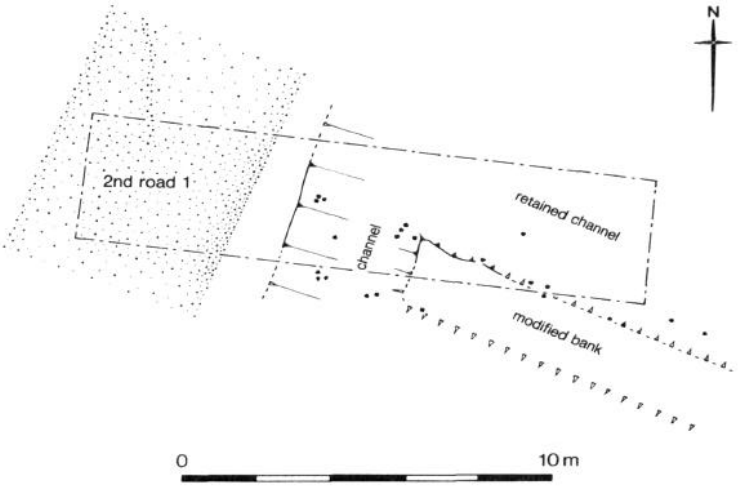


Fig 42 15-35 Copthall Avenue, controlled excavation: plan of Phase 7 features

Phase 7 - early-mid 2nd century

(Figs 42, 43)

The road was completely re-built as a causeway some 0.45m higher, well beyond any danger of inundation (Fig 42). Its foundation was composed of stacked turves laid upside down and, towards its east side, sandy silty clay and turves which were banked to form the eastern edge of the causeway (OPT *306, 350),* (Fig 43). Analysis of the macroscopic remains from the turves suggests that they were derived from a very damp area (Part 8, p 103). A raft, mainly of branches, twigs and discarded timber (OPT *413),* carried the main body of turves, roughly corresponding to the position of the road metalling. The first surface, laid above a levelling layer of sand, was composed of pebbles in a matrix of clay at a maximum level of 7.95m OD.

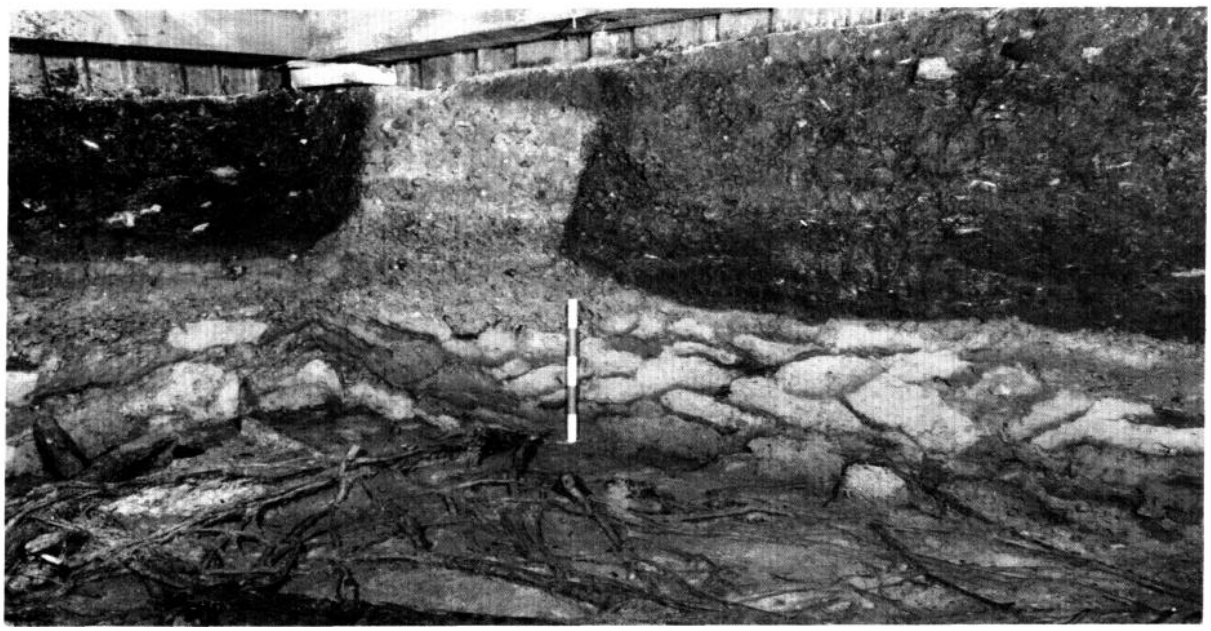


Fig 43 15-35 Copthall Avenue, controlled excavation: Phase 7 road with brushwood raft viewed in plan, turf foundation and metalled surfaces (including those of Period II) viewed in section but largely destroyed by two medieval pits. Scale in units of 0.10m

The Phase 6 drainage channel was retained but its fills were levelled off and its bank cut back to allow adequate drainage at the foot of the causeway.

15-35 Copthall Avenue: watching brief and 44 London Wall - 2nd Century (Figs 44-57)

The watching brief produced much valuable evidence which both complemented that of the controlled excavation and placed it into a wider context. The evidence was, however, recorded in widely dispersed sections and because there were many phases of activity during this period it has not been possible to reconstruct a detailed sequence, although the broad outline is clear (Fig 44). Only very small groups of pottery were recovered (below, 42) so that the dating of the sequence is problematic.

A section which extended northwards from the controlled excavation and was only recorded in photograph, showed that in the valley of the stream the ground level was raised with dumps of gravelly clays (Fig 45). Composed of bands of pebbles in brown clay, the road was laid directly onto London Clay at the south end of the section (Figs 45, 46) and can be compared with that of Phases 2-4 of the controlled excavation (Figs 29, 31, 32); presumably it continued northwards over the gravelly dumps. Darker, less pebbly material overlay these road surfaces and is equivalent to the poor quality surfaces of Phases 5-6 of the controlled excavation (Figs 33-5, 38). This road was associated with a timber-revetted drain or ditch on its west side and here its upper edge was retained by a timber beam. A thick deposit of silt and organic material then covered the road and drain and represents the causeway of Phase 7 of the controlled excavation.

Beyond the valley of the stream the road was recorded in test pits as sequences of banded, compacted gravels. It was laid onto the de-turfed terrace gravels (Fig 47) or directly onto the ground surface (Figs 48, 49). The east edge of the road was marked by a ditch recorded in section (Fig 47) and at the north end of the site, in plan (Fig 44). The west edge was steep, as recorded in Figure 48 but at 44 London Mall to the north, a shallow north-east to south-west aligned cut feature may have represented the west edge of a ditch (Fig 87).

On either side of the road reclamation dumps began to infill the valley of the stream and natural drainage was replaced with ditches or channels, their banks often consolidated or revetted with timber. To the west of the road in Figure 9 a channel seems to have been created when a clay bank, retained by timber posts or revetting, was constructed onto the valley floor, the latter at the same time being cut away to the south. Thereafter successive stages of banking were built up and advanced southwards. This may have connected with two, possibly three, rows of large timber stakes aligned north-south which were probably either related to drainage or were supports for a superstructure (Fig 44). The remains of two timber stakes, driven into the sloping surface of London clay, could have been part of a revetted channel (Fig 45). Also on the west side of the road but beyond the valley of the stream, a north-east to south-west aligned ditch or channel was cut into the terrace gravels (Fig 50). This was probably linked with the channel further south. It was recut on a slightly altered alignment, the fill of which contained pottery dated to AD 100-200. The evidence from the controlled excavation would suggest that these ditches and channels were interrelated with the roadside ditch. It is possible that a culvert was constructed to transport the waters of the stream beneath the road but no evidence for this was observed.

Presumably beneath the east side of the road, reclamation dumps were recorded at the edge of the valley (Fig 8). There is some evidence that the infilling and drainage of the valley was staged. In the 'turn' of the stream its gently sloping west bank was built up with grey-blue clay and the channel recut, perhaps deeper that it had been (Fig 20). Sandy gravels and black silty clay accumulated within the channel, the uppermost of which contained a black-stained human skull. Another human skull was found in this area, the mottled clayey silt adhering to it indicating that it had lain in a drainage channel. The east side of the stream here was recut further to the west through earlier stream deposits; there was no trace of any banking which may have been eroded (Fig 21). A further constriction of the stream occurred when blue-grey clay was dumped above the latest of the stream deposits on this east side. Timber posts recorded in both sections may have represented fencing.

Further south the east edge of the stream was again observed to have been advanced inwards, to the west. A bank, composed of redeposited terrace gravels, was erected on the streambed and was later renewed at a higher level where it seems to have slipped forward above waterlain sandy gravels (Fig 22). Further west along this section and only recorded in photograph, an embankment was formed of redeposited terrace gravels, apparently held in place by revetting. This would have created, in effect, two presumably parallel channels. The stream here was then infilled with organic matter and a channel 2m wide x 1.12-1.45m deep was cut through it and through valley fill (Figs 51, 52). This channel was traced over a distance of 16m in a north-south direction sloping down from north to south (Fig 53). At its south end the channel, clearly cutting through the prehistoric stream, may have been recut. Timber stakes were located on its west and east sides and these were probably the remnants of revetting. The channel was eventually infilled with blue-grey clay (Figs 51, 52, 53). Blue-grey clay was also noted in the south-west above valley fill, sloping down to the east (Fig 54). At the south end of the site the ground level was raised and the earlier channel replaced with another, possibly revetted, channel 0.30m deep (Fig 53). No replacement channel to the north was recorded: this particular length of the channel seems to have become redundant, and it is likely therefore that the replacement channel in the south provided an outlet for the drainage from the west. These modifications cannot be closely dated. The organic infill contained pottery dated AD 100-200 (Fig 51) but stratigraphically later pottery from a deposit below a land drain (Period II) is dated AD 120-160.

At the south end of the site a north-west to south-east alignment of four single and two groups of double stakes were recorded, their tips embedded in the

Plate 1 15-35 Copthall Avenue: the controlled excavation taking place inside 2-3 Cross Key Court formerly gymnasium of Coleman Street Ward School. A complete sequence of archaeological deposits extended to a depth of 7m – a rare occurrence in the City

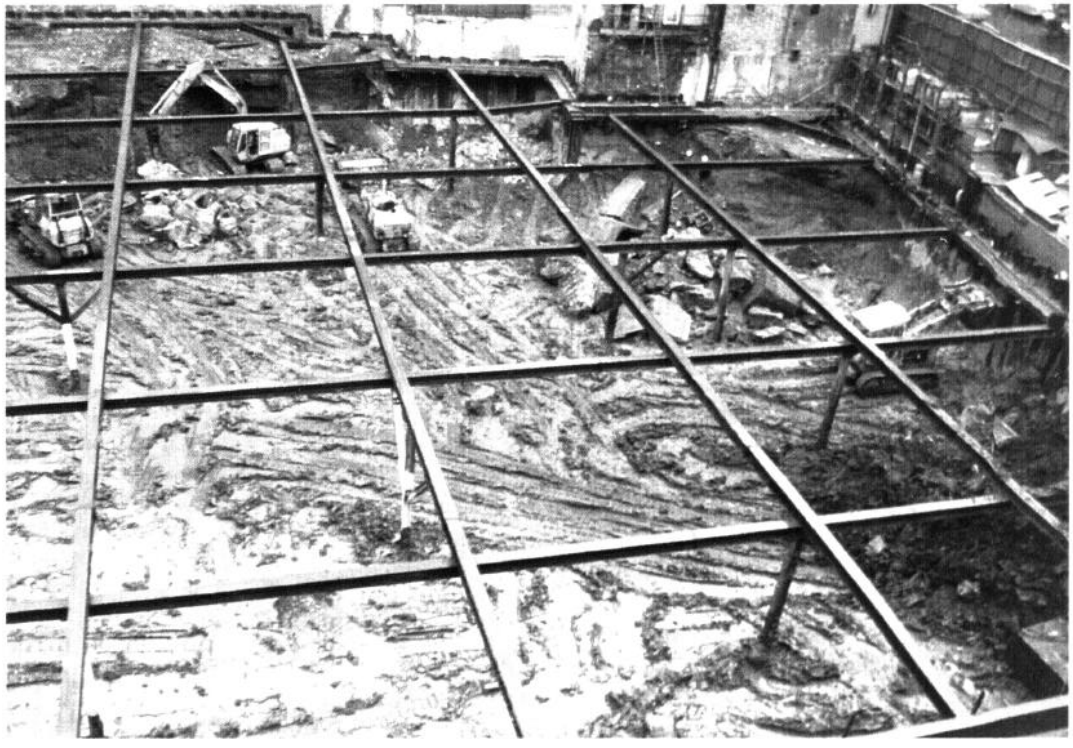


Plate 2 15-35 Copthall Avenue: watching brief. The controlled excavation lay within this area and during the watching brief, these records were significantly added to even though the site was rapidly reduced some 4m from basement level

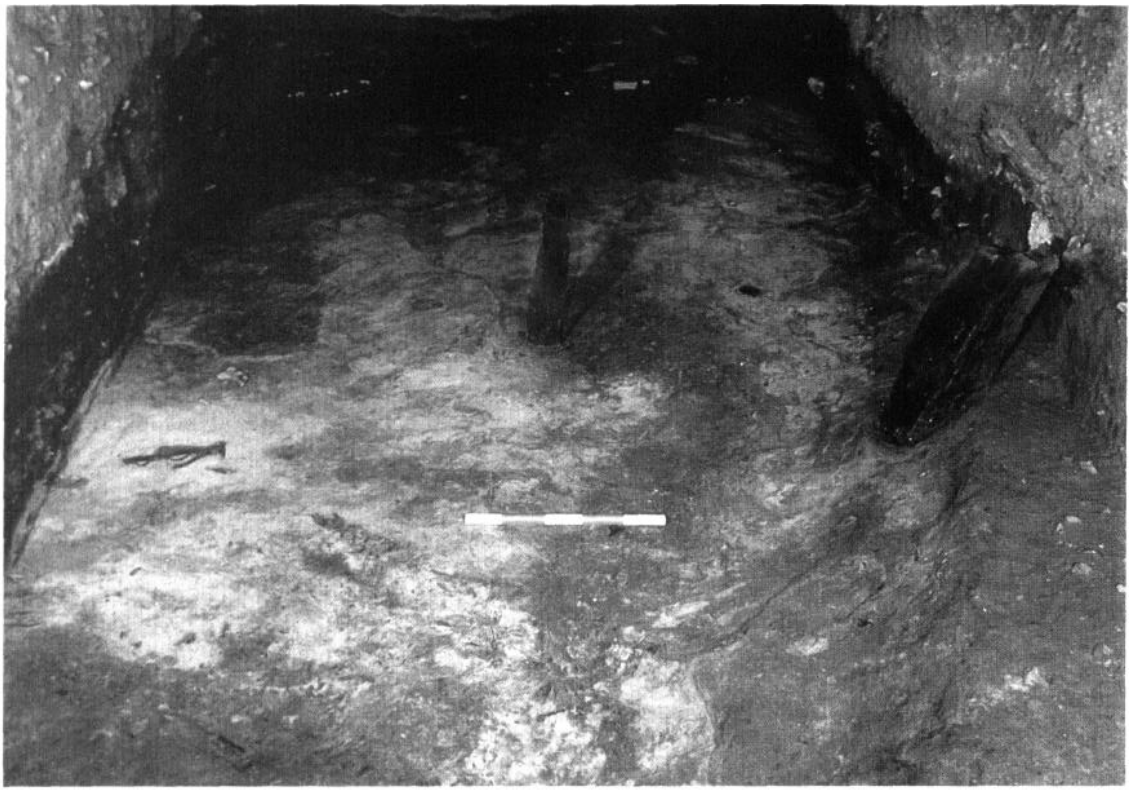


Plate 3 15-35 Copthall Avenue: controlled excavation: sediments in Phase 6 Channel with south bank in bottom right of picture, and piles. Scale in 0.1m units

Plate 4 London Wall: road and western ditch looking south-southwest. Scale in 0.1m units,

Plate 5 15-35 Copthall Avenue watching brief: section showing extent of gravelled surfacing, looking north. Scale in 0.1m units

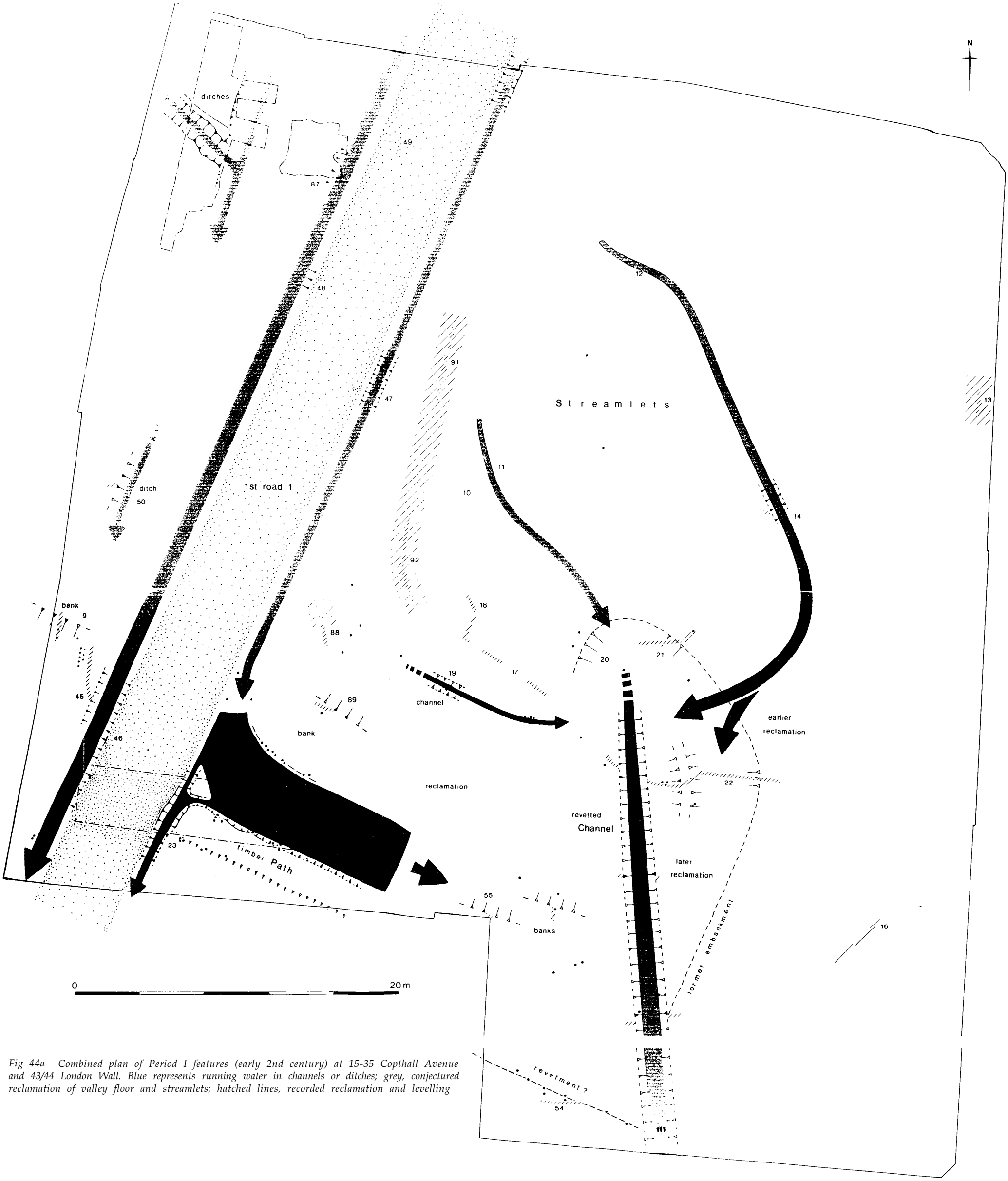


Fig 44a Combined plan of Period I features (early 2nd century) at 15-35 Copthall Avenue and 43/44 London Wall. Blue represents running water in channels or ditches; grey, conjectured reclamation of valley floor and streamlets; hatched lines, recorded reclamation and levelling

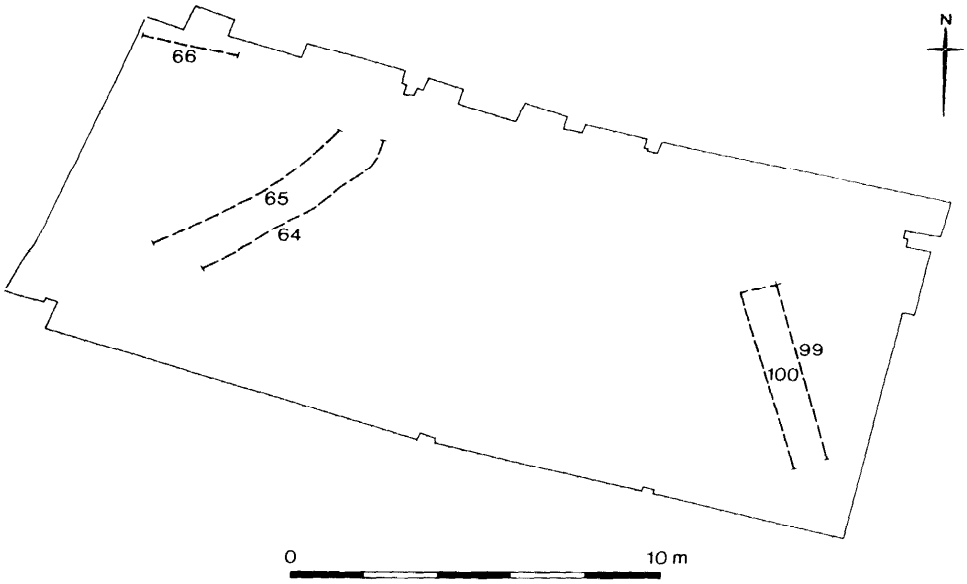


Fig 44b 4-6 Copthall Avenue: plan of sections

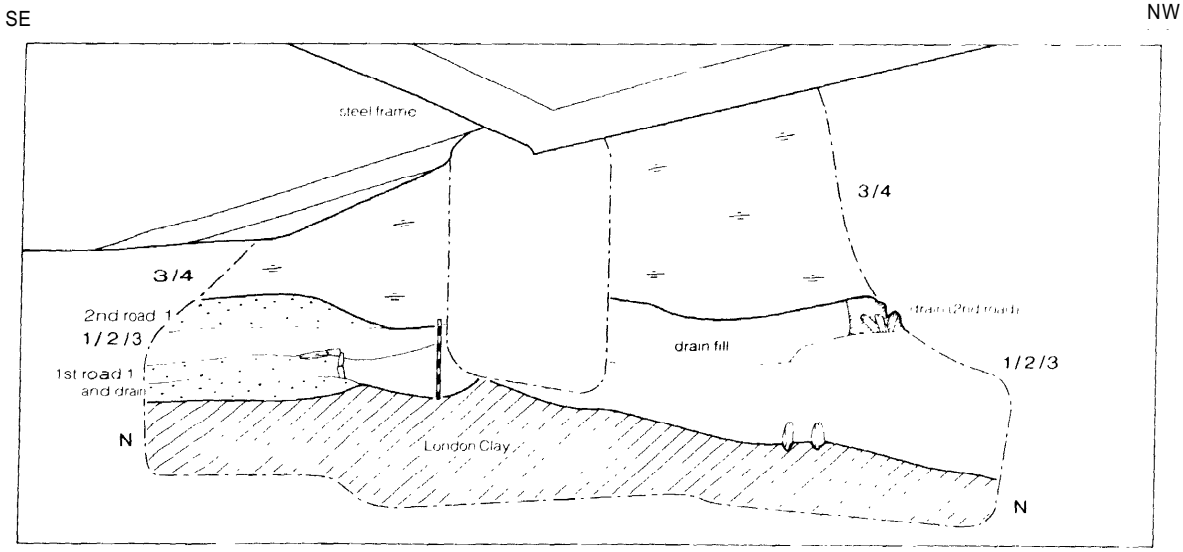


Fig 45 15-35 Copthall Avenue, watching brief: section through the west side of the first and second Road 1. Scale in units of 0.10m from photograph

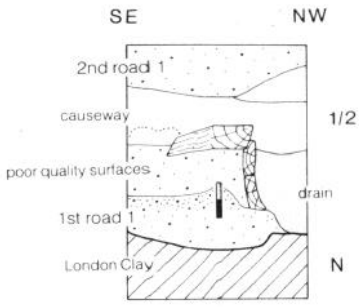


Fig 46 15-35 Copthall Avenue, watching brief: section through the west edge of the first Road 1. Scale in units of 0.10m from photograph

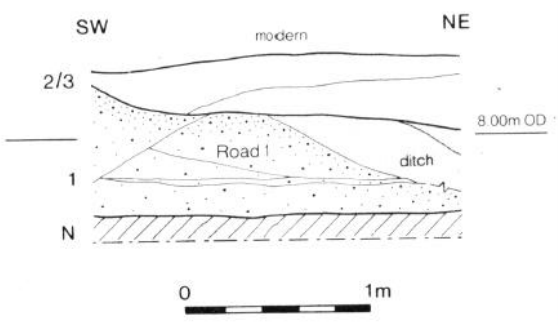


Fig 47 15-35 Copthall Avenue, watching brief: section

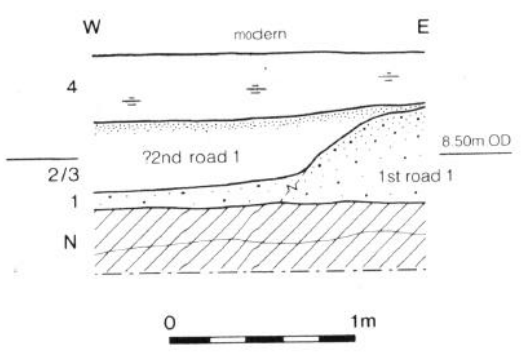


Fig 48 15-35 Copthall Avenue, watching brief: section

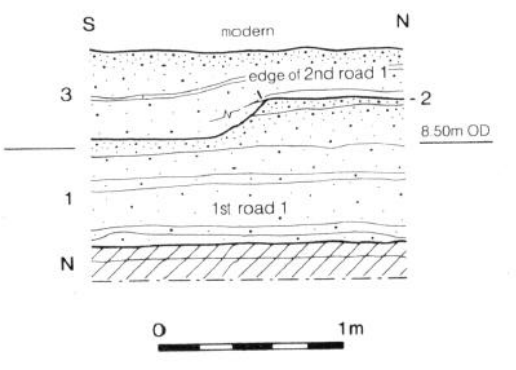


Fig 49 15-35 Copthall Avenue, watching brief: section

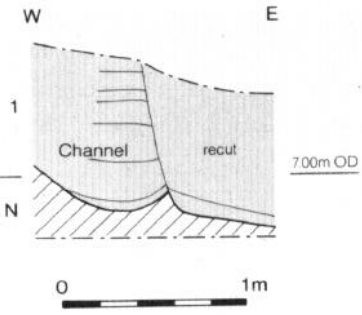


Fig 50 15-35 Copthall Avenue, watching brief: section

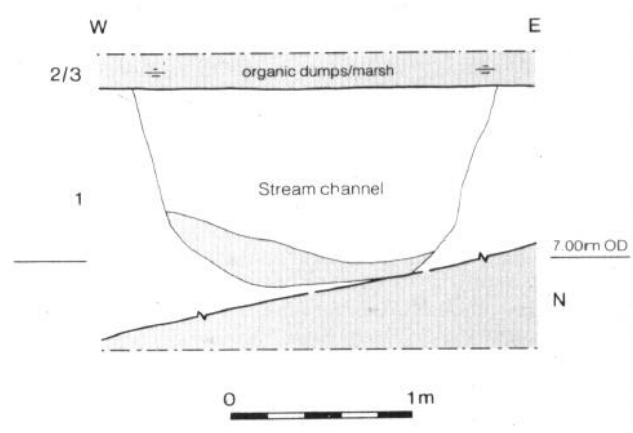


Fig 51 15-35 Copthall Avenue, watching brief: section

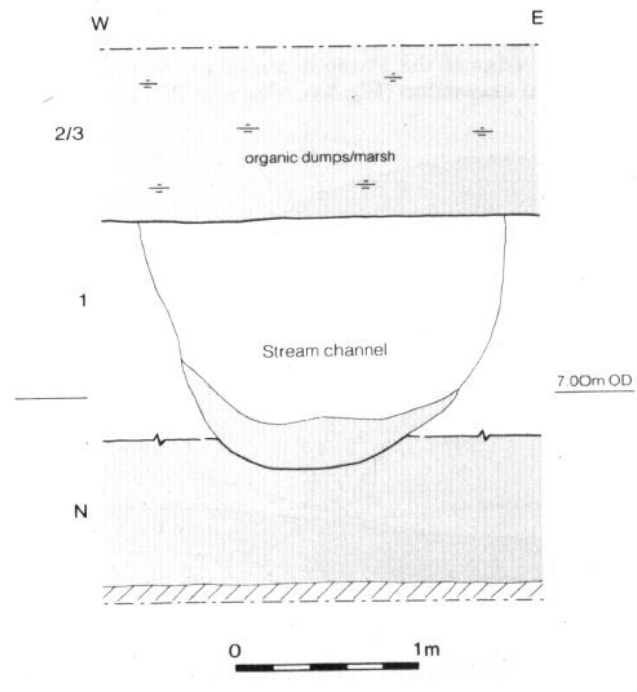


Fig 52 15-35 Copthall Avenue, watching brief: section

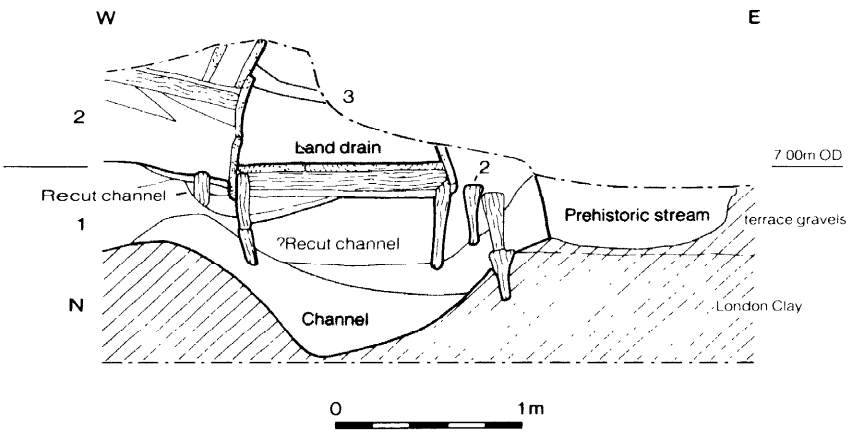


Fig 53 15-35 Copthall Avenue, watching brief: section showing prehistoric streamlet cut through by deeper channel in Period I. Timber posts on east side of *channel were probably supportsfor reverting. This channel may have been recut before it was infilled, theground level raised and another ?revetted channel cut. Finally, a timber land drain, constructedfrom a much higher level, superseded the channels (Period II)*

London Clay (Fig 44). This row of stakes shared the alignment of the Phase 5 timber path of the controlled excavation, suggesting that they were the remains of a similar feature or a revetment, the two separated perhaps by another drainage channel. The clay dump noted above (Fig 54) may have been infill behind this ?revetment.

To the south-east of the controlled excavation a channel was created to the north of a clay bank (Fig 55), while just to its north-east the remains of a possible banked and revetted channel *c* 1.1m wide and orientated west-northwest/ east-southeast was observed (Fig 44). These channels were probably connected with those recorded in the controlled excavation. Near the east side of the road a row of substantial posts or piles above an earlier embanked channel may have marked the northern edge of the Phase 6 drainage channel of the controlled excavation (Fig 56). The fact that four of the

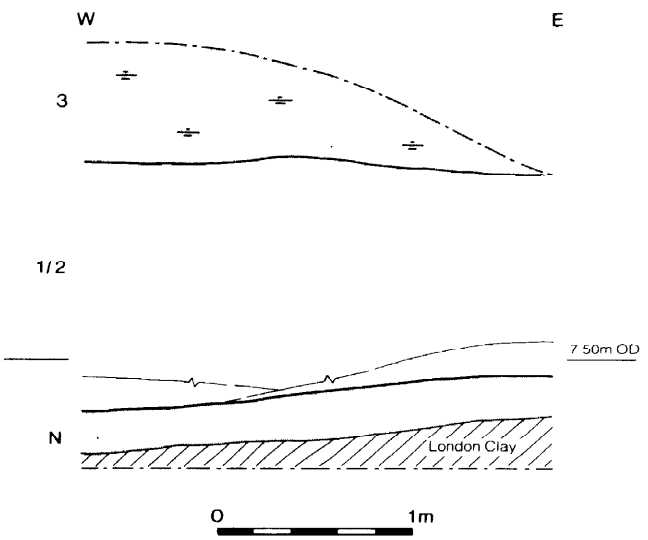


Fig 54 15-35 Copthall Avenue, watching brief: section

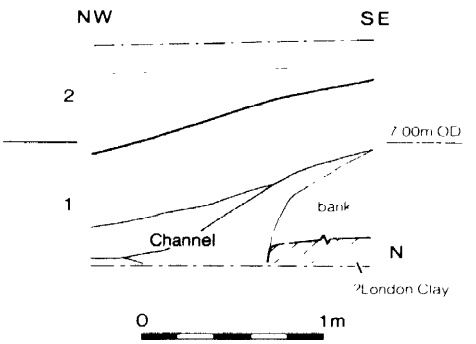


Fig 55 15-35 Copthall Avenue, watching brief: section

seven uprights were grouped into pairs could indicate that they were piles which once carried a superstructure, perhaps similar to that of Phase 5. Nearby, in a section only recorded in photograph, a bank of gravelly clay could represent the edge of a drainage channel aligned east-west, or more likely north-west to south-east (Fig 89). Further north, gravel was deposited above the sloping surface of the terrace gravels, apparently creating an embankment to a shallow channel to the south (Fig 88). The embankment had clearly been affected by erosion and flooding. Along the north bank

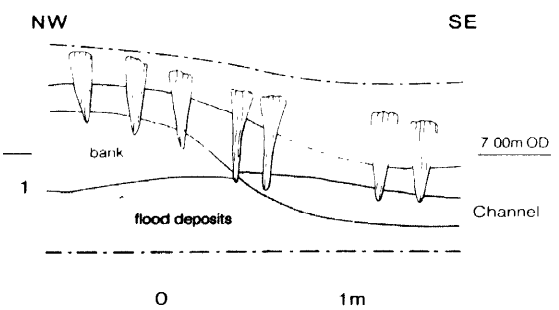


Fig 56 15-35 Copthall Avenue, watching brief: section

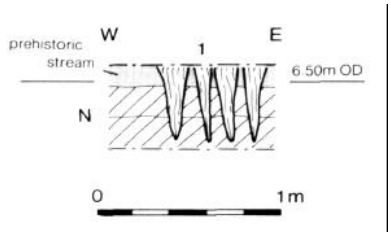


Fig 57 15-35 Copthall Avenue, watching brief: section showing possible revetment supports driven into streambed

of the stream an east-west row of timber stakes driven through stream deposits may have been the remains of a revetment (Fig 57), possibly linked with the recut of a streamlet to the west (Fig 19). Numerous other timber stakes were recorded in the valley of Stream 1, the majority of which must have been associated with drainage channels.

Beyond the edge of the valley, streamlets entering the tributary along its northern bank were infilled with brown or blue clay; the presence of roots in these deposits indicates that they were colonised by plants (Figs 17, 18). To the west of these infilled streamlets the sloping ground surface was levelled up but apparently subject to flooding (Figs 86, 91, 92). The remaining prehistoric streamlets were retained (Figs 10-15), though sometimes modified: dumps of grey-brown silty clay heightened the bank of one streamlet (Fig 10) while another was reduced in width with an infill of blue clay, this latter subsequently flooding its new bank (Fig 16).

Fig 59 43 London Wall: one of *the Phase 1 ditches (402), looking north-west. Scale in 0.10m units*

43 London Wall

Phase 1 - ?2nd Century *(Figs 58, 59)*

Two drainage ditches were cut into the terrace gravels, one aligned north-west to south-east, *c* 1.5m wide x

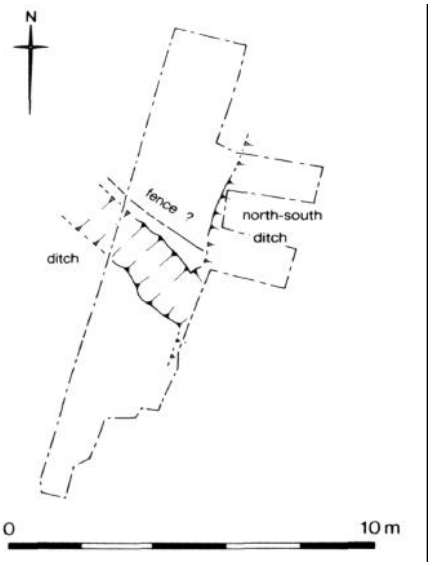


Fig 58 43 London Wall: plan of *Phase 1 features*

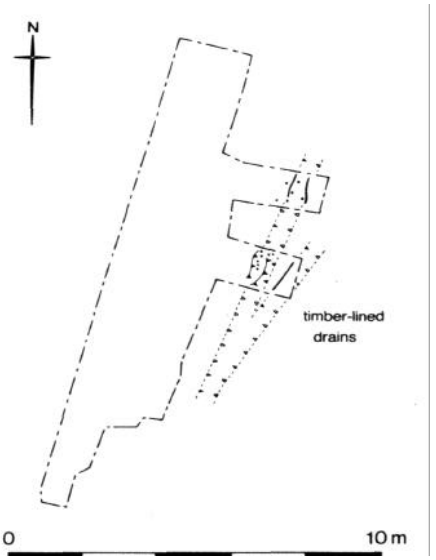


Fig 60 43 London Wall: plan of Phase 2 features

0.5m deep with a fence or boundary marker along its northern edge (Figs 58, 59), the other aligned north-south but truncated. These ditches may have been contemporary; if they were, the two ditches must have joined at the edge of the site.

Both were infilled with silty clay and the area on the west side of the site levelled up to *c* 8.1m-8.6m OD.

Phase 2 - 2nd century (Fig 60)

The north-south phase 1 ditch appears to have been replaced with a timber-lined drain *c* 0.17 wide (Fig 31). At its south end the drain seems to have been repaired. Some stakes which do not directly relate to the drain may have represented supports for a fence.

A second timber-lined drain, aligned north-east to south-west, lay to the east. This could have been contemporary with that to the west; they probably converged to the south of the excavated area.

Both drains contained waterlain deposits. Small groups of pottery loosely dated Phases 1 and 2 to AD 120-200 and it is possible, therefore, that the Phase 2 drains were in fact associated with Period II activity.

8 Telegraph Street - early 2nd century (Fig 61)

Grey gravels and clay raised the ground surface *c* 1m to a level of 8.1m OD. They were contained to the north by an east-west aligned post and plank revetment. The posts were rectangular or triangular in cross-section, some measuring up to 0.2m x 0.22m x 1.2m in length; the only surviving plank measured 0.16m x 0.25m x 0.81m. Around and to the north of the posts, occurred grey-green clay and grey silty clayey sand and pebbles which are interpreted as packing.

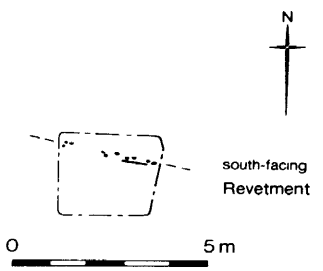


Fig 61 8 Telegraph Street: plan of Period I features

4-6 Copthall Avenue

Phase 1 - early 2nd century (Figs 62, 64-7)

Extensive dumping of grey-blue clay and/or organic material raised the ground level above the flood plain of the stream by *c* lm, to 7m-7.4m OD (Fig 99). No dating evidence was recovered from these layers.

In the western trench a gravelled external surface - possibly a pathway - was resurfaced twice up to a level of 7.5m OD (Fig 62). It was retained to the south by an east-west aligned wattle revetment (Fig 64) which, together with a bank of grey clay lying some 0.6m to the south, probably formed the sides of a drain or channel. The bank, recorded in the east section (Fig 64) but not in the west section (Fig 65), may also have formed the east side of a north-east to south-west channel, although it could merely have been eroded. A post and plank structure which collapsed or was destroyed during subsequent dumping could have been the remains of revetting for this channel (Fig 64) or another channel to the south, parallel with the wattle-revetted channel.

In the eastern trench a clay surface was laid directly onto the artificially raised ground, at the same level as the first gravel surface to the west (Figs 62; 99; 100). It was raised two times, the third surface - through which a pit was cut - being at the same level as the final gravel surface in the west trench, *c* 7.7m OD (Figs 99; 100).

On the west side of the site a north-east to south-west road was identified. Only its east side was revealed, consisting of a make-up layer and four-five bands of grey, blue and brown gravel or gravel in a matrix of clay (Fig 66). The surfaces, which appeared to have been cambered, ranged from 7.64m OD to a maximum 7.95m OD. A timber-revetted drain 0.34m wide x 0.4m deep bordered the road (Figs 62; 66).

Below the eastern edge of the road lay a peaty deposit which probably represented the early dumping that was carried out on the site (above). No dating evidence was recovered from the road deposits but a comparison of levels indicates that it is likely to have been contemporary with the postulated pathway and the drainage system to its east.

Phase 2 - early-mid 2nd century (Fig 63)

The east-west channel was filled and floor surfaces or levelling layers of clay and of gravel were laid above (Figs 63; 64, 65). Above these another gravelled surface extended above the infill as far as and level with the top of the bank at c 7.7m OD (Fig 65). In the east trench, the ground level was raised *c* 0.45m OD (Fig 100). This bordered a ditch to the south, 0.7m deep, at least 2.5m long (Figs 99; 100) which may have replaced a similar feature associated with the earlier surfaces.

23 Blomfield Street (Fig 68)

A north-south alignment of three timber posts was recorded towards the east side of the site (Fig 68, Site 6) traced over a distance of 5m. These were almost square in cross-section, an average 180mm x 170mm; the tops of the posts had been broken but one survived to a length of 1.07m. They had been driven into London Clay at a level of *c* 6.4m OD but it was impossible to determine whether buff-yellow sandy gravels above the clay pre- or post-dated the posts. They were probably supports for a revetment bordering the stream, but no dating evidence was recovered and the timbers themselves could not be dated by dendrochronology.

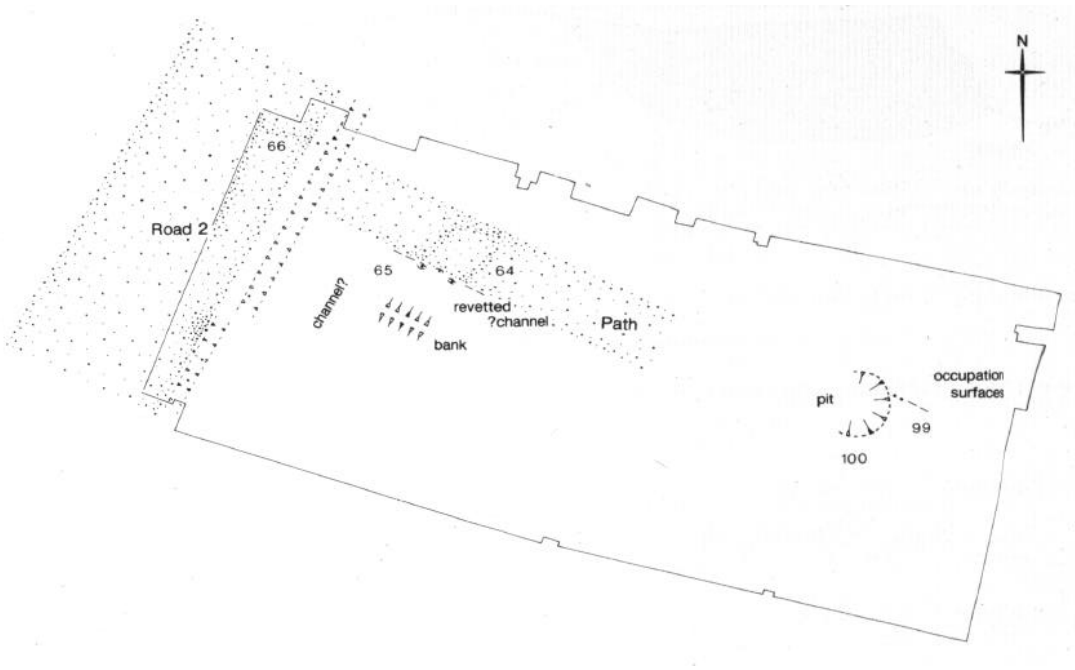


Fig 62 4-6 Copthall Avenue: plan of Phase 1 features

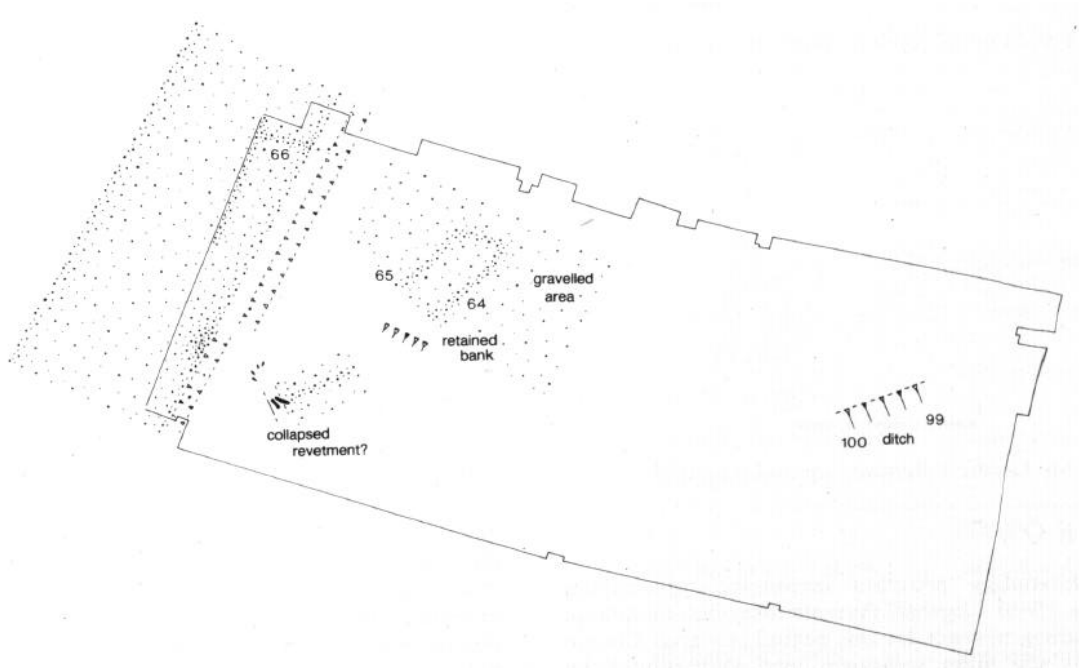


Fig 63 4-6 Copthall Avenue: plan of Phase 2 features

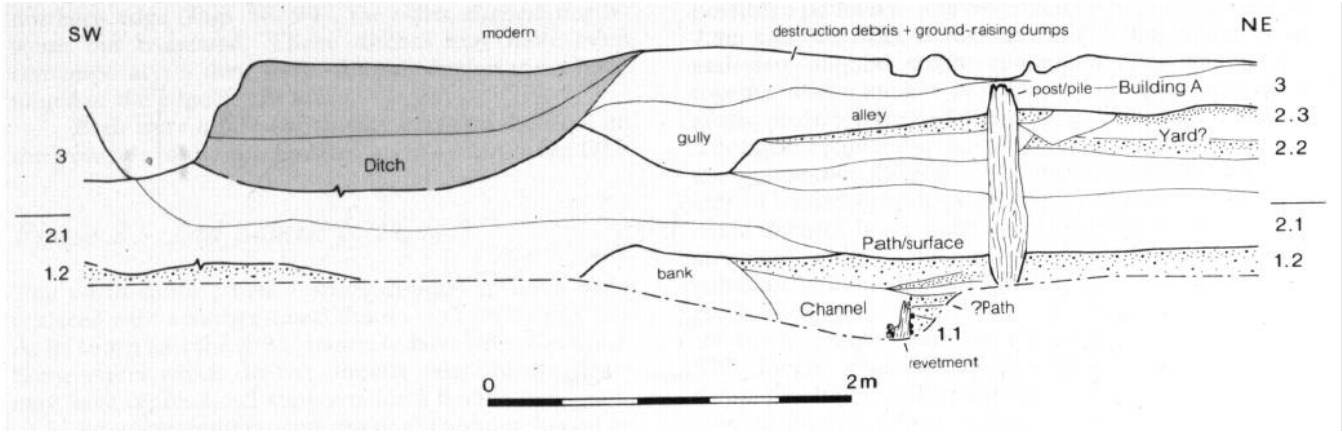


Fig 64 4-6 Copthall Avenue: west trench east section

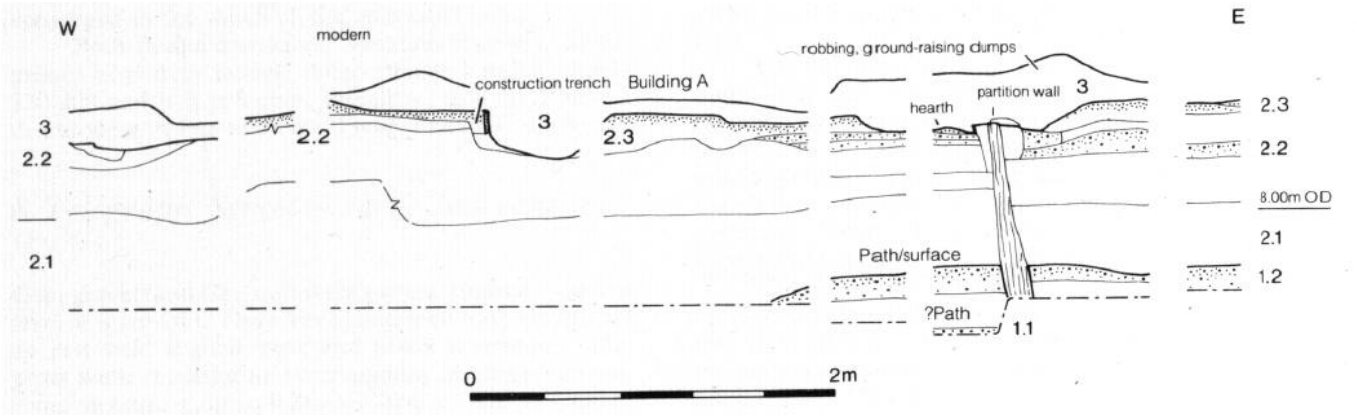


Fig 65 4-6 Copthall Avenue: west trench west and north section

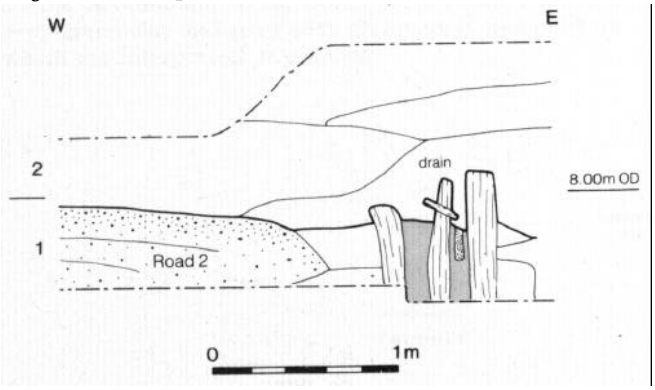


Fig 66 4-6 Copthall Avenue: east-west section

Dating (Fig 67)

Dendrochronology provides important information about the 15-35 Copthall Avenue site, but otherwise precise dating evidence for this period is scarce. Coarse pottery is the main indicator, and this should be interpreted cautiously; the groups are very small and, since no evidence of contemporary occupation was found on any of the sites, it is likely to have been redeposited on at least one occasion. For these reasons, although the general chronology is clear enough, it is impossible to define exactly each of the phases of rapid localised change that took place on the main sites.

Bottle glass sherds and a shale bracelet fragment trodden into the natural ground surfaces indicate casual use, probably in the 1st century AD. Taken as a whole, however, the evidence suggests that none of the area was systematically developed before the very end of the 1st century (although the first phase at 15-35 Copthall Avenue is essentially undated), and that some parts of it may not have been developed until the second quarter of the 2nd century. At 15-35 Copthall Avenue the main recognizable differences in the ceramic assemblages are between Phases 2-4, which contain coarsewares typical of the Trajanic period in London, and Phases 5-7, which contain Black-Burnished wares and Colchester and Cologne finewares vessels which appeared in London for the first time in *c* AD 120. At first sight the dendrochronological evidence suggests a similar division, but the one exactly-dated timber *(679),* a post which was felled in AD 86/7 and was found incorporated in a fence beside the Phase 4 ditch, had clearly been reused from an earlier structure. Of the Phase 5 timbers, at least one *(407)* cannot have been felled before AD 106 at the earliest. It is possible, therefore, that as many as 20 or 30 years separated Phase 4 from Phase 5, but in the absence of more precise dendrochronological information or larger pottery groups it seems safer to conclude that the sequence on the site proceeded in roughly equal stages from the 90s to the 120s. A clear *terminus ante quem* is provided by dendrochronological

Phase	Dendrochronology	Coins	Stamped samian	Other pottery	Suggested date for phase
15-35 Copthall Avenue, controlled excavation (OPT 81)					
Natural ground surfaces			-	--	bottle glass fragments (two) shale bracelet fragment ? 1st c.
1	?AD 34 +				? late 1st c
2			-	AHSU, DR20, FMIC, HOO, HWC **LOMI**, **LONW**, VCWS, VRG, VRW group size 1 6 kg date AD 90 - 120	late 1st/early 2nd c
3				AHSU, DR20, FMIC, HWC, **LONW**, VRW group size 0 7 kg date AD 90 - 120	late 1st/early 2nd c.
4	AD 86/7 AD 81 +			HWC, LOMI, **VCWS**, VRW group size 0 3 kg date AD 90 - 120	late 1st/early 2nd c.
5	AD 106 +			AHSU, **BB1**, DR20, FMIC, HWC, KOAN, LOMI, NKSH, PE47, RDBK, SLOW, VRG, VRW group size 3 7 kg date AD 120 - 140	early/mid 2nd c
6				**BB2**, CGOF, DR20, FMIC, GROG, HWC, **KOLN**, LOEG, PE47, VRW group size 2 1 kg date AD 120 - 140	early/mid 2nd c
7	AD 69 +		SABINUS III La Grauf Dr 15/17 or 18 AD 65-80 FELIX I La Grauf Dr 15/17 or 18 AD 50-70	AHSU, **BB1**, **BB2**, CGWH, COLC, DR20, FMIC, HOO, HWC, **KOLN**, LOEG, LOMA, LOMI, **LONW**, MICA, NKSH, PE47, PRW, RDBK, **VCWS**, VRG, VRMI, VRW group size 4 2 kg date AD 120 - 140	early/mid 2nd c
15-35 Copthall Avenue, watching-brief (KEY 83)					
—		Domitian As AD 85		AHSU, **BB1**, **BB2**, GROG, HWC, LOMA, PE47, VRW date AD 120 - 160 +	early/mid 2nd c.
44 London Wall					
—					no dating evidence ? early 2nd c
43 London Wall					
1				**BB2**, DR20, HWC, VRW date AD 120 - 160 +	early/mid 2nd c
2				**BB1**, **BB2**, DR20, KOAN, PE47, VRW date AD 120 - 160 +	early/mid 2nd c.
4-6 Copthall Avenue					
1				**BB1**, **BB2**, **COLC**, HOO, HWC, VRG, VRW, **VCWS** date AD 120 - 200	early 2nd c. and later
2				**BB2**, DR20, HWC, VRW date AD 120 - 200 +	early 2nd c. and later
Telegraph Street					
—				AHSU, DR20, **HWC**, LOEG, LOMI, **LONW**, PE47, VRW date AD 120 +	early 2nd c.

Fig 67 Summary of dating evidence for Period I

analysis of timbers from Period I I Phase 6 (p 118); these, it is suggested, must have been felled by AD 138 at the latest.

At Telegraph Street the initial raising of the ground surface is dated by an imitation Black-Burnished ware jar to AD 120 or later, but on the remainder of the sites the very earliest activities are undated. Many of the finds came from the silting of cut features, such as the drainage ditches at 43 London Wall or the roadside ditch located in the 15-35 Copthall Avenue watching-brief, and provide evidence of the date at which those features were open and in use. Neither at 43 London Wall nor at 4-6 Copthall Avenue can differences be detected between the Phase 1 and Phase 2 assemblages, and in all cases the pottery suggests a *terminus post quem* of *c* 120.

Discussion (Fig 68)

15-35 Copthall Avenue, 43 and 44 London Wall

At 15-35 Copthall Avenue the western section of the Stream 1 was infilled with clay so that a road (1) could be constructed across it (Fig 68). This is dated *c* A D 90-120. The exact plotting of the road is, however, problematic because of the differences in the levels of recording (that is, in the watching brief) and because there was a further complication in the presence of similarly compacted gravel surfaces (Period II, Part 4). Ditches and revetted channels too, even if apparently adjacent to and on the same alignment as the road, may not be reliable indications of it. The evidence can be accounted for in three ways: the road changed direction towards its north end from north-east to south-west to a more north-south alignment, it widened dramatically towards the north end of the site; or it shifted westwards during Period I (compare Figures 44 and 84). The most consistent evidence favours the latter solution. The earliest road therefore, was aligned north-east to south-west, about 5.5m wide; the second road was realigned north-northeast/ south-southwest, about 5m wide. It was maintained up to the mid-late 4th century (see Part 5). This road could have been the main axis of communications up the west side of the Walbrook valley from a junction with the major east-west road beneath modern Cheapside. It is therefore also likely to have crossed the east-west King Street/ Ironmonger Lane road (shown on OS 1983).

A network of interconnecting ditches and channels was dug on either side of the road to cater for the displaced stream. Some of these were embanked, some revetted and in the main seem to have been parallel with or at right angles to the road.

To the east, the north-south section of Stream 1 was restricted to a narrower channel, its artificial clay or gravel banks probably being revetted. Drainage north of the main tributary was rationalised, some streamlets being infilled while others were retained. Evidence from both the watching brief and excavations at 43 London Wall indicates that additional drainage was provided on the west side of the road by ditches cut into the terrace gravels. These seem to have been independent of the roadside ditch. The success of this drainage system is discussed below.

The detailed evidence from the controlled excavation illustrates that drainage management in this area underwent frequent modifications throughout this period from *c* AD 90-120. The basic pattern, however, remained largely unchanged: channels were eroded, silted up and overflowed, and were then recut at a higher level and their eroded banks consolidated and raised. The number of channels was reduced, although the alignment remained constant, until in the final phase there was one wide channel at right angles to the roadside ditch. This expedient seems to have been successful.

These later phases (5-7) of drainage are dated *c* AD 120-140, but a date closer to *c* AD 120 can be suggested by reference to the Period II building (p 42). A dendrochronological date of *c* AD 138 was provided from the timbers of a drain which was later than two phases of major modifications to the building (below, p 50). Some time before AD 138 must be allowed therefore for both the building's construction and use and development of the drainage system.

These modifications do not appear to have been the result of a phased drainage programme. The frequent overflowing of the ditches and channels, the flooding of the road and the sometimes temporary measures taken to alleviate flooding, indicate that for some time the drainage provision for the blocked-in Stream 1 was inadequate. The lack of proper drainage provision was probably also exacerbated by the casual dumping of refuse. Further rapid silting of the channels, following erosion of the dumped deposits that formed the banks and initially the bottom of the channels, suggests that the volume and/ or velocity of water was underestimated.

Towards its eastern side, the wide canalised stream was infilled and replaced with a deep narrow north-south channel. This modification can only loosely be dated to the 2nd century. It was eventually filled in, being apparently no longer necessary in the northern stretch since there was no replacement. At the south end of the site, however, another channel was cut at a higher level, perhaps an outlet for drainage from the west.

Timber drains, dated by pottery to *c* AD 100-120, were located during the re-excavation of 55-61 Moorgate (Site 15). These may have been associated with the management of Stream 1 further downstream (Fig 68).

Three human skulls were found at 15-35 Copthall Avenue: one in a canalised stream, one in a drainage ditch beside the road, dated AD 120-140 and the other embedded in material typical of channel fills. The skulls, besides being stained grey-blue, had a shiny surface and they were all from young adult males (B West, pers comm). These features are characteristic of human skulls found in the Walbrook, those surviving from earlier excavations having been examined recently (Marsh & West 1981).

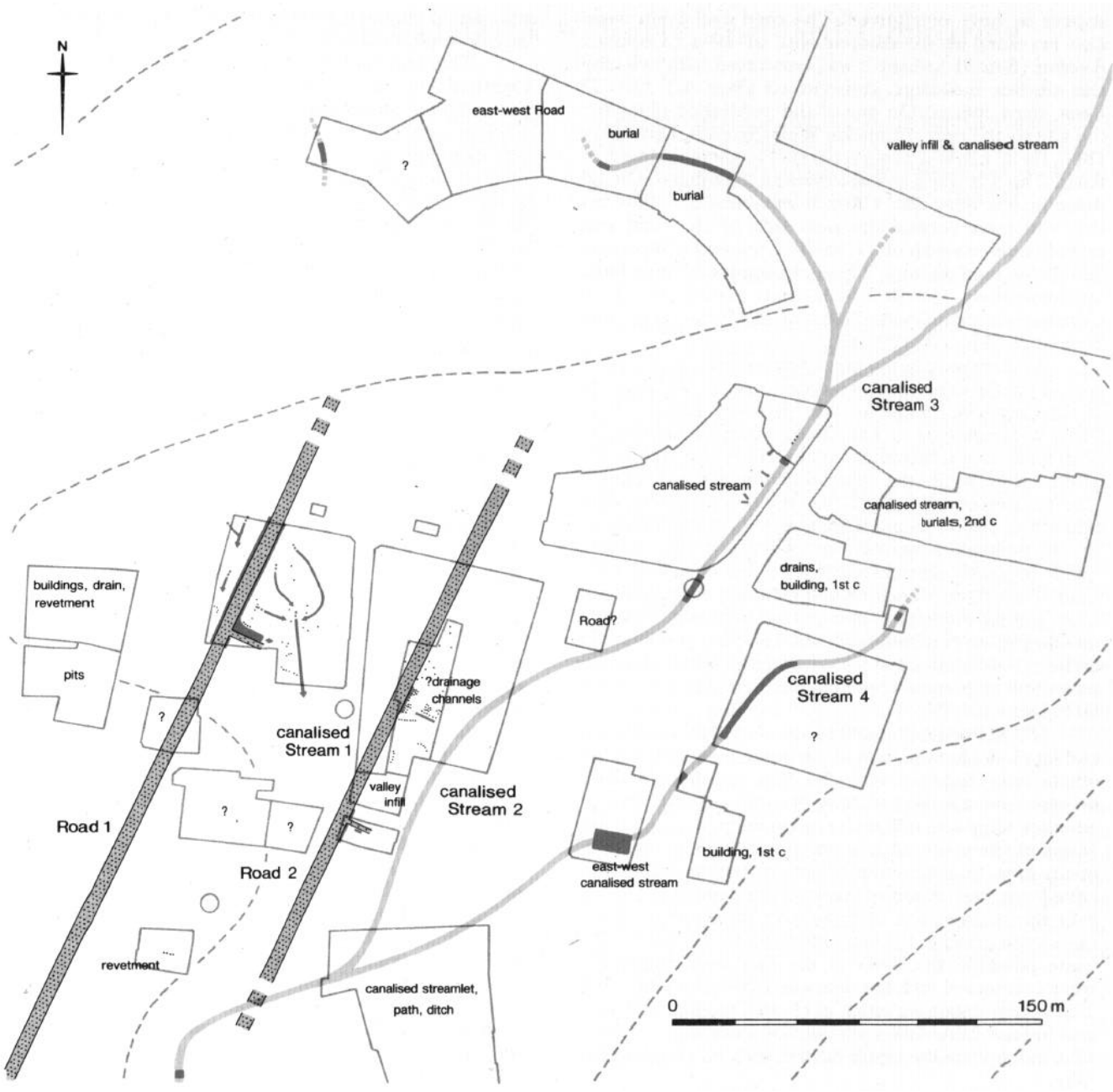


Fig 68 Study area: plan of Period I features (early 2nd century)

8 Telegraph Street

At Telegraph Street to the south the ground level was raised c 1m with gravels and clays, contained by an east-west timber revetment. This took place c AD 90-120. Since this site was already on the higher, drier ground towards the west side of the valley, this revetment and dumping may not have been primarily concerned with reclamation. Road 1 must have passed within a few metres to the west of this site.

4-6 Copthall Avenue

The west side at least of the stream at 4-6 Copthall Avenue (Stream 2) was infilled and the ground level thereby raised c 1m. No dating evidence was obtained from this infill. A north-east to south-west road (Road 2), bordered by a timber revetted drain, was probably linked to a gravelled north-west to south-east path revetted with wattlework. Interconnecting ditches provided drainage for the area to the south: these do not

appear to have overflowed. The road and drain were also revealed at the adjacent site of 10-12 Copthall Avenue (Site 31), where it was associated with two clay and timber buildings, constructed after AD 110 (D Lees, pers comm). On one of the published plans for the site to the rear of London Wall (Site 28; Lane-Fox 1866, fig 2) a row of posts is parallel to the alignment of Road 2 and is likely to have marked a timber-revetted drain on its west side. Current excavations (1989) on this site have located the west side of the road and established its width of *c* 7.5m (D Lees and A Woodger LOW 88, pers comm). This road seems to have been approximately parallel with that found at 15-35 Copthall Avenue, some 70m to the west, and was constructed in AD 120-140.

As discussed in the preceding section (p 22), the 3 feet of undisturbed loam recorded just to the south at 10-12 Copthall Avenue in 1906 (Site 30) (Reader 1906, 232), is considered to have been dumped material to both form an embankment to the stream and to raise the ground level within the depression which it had created. The suggested level of *c* 7.7m OD is comparable with that of the raised ground surface at 4-6 Copthall Avenue and very closely comparable to the levels of the road and 'path' in particular; indeed it must have included the road. This layer of undisturbed loam lay above London Clay, giving way to stream deposits in the east. Such an interpretation has been confirmed at Site 31 where the earliest recorded sequence of archaeological deposits consisted of dumped clay *c* lm thick at a level of *c* 7.9m OD (Lees 1989).

To the north (Site 28) (Lane-Fox 1867, lxxii-lxxv and figs l-4), some at least of the 'peat' recorded over the whole site, together with the blue mud, must have represented dumping to raise the ground level though whether they also infilled a stream is open to question. Many of the posts and post and plank alignments, some north-east to south-west, some east-west, must also have been the remains of revetted drainage channels cut into the dumps; one of these post alignments clearly marks the drain on the east side of Road 2 (Fig 68). It is quite possible that some of the east-west alignments were connected with the drainage network to the west. The complicated sequence at 15-35 Copthall Avenue - and indeed Lane-Fox's own section drawings - indicate that more than one phase of drainage was represented here.

A sequence typical of the upper Walbrook sites was excavated to the south and east at Angel Court in 1974 (Site 34) (Blurton 1977). The earliest phase apparently consisted of a north-east to south-west aligned streamlet which overflowed in the late lst-early 2nd century *(ibid* fig 2, 20-21). As a result it was contained by timber revetting held in place by an extensive dump of clay up to 0.9m thick. Beside the revetted stream a gravel path *c* 2.38m wide had been laid at a level of *c* 7.7m OD, dated to the early-mid 2nd century. This was cut by a north-west to south-east orientated ditch which must have converged on the canalised streamlet. The layer which is interpreted as an overflow deposit of the streamlet (20c), however, is actually contained within the revetted stream and therefore post-dates it.

This sequence is very similar to that found on the Copthall Avenue sites: a dump of clay which raised the ground level - doubtless in the depression caused by the streams - and the banks of a now canalised stream. In this example the stream appears to have been smaller than its successor. If this were the case (and as discussed in Part 2, p 25, this may not have been the full extent of the streamlet since geological strata were not examined or described), an enlarged stream would imply that streamlets or ditches to the north-east had been directed into it. The gravel path bordering drainage features at Angel Court and its level is also closely comparable with the proposed arrangement at 4-6 Copthall Avenue. It may be that the Angel Court path was connected with Road 2.

The watching brief at Blomfield Street could add very little to the evidence recorded here at the beginning of the century when timber compartments were found, filled with earth and rubbish and topped by platforms (Site 7) (Reader 1903, 179-81, 187-95). Two of these platforms formed the sides of a timber-lined channel, or perhaps of a tank. Whatever the interpretation of this structure, it is clear that it was constructed on the bed of Stream 3 which must therefore have been canalised or diverted.

That the main Walbrook stream (Stream 3) was canalised, and further north too, has been recently confirmed by excavations at Broadgate (Fig 2, Site 5; Malt 1987). Here *c* 0.7m of clay and gravel was dumped above the numerous stream channels to a level, initially, of *c* 7.9m OD and later to *c* 9.1m OD, at the same time creating a channel - which remained unrevetted - *c* 1.6m wide. Pottery recovered from the interface of the two banks is dated AD 180-300 (p 69). At 35-45 New Broad Street (Site 9), dumps of brickearth, loosely dated to the 2nd century, levelled up the slope down to the east-side of Stream 3 (Woodger 1988). To the south, at 85-86 London Wall (Site 10), drainage ditches were dug in the 1st century but here succeded by a timber building and drain, also dated to the 1st century (Sankey 1989).

Recent excavations at 9-19 Throgmorton Avenue (Site 36) (Durnford 1988) have also demonstrated that a similar drainage programme was undertaken on the east side of the Walbrook valley in the late lst-early 2nd century. The north-east to south-west course of the Stream 4 was infilled and realigned east-west in a timber-revetted channel. This was later replaced by a north-east to south-west channel, its banks made up of dumped clay and gravel upon which a timber trackway had been laid.

Thus, during Period I, reclamation within the valleys of the Walbrook steams - a major undertaking - was begun. The natural drainage pattern was re-organised as courses were restricted in width and re-directed; streamlets disappeared or were rationalised within the framework of a new, superimposed drainage system. Flooding was the initial result at 15-35 Copthall Avenue, but by *c* AD 120 was sufficiently under control to allow the developments of Period II.

4. Period II Buildings - Early 2nd-3rd Centuries

By *c* AD 120 drainage was sufficiently under control for further development of the upper Walbrook valley to take place, which, it is proposed, was part of the planned development of the city. The canalised tributary streamlets and drainage ditches were infilled and the area now became available for the construction of buildings, both on the reclaimed floodplains and on the drier ground beyond. At 15-35 Copthall Avenue the buildings were contemporary with a very large gravelled area. Evidence from Copthall Avenue indicated that the buildings had both a domestic and an industrial function. Very close proximity to a water supply seems to have been an important factor in the siting of buildings on the less favourable reclaimed ground rather than on higher ground. The Walbrook streams were presumably still canalised, though the western tributary (Stream 1) now survived only as a land drain. Beyond the streams, drainage (and water supply) was maintained by the construction of timber-lined or revetted drains.

Evidence from macroscopic and insect remains confirms the urbanisation of the area, though suggesting that the environment was still wet (Part 8, p 110).

15-35 Copthall Avenue: controlled excavation

A timber building (A) was constructed beside and on the same alignment as the Period I road (though the latter may have shifted westwards, see Part 3, p 42). Well-correlated evidence to the immediate south and east and, for the road, west of the controlled excavation was recorded during the watching brief and will therefore be included here. The west, east and south walls of the building were located, establishing its length of 12m, the north wall was not found, but evidence from the watching brief (p 56) suggests a width of 4m.

The external walls of this building had been erected on timber baseplates, laid onto the Period I piles; two survived in situ. Inside the building, where the arrangement of rooms was frequently modified, partition walls were supported by timber ground-beams, two survived *in situ*. Floors were composed of beaten clay or brickearth, often scorched. They were also very worn with use and regularly relaid. So many surfaces were recorded that only those associated with another activity are included here; likewise not every feature is described.

The building was erected directly above uncompacted organic fill (Phase 1): these eventually compressed and the building subsided. Levels in and around the building were thus subject to considerable variation.

Phase I - early-mid 2nd century

The drainage channels on the east side of the road were filled in over a period of time with highly organic dumps of mainly domestic rubbish and industrial wastes (OPT *518, 523, 535),* (Figs 23; 41). Within these dumps were a number of timber posts and stakes which had no obvious function (OPT *270* reused, *273, 274* reused).

Phase 2 - early-mid 2nd century (Fig 69)

A building was constructed on the Phase 1 infill, its west wall represented by a robber cut, presumably for a ground-beam or baseplate which may have been supported on the Period I piles (Fig 69). No trace of the south wall was found. A north-south partition wall dividing the structure into two rooms (i and ii) was marked by the remains of a slot - the south end of which abutted on an earlier, Period I pile - and by the alignment and straight western edge of the first clay surface. No surface survived in Room i which contained two hearths, dome-shaped in section, and composed of baked clay on a bed of charcoal (OPT *406).* Another possibly unused hearth was composed of mortar. In Room ii a second floor surface contemporary with a partition which divided this room, was cut by shallow pits, the sides of one being burnt and sandy, and containing charcoal and burnt twigs. The clayey silt infill of one of these pits was sampled (OPT *477).* Nearby three stakes formed a triangle which could have been drawn together to form a structure from which a vessel, for example, could be hung. At this stage the building was set back *c* 4.5m from the road, the intervening area remaining apparently undeveloped although an external surface composed of large tile fragments - a yard or a path - lay to the south. A path could have provided access to the building from the road, any ditch or drain beside the road perhaps being spanned with timber.

Phase 3 - early-mid 2nd century (Fig 70)

Two partition walls were later dismantled and a shallow pit containing charcoal, burnt wood and slag was cut through. This end of the north-south partition was then re-instated (Fig 70, Room iii). The limits of two floors surfaces suggest a partition between this room and one to the south (Room iv) where a threshold of tile fragments marks the position of a doorway either between Rooms iii and iv or onto the Phase 2 tiled external surface. There were three hearths in Room iii, two of which were subrectangular, composed of hard, burnt clay; one of them overlay a sunken hearth containing clay and pebbles - both burnt - and carbonised twigs. The third hearth was constructed of large tile fragments embedded in clay within a bowl-shaped cut. Situated very close to this hearth was a stake which may have helped support a superstructure or have been one of a pair of supports spanning the hearth.

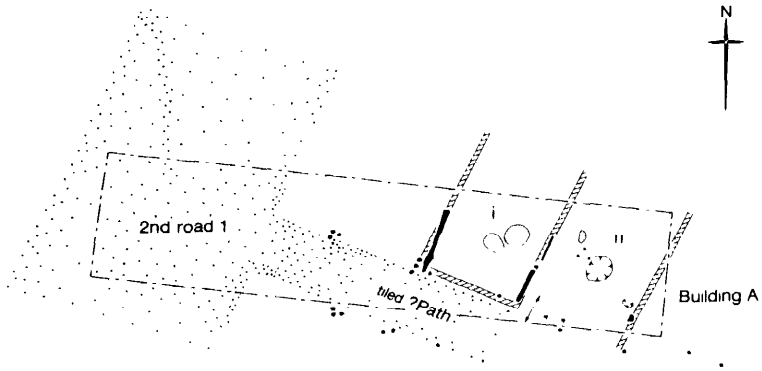


Fig 69 15-35 Copthall Avenue, controlled excavation: plan of Phase 2 features

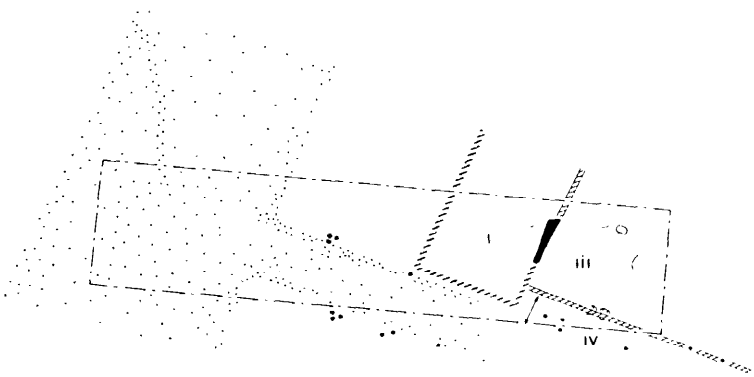


Fig 70 15-35 Copthall Avenue, controlled excavation: plan of Phase 3 features

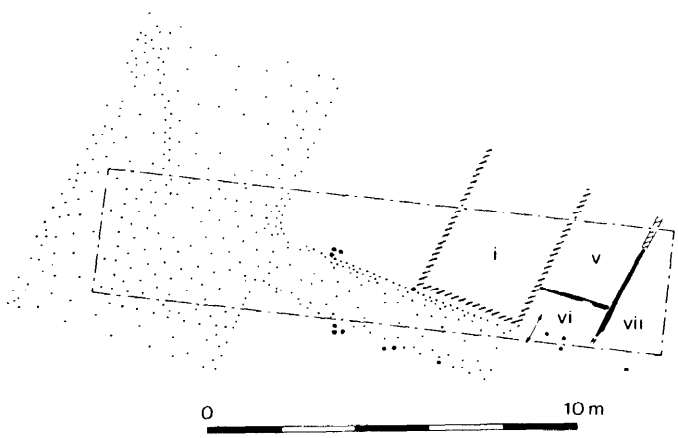


Fig 71 15-35 Copthall Avenue, controlled excavation: plan of Phase 4 features

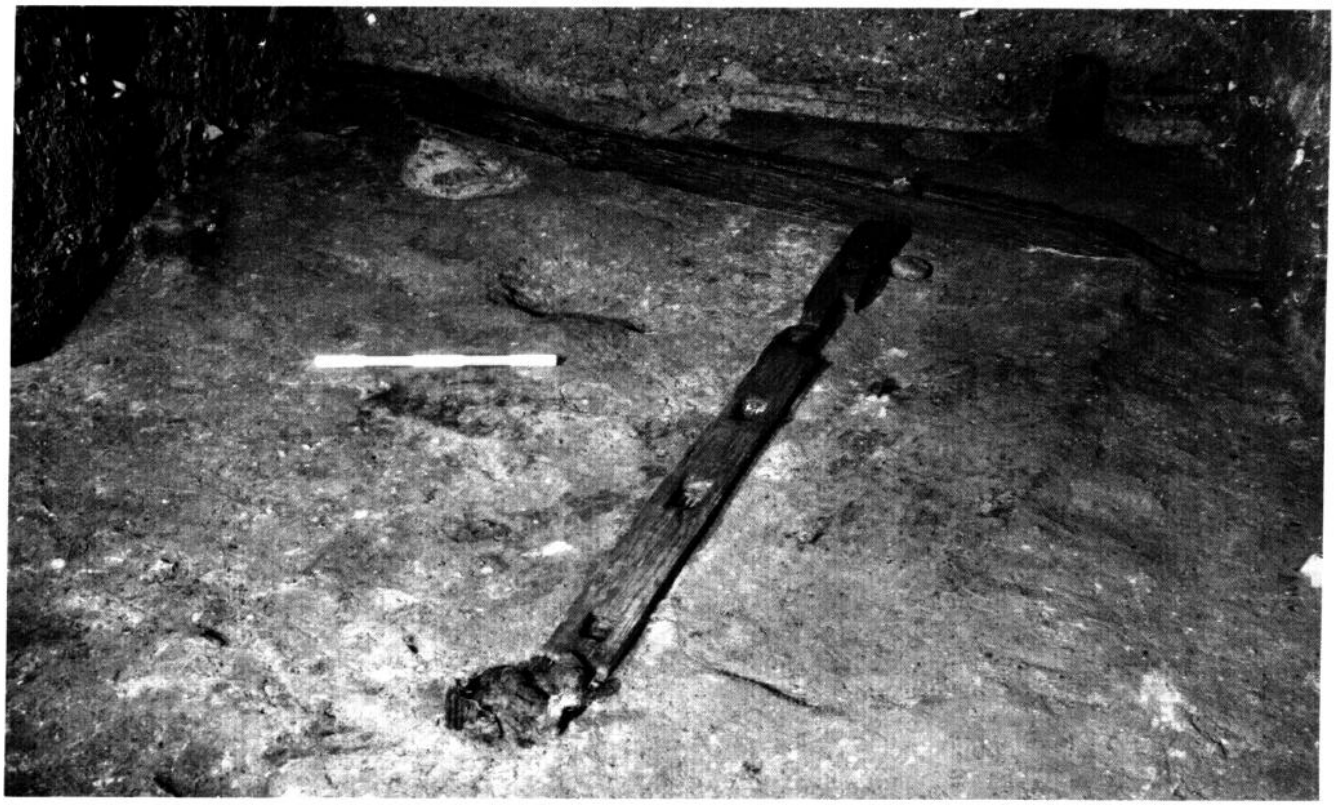


Fig 72 15-35 Copthall Avenue, controlled excavation: timber ground-beams in Building A (411, 393) *which would have supported partition walls between Rooms v, vi and vii (Phase 4). The pile in the foreground was reused from Period I*

Phase 4 - early-mid 2nd century
(Figs 71, 72)

The partition between Rooms iii and iv was dismantled and two new walls erected to create three rooms (Figs 71; 72, Rooms v-vii). They were represented by oak ground-beams set in very shallow slots. The best preserved of these (OPT *411),* (Fig 72) had five mortices aligned along its upper face. It was retained on its west side by one of the Period I piles and on its east side by the second beam (OPT *393).* This was very weathered but six mortices were discernible, together with three very decayed timber uprights or tenons. Apparently connecting the mortices were two parallel grooves which contained decayed wood and clay, while part of the beam was covered by a deposit of brickearth. This evidence suggests that the fabric of the walls was composed of wattle and daub (see discussion, p 65 and Fig 105). In Room v hearths to the north and east already described may have been, constructed or continued in use, but Room vi was the most intensely occupied before its west wall was dismantled. From Room vi an occupation surface composed of dark grey sandy silt was sampled (OPT *433).*

The road meanwhile had been repaired and resurfaced a number of times; its surface, often cobbled, was compacted and cemented. A row of stakes may suggest a property boundary. It is quite likely that a drainage ditch existed beside the road but, if so, all trace of it had been removed by a large Period III ditch. Because of this ditch it was not possible to relate the road directly with the building but a small group of pottery dates re-surfacings up to a level of 8.2m OD to *c* AD 120-140.

Phase 5 - early-mid 2nd century
(Figs 73, 74)

The south and west walls of the building were demolished and rebuilt (Fig 73). Outside the building the ground surface was levelled up and a gravelled surface laid down. Evidence from the watching brief indicates that this was at least 1.8m wide; it may therefore have been a lane. The organic silty fill of a pit within its make-up was sampled (OPT *544).* At its west end, a poorly preserved oak plank set on edge in a cut c 0.53m wide x 0.43m deep was parallel with and only 0.30m east of a later timber drain; this may therefore have represented an earlier drain or timber-revetted gully. The south wall of the building was re-erected, its baseplate laid onto the piles of the Period I timber path

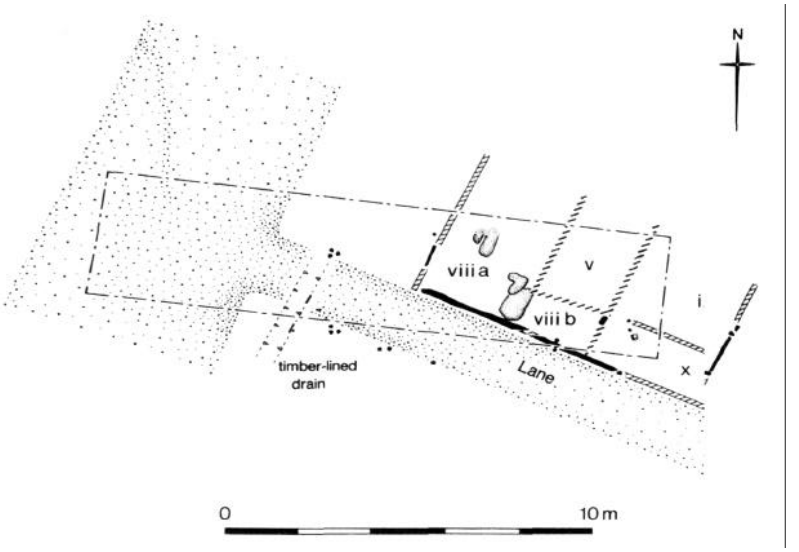


Fig 73 15-35 Copthall Avenue, controlled excavation and watching brief: plan of Phase 5 features

(Fig 74). All that survived of the west wall was a scrap of timber aligned with a small timber upright (but see Phase 6). The east wall of the building, recorded in the watching brief, was represented by a timber ground-beam and two substantial posts or stakes aligned north-east to south-west. These were abutted on their west side by internal surfaces.

Inside the building a short-lived rectangular hearth consisting of compacted burnt brickearth on a slab of hard clay and sand was constructed above the dismantled partition between Rooms i and vi. How access was gained to the east part of this room (Room viiib) while the hearth was functioning, is not known. Within the westernmost room (viiia) were three sunken hearths. One of these was hard and burnt with a ledge at a slightly higher level and a deeper cut, thinly coated with charcoal and silt, at its north end. It was filled with decayed organic matter, sand and brickearth, including large fragments of charcoal (OPT *388).* Next to this the second, smaller sunken hearth contained charcoal fragments and twigs stuck together and very light in weight. One side of the third, roughly L-shaped sunken hearth was stepped down a deeper subcircular base. Its fill contained med-large sized fragments of charcoal, slag and flint pebbles.

In Room ix to the east two timber posts (ash and oak) were erected, one of which may have been structural (OPT *400).* The position of posts, in both the controlled excavation and watching brief suggests that this room was partitioned at its south end (Rooms ix and x). A repair to the h-south partition wall was represented by a possible post-pad.

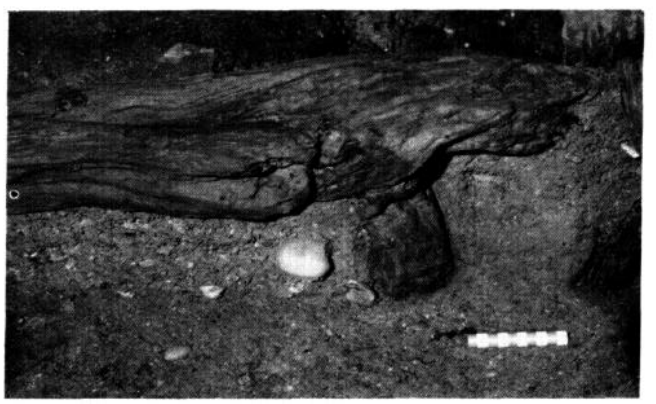


Fig 74 15-35 Copthall Avenue, controlled excavation: detail of *Phase 5 baseplate (279) laid onto Period I pile (408). Scale in 10mm units*

Phase 6 - mid- latnd century

(Figs 75, 76)

An addition to the building extended it westwards towards the road (Fig 75) No walls were found but they were implied by the clay surfaces (OPT *214)* which mirrored the alignmentshe building and respected two groups of piles retained from the path of Period I and a post on its west side (OPT 573). Timber staining and a piece of decayed timber at the eastern edge of the surfaces may have represented either a replaced wall here or the Phase 2 wall

In the extension (Room xi), a small infilled pit was truncated by two sunken hearths which were separated by a narrow ridge (Fig 76) The deeper, more northerly hearth was lined with a thin layer of grasses and/ or rush (Part 8 p 108) and its silt1 contained fragments and whole twigs of charcoal and lenses of burnt brickearth (OPT *222);* from this 'arm' extended 0.2m. Both hearths then contained large flint pebbles, slag, charcoal and burnt tile fragments in a silty fill which also included charred cereal grains (OPT *215,* Part 8 p 110).

Outside the building gravelled surface or lane was re-laid to a level of 8.17m OD and a timber-lined drain was constructed, replacing the possible Phase 2 drain (OPT *235, 237, 239, 240, 241, 245).* It

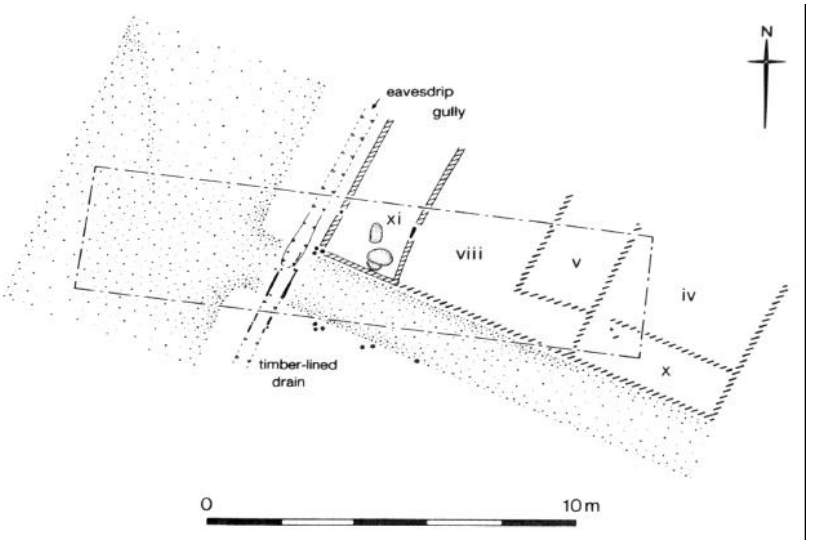


Fig 75 15-35 Copthall Avenue, controlled excavation: plan of Phase 6 features

measured 0.4m wide x 0.4m deep, the sides and bottom being lined with oak planks, the former retained by rectangular posts. This drain was linked with a shallow timber-revetted gully to the north which measured 0.40m wide x 0.20m deep. It was orientated along the west edge of the building, probably an eavesdrip gully. Timbers from the drain have been dated by dendrochronology to *c* AD 138 (p 63) while pottery from the gravel and silt fill of the drain (OPT *184)* is dated *c* AD 140-200.

Phase 7 - late 2nd–mid 3rd century

(Fig 77)

The walls between Rooms v and viii were dismantled and the larger room thus created (Room xii), was resurfaced.

A flimsy partition or screen, represented by a thin strip of wood above and continuing the alignment west of the earlier east-west wall, seems to have divided the central room (xiia and xiib, Fig 77). All the sunken

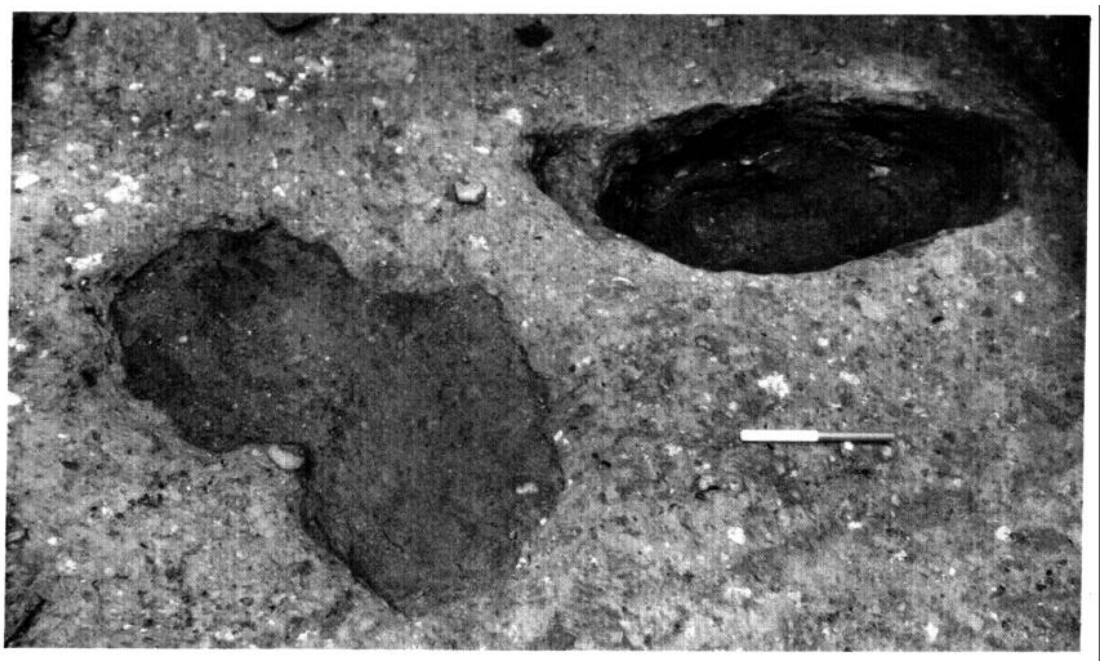


Fig 76 15-35 Copthall Avenue, controlled excavation: detail of sunken hearths (216, 501) in Room xi (Phase 6). Scale in 0.10m units

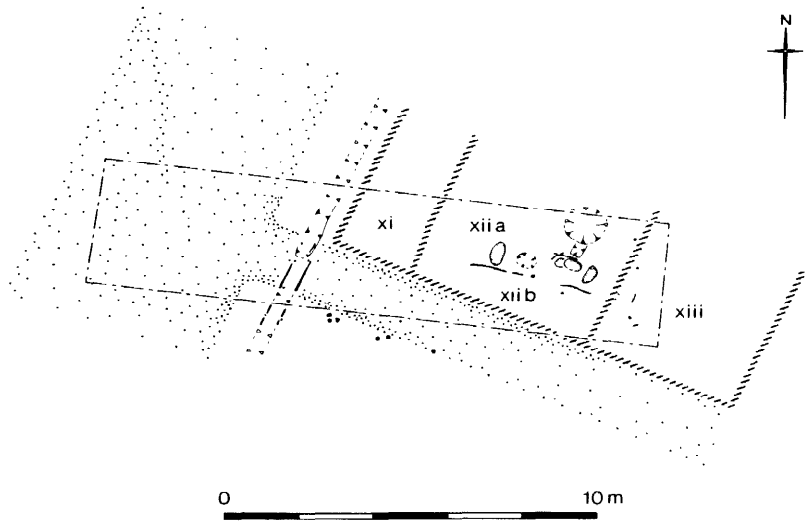


Fig 77 15-35 Copthall Avenue, controlled excavation: plan of Phase 7 features

hearths and pits were confined to the north side of this partition. Two sunken hearths, not contemporary but both containing organic matter, brickearth, sand and pebbles - all burnt - and fragments and twigs of charcoal, were enclosed on two sides by the remains of strips of wood and twigs, perhaps a screen or support for a superstructure (OPT *355).* A similar fill was contained within another sunken hearth, the sides of which were coated with burnt sand (OPT *344)* while, towards the west side of the room, a bowl-shaped sunken hearth with a shallower 'arm' was filled with vivianite-encrusted gravelly silt and charcoal (OPT *257).* A shallow, rectangular, vertically-sided cut may have held a container; its fill consisted of dark organic silt, (OPT *367).* This was cut by a possible rubbish pit which contained decayed organic matter and silt (OPT *363).*

To the east the suggested partition between Rooms ix and x seems to have been removed (Room xiii). A new floor surface was laid which, in the north, partially covered the ground-beam of the wall between this and Room xii. Evidence of intense activity at the south end of Room xiii consisted of a much-truncated sequence of scorched floor surfaces and a brickearth hearth base set into which was a sunken hearth.

Phase 8 - late 2nd-mid 3rd century
(Fig 78)

The northern end of the partition wall between Rooms xii and xiii was demolished (Fig 78). After a small sunken hearth filled with burnt organic material was dug, it was replaced with a much larger one with a shallower cut on one side containing hard, burnt sand, brickearth and silt. A new brickearth surface was laid, much of it burnt (OPT *338),* which was associated with the destruction of a complex of shallow, flat-bottomed pits. The first of these, a large, irregularly shaped pit, contained a second, smaller pit at its bottom. Neither appeared to have been used but they were inter-related to a slab of very hard brickearth, scorched in places, which filled the pits. A third pit with a shallower 'arm' at one end was then cut into the slab, its sides and surrounds very hard and burnt, and its primary fill containing burnt brickearth and ash. Four stakes in the north-east, south-east, and south-west (two stakes) and a slot may represent supports for a superstructure, probably an oven.

Phase 9 - late 2nd-mid 3rd century
(Fig 79)

The remainder of the partition between Rooms xii and xiii was removed to create a large room (xiv), and a portion of the south wall of the building was dismantled, probably for a doorway onto the yard or lane outside (Fig 79). Two sunken hearths were recorded, the earlier of the two being shallow and circular, its silty fill including charcoal and vivianite (a phosphate of iron) (OPT *258).* The later hearth was cut on two levels, its silty fill contained charcoal, burnt daub, slag, vivianite and bones (OPT *255);* the surface here was scorched.

At this stage deposits of sandy silt were heaped over the eastern half of the baseplate of the building's south wall, both inside and out. The occupation sequence clearly continued however, even covering the banked deposits inside the building. It is possible that this represented an attempt to prevent the walls becoming damp. The western half of the wall is likely to have been treated in the same way, but here the internal and external deposits had been truncated (below, Phases 10 and 11).

Phase 10 - late 2nd-mid 3rd century
(Fig 80)

The partition between Rooms xi and xiv was replaced and a new internal wall erected on an earlier north-south alignment, its ground-beam set into the retained south wall of the building, (Rooms xv and xvi; Fig 80).

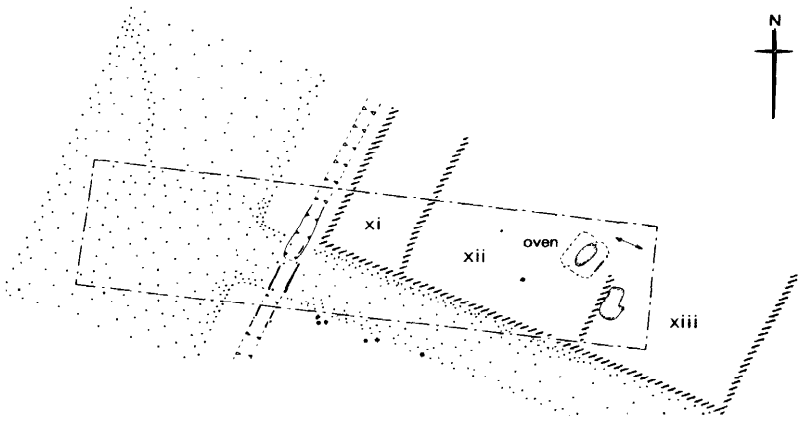


Fig 78 15-35 Copthall Avenue, controlled excavation: plan of Phase 8 features

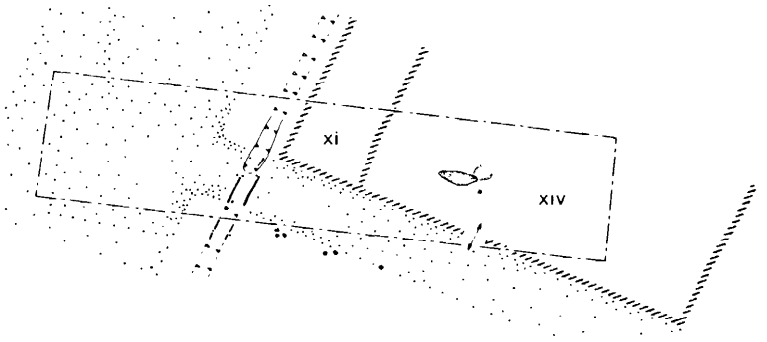


Fig 79 15-35 Copthall Avenue, controlled excavation: plan of Phase 9 features

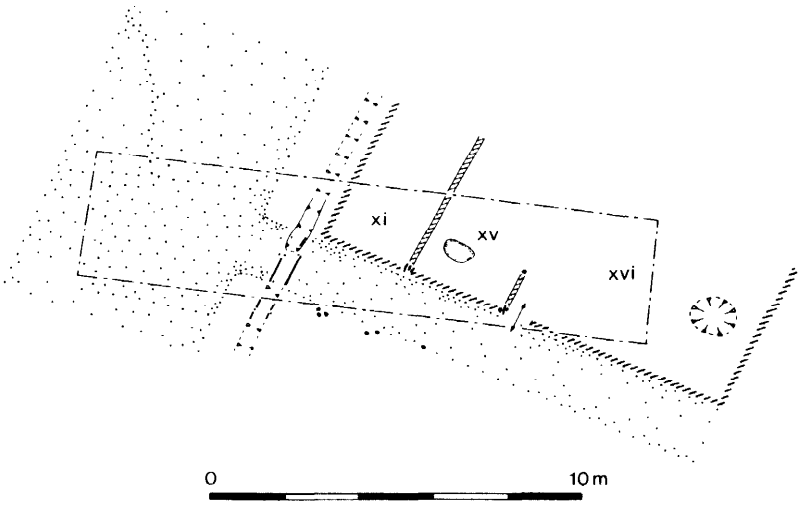


Fig 80 15-35 Copthall Avenue, controlled excavation: plan of Phase 10 features

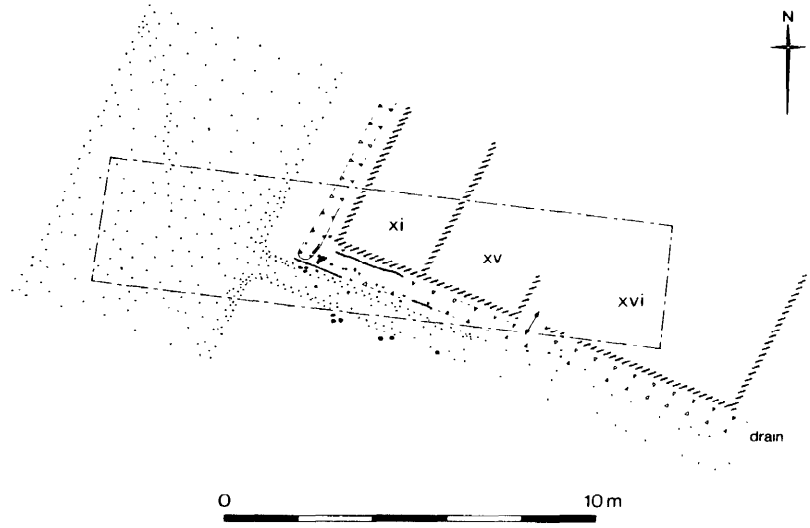


Fig 82 15-35 Copthall Avenue, controlled excavation: plan of Phase 11 features

The poor quality surface of Rooms xv and xvi was associated with only one sunken hearth complex consisting of a small, shallow pit at the bottom of a much larger one. Neither appeared to have been burnt. To the east, in Room xvi or possibly xiv, a sizeable pit was recorded in the watching brief.

There was evidence of renewed activity in Room xi but here the sequence was truncated. It is clear, however, that in contrast to Rooms xv and xvi at this stage, the floor surfaces were superior: clean, compacted and/or scorched brickearth with one possible timber floor (OPT *191).* The latest surface lay at a level of 8.1 m OD.

Phase 11 - late 2nd-mid 3rd century
(Figs 81, 82)

A timber-revetted trench or, more probably, drain was inserted into the external surface along the edge of the building (OPT *247, 248, 277),* (Figs 81, 82) the Phase 6 drain having been blocked off with the aid of timber stakes (OPT *242, 244).* This drain seems to have been connected with the Phase 6 gully which was still open, possibly cleaned out, but it is not clear how this would have functioned since the gully was at a lower level. There was no evidence of erosion or silting within the drain, suggesting that only small quantities of water were involved and that it had a short life. A number of stakes located within the drain (including OPT *269)* imply that either it may have had some specific function associated with activity within the building or that it replaced an earlier drain.

This drain, or a predecessor, could have been constructed during an earlier phase and indeed it seems possible that it was associated with the covering of the baseplate in Phase 9.

Phase 12 - 3rd Century (Fig 83)

The drain and gully were infilled - the infill including discarded timbers (OPT *246, 263)* - and what appear to be internal surfaces were laid above, as far west as the most western of the partitions, and possibly indicating some sort of addition to the building (Fig 83). The edges of internal and external surfaces recorded in the watching brief suggest the position of the walls of this addition. A new external surface was laid.

Pottery from the infill could provide only a very broad date of AD 200-300 for the disuse of the channel and possibly for the laying of the surface. No dating evidence was obtained for the latter.

The pit recorded in the watching brief (Phase 10) was infilled and surfaces laid above; these subsided into the pit. In another section to the east of the controlled excavation, a possible hearth, 0.48m wide, was located in the latest of a sequence of floor surfaces. Eventually the building was dismantled, robbing cuts for the walls being recorded in the controlled excavation and the watching brief. The site was then cleared.

The road continued to be repaired and resurfaced with rammed, cemented gravel, on occasion cobbled; the last good surface may have been cobbled with ragstone blocks. Evidence from a section to the immediate south-west of the controlled excavation indicates that the west edge of the road had been extended; a timber stake recorded in this section may have been the remains of revetting. Pottery dates the latest resurfacings to *c* AD 240-350, but there was no stratigraphic link between these re-surfacings and the building. It is therefore quite possible that the latest surfaces post-dated the building. A depth of 0.8m eventually accumulated for this period and Period III of the road. The dating evidence for the building suggests that it was occupied for a remarkable length of time, over 100 years and possibly more. A discussion of its uses follows on page 67.

Fig 82 15-35 Copthall Avenue, controlled excavation: Room xi (floor surface on which scale rests), bordered to south by Phase 11 revetted drain (247,248). Period I reused piles can be seen left of centre, Phase 7 gully left of and below piles. Scale in 0.10m units

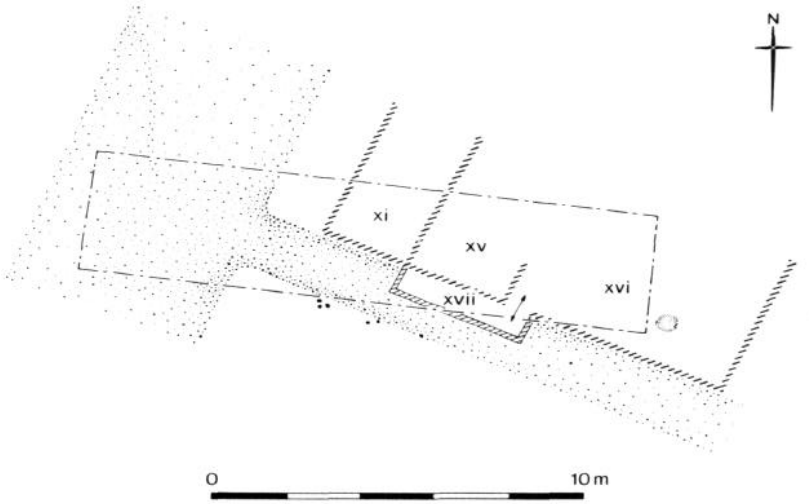


Fig 83 15-35 Copthall Avenue, controlled excavation: plan of Phase 12 features

15-35 Copthall Avenue: watching brief and 44 London Wall mid-late 2nd century (Figs 84, 93, 94)

All the drainage channels and the canalised stream seem to have been infilled (Fig 84). Within the depression of the former stream this infill comprised organic material similar to that recorded in Phase 1 of the controlled excavation (Figs 19; 53-6; 89). Peaty material shown in Figures 51 and 52 could have been organic dumps of this period, part of a marsh formation, or both. The very small groups of pottery from these infills are dated AD 120-200.

The road was continually re-surfaced but also seems to have been moved to the west. In a section near the controlled excavation, the causeway of the Period I road and subsequent re-surfacings, extended westwards beyond the earlier drain (Figs 45, 46). A new timber-lined drain was constructed at a higher level and also further to the west (Fig 45). To the north, three posts recorded in a test pit, probably mark the continuation of this drain. Its fill and the west side of the road was recorded in section (Fig 85). Thick deposits of compacted gravels in a clay matrix, representing the road, were noted in a section to the north (Fig 86). Northwards again, in another section, slightly pebbly peaty material, 0.30m-0.40m thick, covered the steep edge of the Period I road (Fig 48). This seems an unlikely road surface and yet evidence both to the north and south indicates that it should have been: this must remain an inconsistency in the evidence.

Further north, excavations at 44 London Wall revealed good evidence for the west side of the road (Site 18). The postulated Period I ditch was infilled and the road laid above and to its west (Plate 4). The road was composed of pebbles in a matrix of silty clay, capped by heavily compacted gravels with a cambered, cobbled surface at 8.5m OD (Fig 87). Bordering the road on its west side was a timber-revetted ditch 1.5m wide x 0.7m deep, the west side of which had been cut away. The ditch silted up with dark grey-blue black silty clay and was recut (Fig 87).

To the east of the excavations at 44 London Wall, evidence from the sections seems to indicate that the east side of the road was cut back (Fig 49). The position of an east edge of the road, briefly recorded some 25m to the south during ground reduction, seems to confirm the new alignment of this edge of the road.

On the east side of the road the internal and external surfaces of a building, closely comparable with those recorded in the controlled excavation, were observed in section (Fig 88). The north edge of the building, 14m north of the southern wall of that revealed in the controlled excavation (Fig 84), was marked by a pair of substantial timber uprights related to a series of levelling layers, brickearth floors, occupation layers and a pit on its south side, with gravelled surfaces on its north side. A third timber post inserted at a later date may represent a repair. An east-west aligned plank recorded a short distance to the north seems to define the edge of the gravelled surface and could have been the remains of a drain bordering an alley on its north side (Fig 84). In another section to the south-east, a series of brickearth floors and occupation deposits above organic dumps infilling a Period I ?channel (Fig 89) overlapped a gravelled external surface, possibly another alley. The presence of this external surface, together with the position of two posts to the south, indicates that there were at least three buildings on this site altogether (A-C), the dimensions of which were *c* 12.0m x 4.0m, with the northernmost (C) and possibly the middle (B) buildings being 10.0m x 4.0m. The width of the alleys is suggested as being 0.6-0.7m (Fig 84).

At the south end of the site, the Period I drainage channel was also infilled and the ground levelled up with organic material, but here a timber drain replaced the earlier revetted channel (Figs 53, 90). It was traced over a distance of 12m, aligned approximately north-south and measuring 1.2m wide x at least 0.97m in height (it had been disturbed at a level of 7.88m OD). The sides were constructed of planks set on edge while the bottom plank was supported by beams or planks 110mm thick. Pottery from a levelling layer for the drain is dated AD 120-200, while pottery from one of the organic dumps is dated *c* AD 120-160. A sample from a plank, thought to represent the east side of this drain at its northern limits, was taken for dendrochronological analysis (KEY *1392).* To the north of this section organic/ peaty material overlay the infilled stream (Fig 22). It may represent continuing infilling, merging into marsh deposits.

Beyond the edge of the prehistoric tributary, but including the canalised stream in its turn, gravel surfaces were laid, at the same time infilling all the surviving streamlets and canalised stream (Figs 10-15; 20, 21) (P15). These were not at a uniform level but seem to reflect the natural contours. The function of two timber stakes apparently associated with the gravel surface in Figure 10 is not known. Above the streamlets and canalised stream the gravel appears to have been used as permeable infill and levelling, besides its function as a surface: it was over lm thick above the canalised stream (Figs 20, 21). Further west, where parts of a section approximately 30 + m long could be examined, the gravels were composed of several bands of compacted gravel, clearly metalled surfaces (Figs 91; 92) (P15). Just to the east of the buildings a sequence of six metalled surfaces with occupation deposits were dated by pottery to AD 120-160 (Fig 17). These, however, and a surface above a Period I streamlet (Fig 19), were at a lower level than those recorded elsewhere and may have been laid at an earlier date (no pottery was recovered from the surfaces exposed in other sections). It is also suggested however that the ground here could have been terraced; in part of the same section to the north, gravelled surfaces (Fig 18) - but poorer in quality - were recorded at a higher level though the latest of these must have post-dated the well-metalled surfaces to the south. These latter were sealed by material which contained pottery also dated AD 120-160. A large pit for the disposal of animal bones was sealed by these surfaces but post-dated the infilling of the streamlets (Fig 84).

On the west side of the road metalled surfaces at comparable levels to those on the east side were recorded (Fig 85; Figs 93; 94). A timber-lined drain, aligned north-west to south-east was inserted into the latest surface (Fig 93) and probably flowed into the roadside drain.

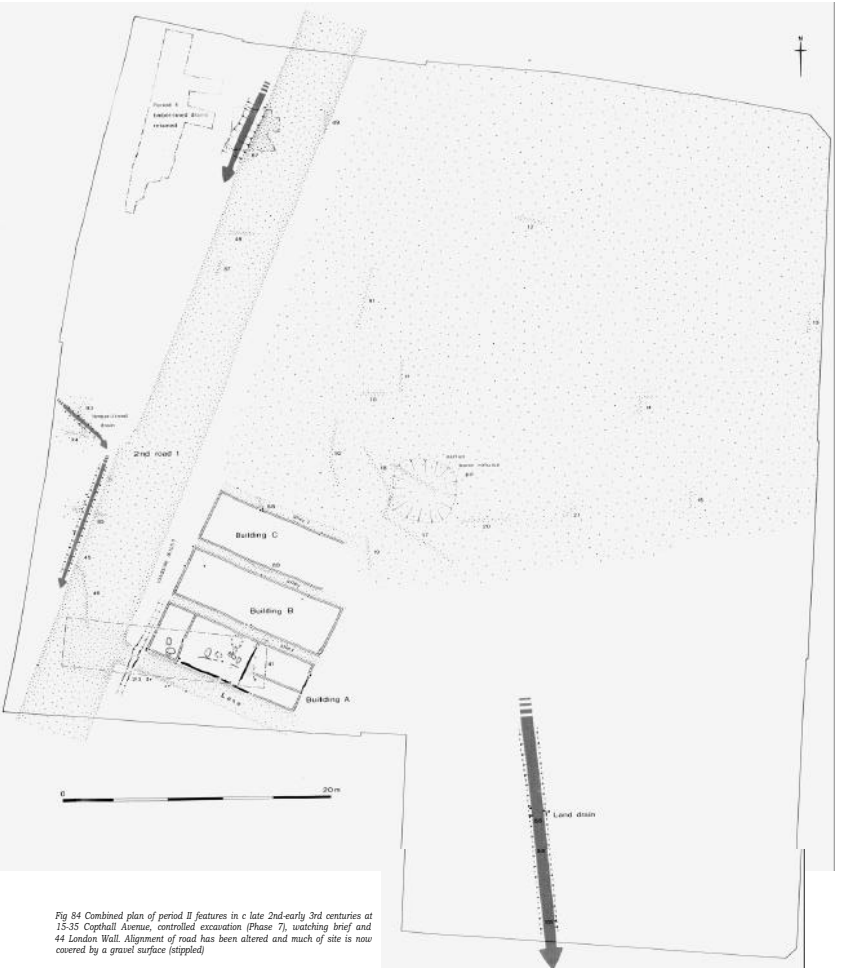


Fig 84 Combined plan of period II features in c late 2nd-early 3rd centuries at 15-35 Copthall Avenue, controlled excavation (Phase 7), watching brief and 44 London Wall. Alignment of road has been altered and much of site is now covered by a gravel surface (stippled)

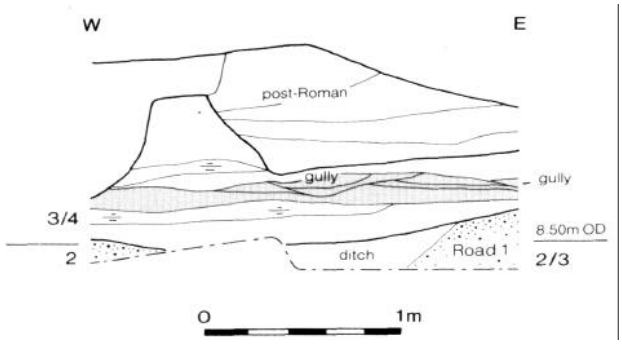


Fig 85 15-35 Copthall Avenue, watching brief: section

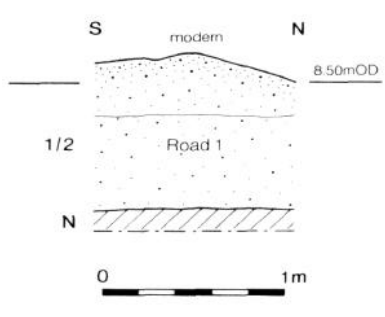


Fig 86 15-35 Copthall Avenue, watching brief: section

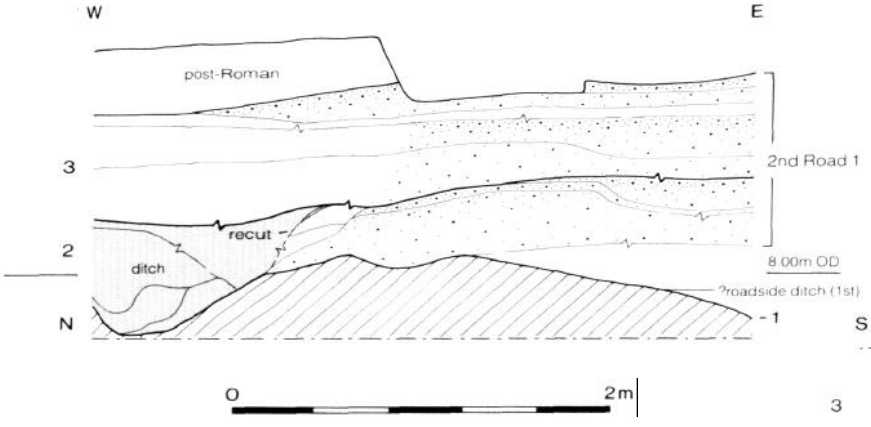


Fig 87 44 London Wall: east-west section

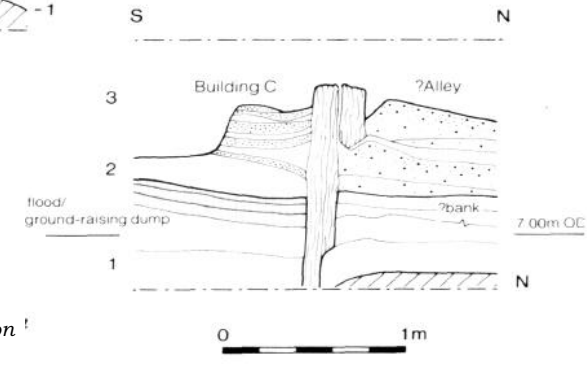


Fig 88 15-35 Copthall Avenue, watching brief: section

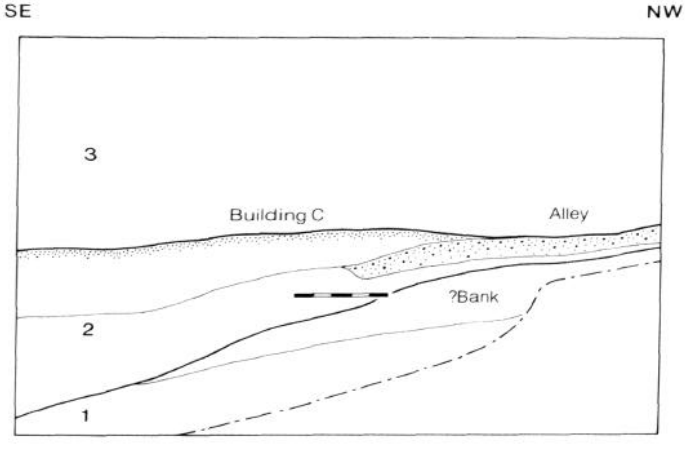


Fig 89 15-35 Copthall Avenue, watching brief: section. Scale in 0.10m units from photograph

Fig 90 15-35 Copthall Avenue, watching brief: timber land drain, looking south. Period I infilled channels and timber supports can be seen below the drain. Scale in 0.10m units

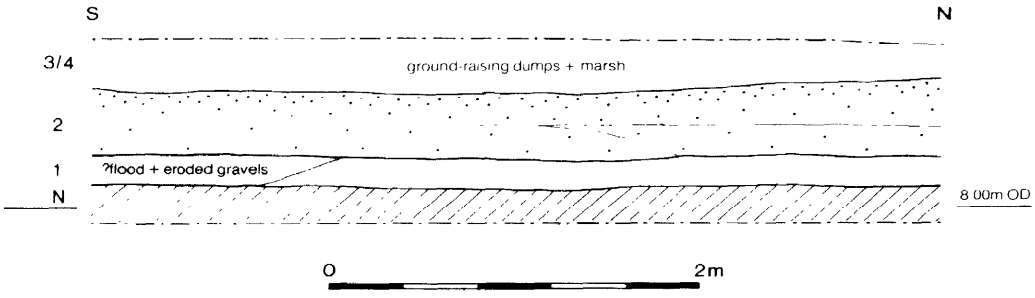


Fig 91 15-35 Copthall Avenue, watching brief: section

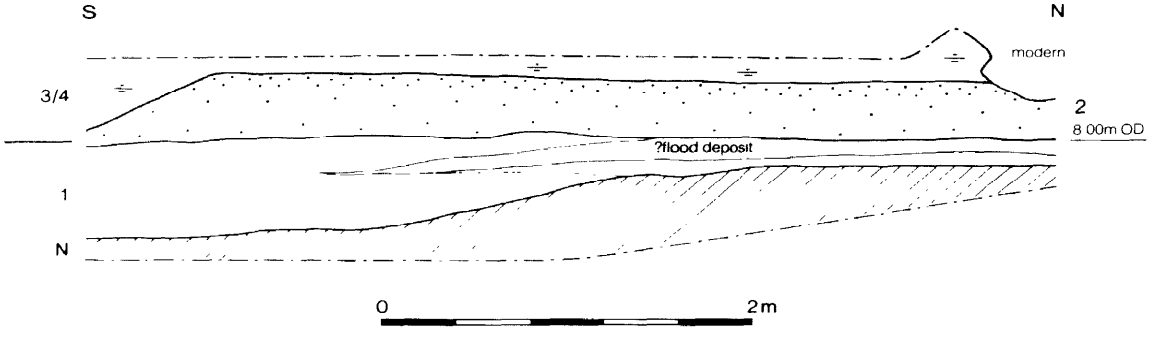


Fig 92 15-35 Copthall Avenue, watching brief: section

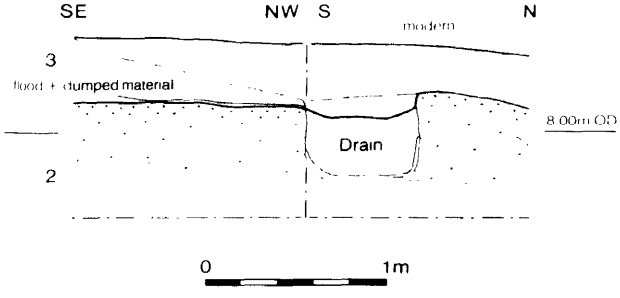


Fig 93 15-35 Copthall Avenue, watching brief: section

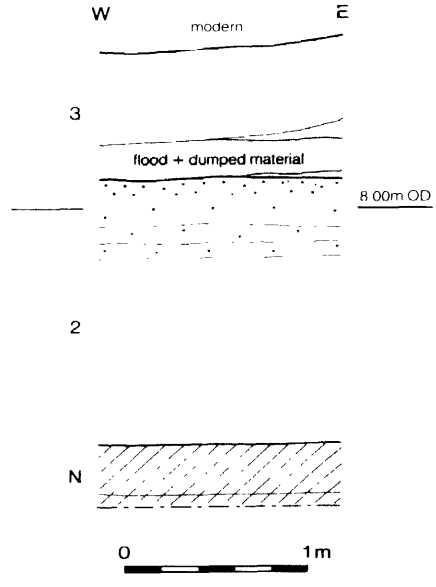


Fig 94 15-35 Copthall Avenue, watching brief: section

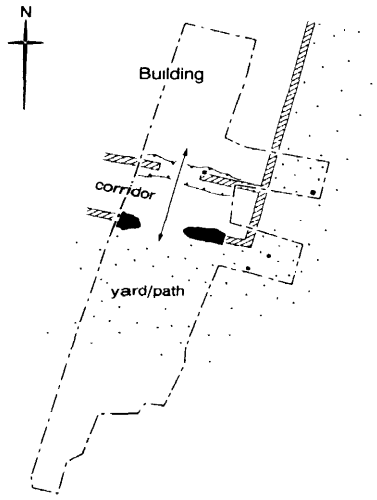


Fig 95 43 London Wall: plan of Phase 1 features

43 London Wall

Phase 1 - early 3rd century *(Fig 95)*

The Period I drains were infilled and the ground levelled up for the construction of a timber building at a level of *c* 8.6m OD. Its south wall was represented by an east-west construction trench into the fill of which three timber posts had been set; the wide spacing between two of these posts suggests a doorway. Parallel with, and a short distance to the south of this wall, the remains of a brickearth sill may imply a covered corridor *c* 1.4m wide with an entrance-way *c* 1.1m wide opposite the doorway suggested in the south wall; the 'corridor' itself was gravelled. The east wall of the building is implied by an external gravelled surface only 0.8m beyond the recorded eastern limit of the south wall. Three rectangular posts were located in this gravelled area, two of which seemed to continue the alignment of the walls of the building. To the south of the building a surface was formed by the levelling deposits which comprised pebbles in a clay matrix.

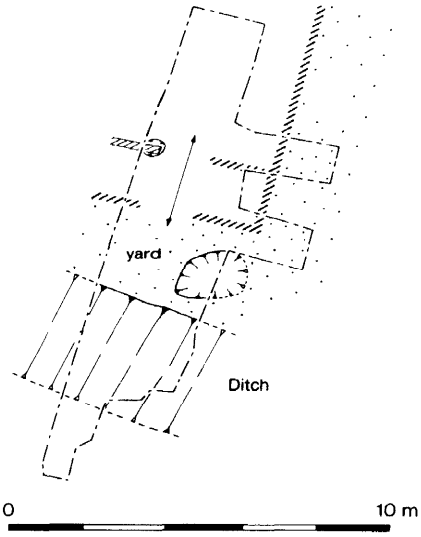


Fig 96 43 London Wall: plan of Phase 2 features

Phase 2 - c mid-late 3rd century *(Fig 96)*

A repair was made to the south wall of the building represented by a postpit close to one of the Phase 1 postholes. This was probably a replacement of an original wall or door support. Within the building, the floor was resurfaced. Outside, a new gravelled surface was laid to the south of the building; it was then cut by a pit (possibly refuse) and a very substantial east-west ditch, at least 2-3m wide x 1m deep. The ditch contained waterlain material.

Pottery from the Phase 2 surface is dated mid-late 3rd century, that from the ditch, late 2nd-early 3rd centuries and therefore residual.

8 Telegraph Street

Phase 1 - early-mid 2nd century *(Fig 97)*

A substantial stone-founded building was constructed on the same alignment as the earlier revetment (Fig 97). The remains of its north wall consisted of six courses of rough-hewn ragstone, 0.8m in height x 0.6m in width, bonded with sandy mortar. At its east corner a possible post-setting was aligned with a row of north-east to south-west orientated timber uprights; these may represent the remains of a portico. The stone wall and the timber upright alignment enclosed a make-up layer or surface of crushed white mortar.

Pottery from the initial dumps is dated AD 120-140/60 but a very small quantity was collected.

Phase 2 - mid/late 2nd century *(Fig 98)*

The ground level was raised and the Phase 1 building re-built, its east wall superseded by a 'plinth' of ragstone and flints which abutted the north wall. A sequence of make-up layers and floor surfaces of mortar and brickearth within the building accounted for a depth of *c* 0.5m, the latest surface associated with numerous small stakeholes.

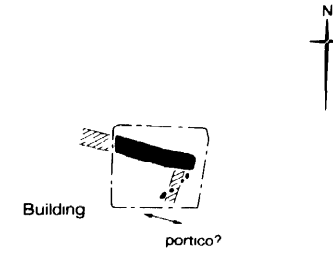


Fig 97 8 Telegraph Street: plan of Phase 1 features

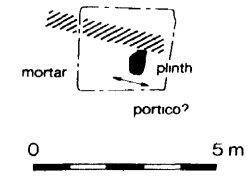


Fig 98 8 Telegraph Street: plan of Phase 2 features

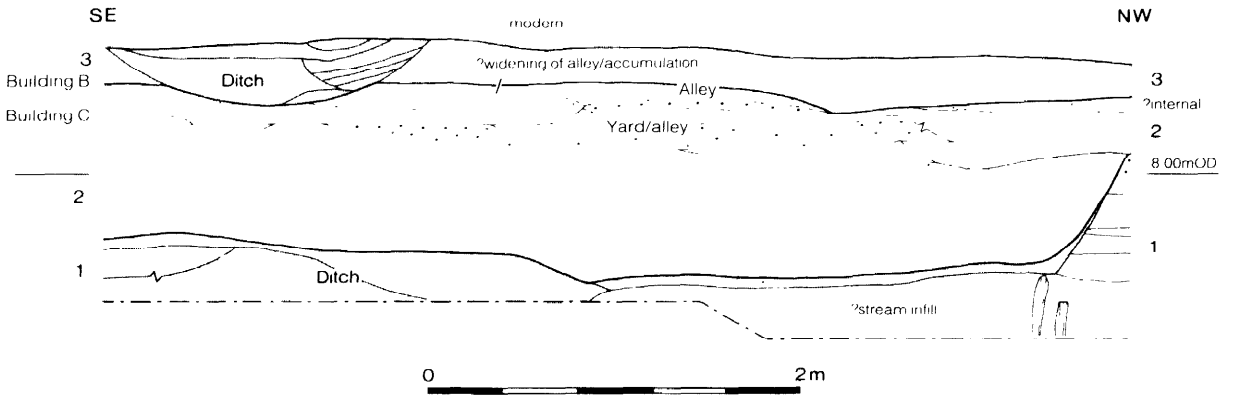


Fig 99 4-6 Copthall Avenue: east trench west section

The construction of the Phase 2 building, containing residual pottery, is dated by reference to the underlying dumps (see above) and dumps outside the building which are dated *c* AD 150 or later. The building was robbed in *c* AD 240-300.

4-6 Copthall Avenue

Phase I - mid-late 3rd/mid 4th centuries
(Figs 99, 100)

The Period I surfaces were covered and the drainage channels infilled with highly organic clayey silts (Figs 64; 65; 99; 100). This filling in of the channels was carried out over a long period of time and initially is likely to have been casual. Dumps and probably natural accumulation of organic clays, some of which contained brickearth, burnt daub and mortar (Fig 66), also sealed the east edge of the Period I road.

Phase 2 - mid-late 3rd/mid 4th century
(Fig 101)

A series of make-up layers (Figs 64; 65; 99; 100) above the Phase 1 dumps apparently prepared the site for the erection of timber and clay buildings. In the western trench, clay surfaces (Figs 56; 113; 114) probably represented floors within a building one wall of which was aligned north-west to south-east (Building A). On its north-east side was a sequence of external gravelled surfaces. In the eastern trench a similarly aligned building (B) is implied by clay and scorched brickearth floor surfaces (Figs 99, 100) which were bound by an external gravelled surface to the north-east, a yard or possibly an alley.

Phase 3 - mid-late 3rd/mid 4th centuries
(Fig 102)

In the western trench the external surface was built over as the Phase 1 building was extended northwards, its north-east wall being retained (Fig 102). The south-

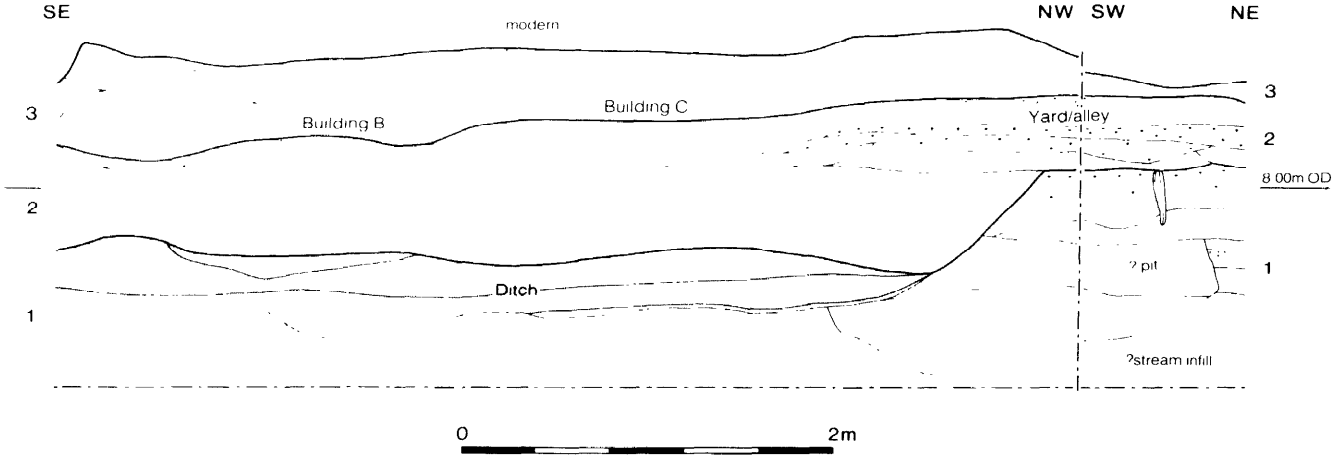


Fig 100 4-6 Copthall Avenue: east trench north and east section

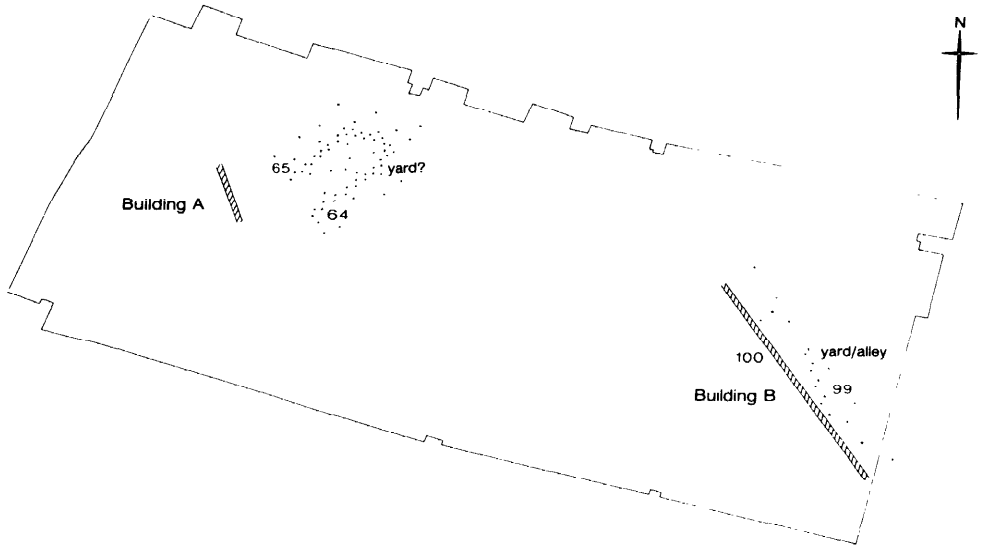


Fig 101 4-6 Copthall Avenue: plan of Phase 2 features

eastern edge of the building was represented by a north-east to south-west orientated row of pairs of substantial timber uprights and a construction trench (Fig 65). Inside the building a pair of timber posts, which separated floor surfaces composed of compacted clay or brickearth, probably indicated a partition wall. The floors had been re-surfaced and a possible hearth of mortar and charcoal was situated against the partition wall (Fig 64). A gravelled yard or alley was laid on the south-east side of the building, bordered by a gully, perhaps an eavesdrip (Figs 64; 102).

It is not clear whether the external walls of the building were supported by posts or whether they were carried on piles: the level of the tops of the upright timbers was higher than the surfaces but the latter could well have subsided as the soft dumps of Phase 1 compressed.

In the east trench Building B seems to have been demolished. A surface (Figs 99; 100) 0.5m wide, composed of well-laid gravels and aligned approximately north-south, may have been an alley at least on the east side of a building (C), and possibly between two buildings which were represented by floors of clay. A layer of gravelly clay then overlay the alley and possible internal surface to the south, suggesting either a deliberate widening of the alley or the accumulation of tread. The walls of these buildings and their partitions were implied by the common termination points of many of the floors and occupation layers; nothing survived of the walls which were presumably dismantled and removed.

Pottery dates these buildings and the dumps to the mid 3rd- early 4th centuries. The infill in the channels, however, also contained dumps dating to the 2nd

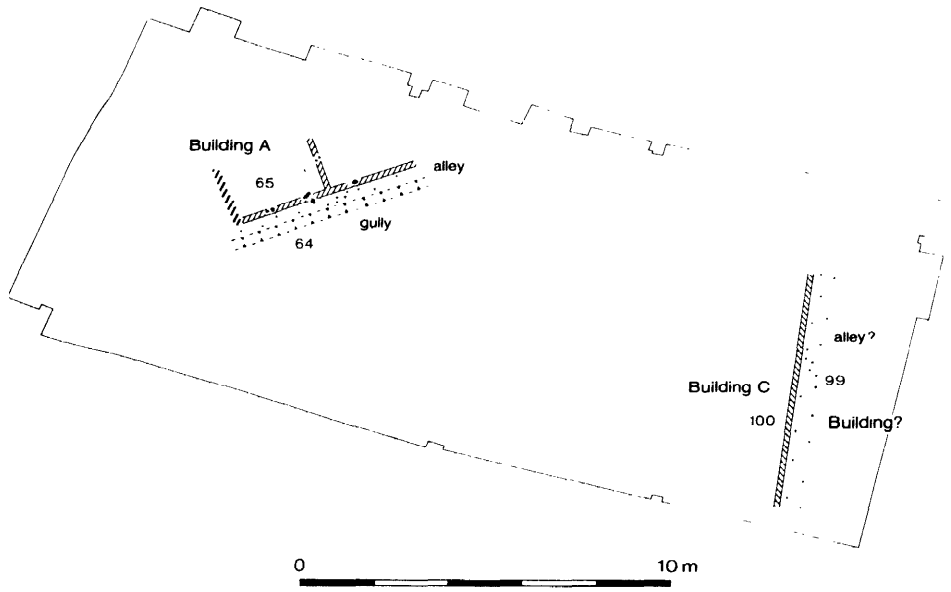


Fig 102 4-6 Copthall Avenue: plan of Phase 3 features

century, possibly implying that these were partly infilled in the 2nd century and that the site was abandoned until the mid 3rd-early 4th centuries (though see Discussion).

Dating (Fig 103)

This period may span as many as two hundred years, from early in the 2nd century, through the 3rd and into the 4th century. A similar sequence of drainage ditch infilling - levelling - building construction/habitation was observed in most parts of the study area, but the rate of development varied from site to site. This chronological variation is interpreted further below, in the general discussion of the settlement pattern in the Walbrook valley (pp. 120-122).

At 15-35 Copthall Avenue, the site where the dating evidence is fullest and most precise, a very large group of pottery indicates that Phase 1 probably began in the 120s. Stamped samian vessels and Black Burnished wares provide *termini post quos* of 110 and *c* 120 respectively, and it is even possible that some of the pottery, which is severely burnt, was damaged in the Hadrianic Fire and redeposited on the site. The following four phases seem to have passed rapidly, because dendrochronology suggests a *terminus ante quem* of 138 for the construction of the Phase 6 drain. Four timbers from the drain are consistent in having outer rings dating between 70 and 86, and if it has been correctly deduced that only the sapwood has been removed from them (p. 118), then the latest possible felling date is the year 138. Pottery from the fill of the drain shows, on the other hand, that it continued in use into the mid/late 2nd century.

Dendrochronology is of little help in dating the remaining phases on the site, but the appearance in Phase 7 of late Black Burnished Ware 2 forms and a Camulodunum type 306 D-rim bowl, and in Phase 11 of a North Gaulish Grey Ware pentice beaker, place these phases in the late 2nd and the 3rd centuries respectively. The latest road surfaces (Phase 12) contained Nene Valley colour-coated wares, together with Alice Holt/Farnham and Black Burnished Ware 1 flanged bowls, and so will have remained in use through the 3rd, if not into the 4th century. The final history of the building is less certain, but it seems most likely that it was dismantled shortly after the early 3rd-century modifications (Phases 10-11), and that its site was left unoccupied until the ground level was raised again in the second half of the 4th century (Period III, below p 70).

Very few datable finds were recovered from the watching-brief at 15-35 Copthall Avenue, and the sequence cannot be reconstructed in detail. Most activities which can be dated - in particular, the initial ditch-infilling and the laying of metalled surfaces to the east of the buildings - were associated with 2nd century pottery, which suggests that development here may have proceeded at a similar rate to that in the main, controlled excavation area. The erection of the buildings followed not long after the reconstruction of the road on a more northerly alignment. This is dated by a large group of pottery from silt layers in the roadside ditch at 44 London Wall, which shows that the ditch had been cut and the road was in use during the second half of the 2nd century.

At Telegraph Street a very small group of pottery from the initial levelling dumps suggests that the stone building may also date from as early as the first quarter of the 2nd century. Pottery from further dumps, outside the building but preceding Phase 2, date its reconstruction to *c* 150 or later; and, to judge by the presence of an Oxfordshire mortarium, it was probably dismantled in the second half of the 3rd century.

On the other two sites, however, the buildings seem not to have been put up until later. The make-up layers beneath the timber building at 43 London Wall, and the fill of its construction trench, yielded a late form of Black Burnished Ware 2 bowl and a Black Burnished Ware 1 bowl with incipient flange - pottery types that did not appear until the early 3rd century; the pit outside the building (360) cannot have been backfilled until even later, for it contained a late 3rd-century coin, a radiate copy. Similarly, at 4-6 Copthall Avenue, although one group of virtually complete pots (from context 15) suggests that infilling may have begun in the middle of the 2nd century, the pottery from the remainder of the levelling dumps (Black Burnished Ware jars with obtuse lattice decoration, Alice Holt/Farnham and Nene Valley wares) indicates that the process was not completed, in preparation for building, until the second half of the 3rd century. The structure itself may have remained in use into the 4th century, although the finds provide no clear terminal date.

Discussion (Figs 104, 105)

15-35 Copthall Avenue and 44 London Wall

At 15-35 Copthall Avenue drainage channels, the canalised stream and streamlets were all infilled. Very little pottery, however, was retrieved and most of it was in small groups so that dating evidence for this period is unsatisfactory.

In the former tributary the infill consisted of dumps of organic material; evidence from the controlled excavation demonstrated that this eventually subsided. Pottery from these dumps range in date from AD 120-200; comparable material from the controlled excavation is dated AD 120-140.

The evidence seems to suggest that Road 1 - or part of it - was moved a little to the west and realigned on a more north-northeast/south-southwest axis to that of the earlier road (see p 42). Drainage was provided by timber revetted ditches or timber lined drains, the differences suggesting that drainage beside the road was the responsibility of individual property occupiers. No drain was recorded in the section adjacent to the west end of the controlled excavation though here the awkward angle of the section, together with erosion at the edge of the road, may have obscured its profile. A timber stake could have marked the position of the east side of a drain. During this period the road was regularly repaired and resurfaced and up to *c* AD 350 (Period III, Part 5).

Phase	Dendrochronology	Coins	Stamped samian	Other pottery	Suggested date for phase
15-35 Copthall Avenue, controlled excavation (OPT 81)					
1	AD 69-114	–	MALCIO, Montans, Dr 37, AD 110-45 BALBINUS, Les Martres, Dr 18/31, AD 110-25 DAGOMARUS, Les Martres, Dr 33a, AD 100-125 MANDIULUS, La Graufesenque, Dr 15/17 or 18, AD 60-85	AHSU, **BB1**, **BB2**, **BBS**, COLC, COMO, DR20, FMIC, G238, GROG, HWC, **KOLN**, LOEG, LOMA, LOMI, **LONW**, NKGW, NKSH, PE47, RDBK, **VCWS**, VRMI, VRR, VRW group size 25.3 kg date AD 120-140	early/mid 2nd c
2-5	AD 66 +	—	—	AHSU, **BB1**, **BB2**, DR20, FMIC, GROG, HWC, **KOLN**, LOEG, LOMA, LOMI, **LONW**, NKSH, **VCWS**, VRW, NVCC (intrusive) group size 10.0 kg date AD 120-140	early/mid 2nd c
6	AD 96 +	-	MATERNUS III, Lezoux, Dr 33, AD 125-50	AHSU, **BB2**, DR20, HWC, KOAN, PE47, **VCWS**, VRW group size 3.4 kg date AD 140-200	early/mid 2nd c (use of drain mid/late 2nd c.)
7-8	–	—	BUCCULA, Lezoux, Dr 33, AD 140-80	BB1, **BB2**, BBS, **C306**, DR20, H70, HWC, LOMI, NKGW, NKSH, SESH, VCWS, VRW group size 4.8 kg date AD 180-260	late 2nd c
9	–	—	–	BB1, **BB2**, DR20, HWC, KOAN, MICA, PE47, RDBK, VCWS, VRW group size 2.8 kg date AD 180-260	late 2nd c.
10	–	—	?, Les Martres, Dr 18/31R, AD 100-20	AHSU, BB1, **BB2**, BBS, **C306**, DR20, HWC, LOMI, MICA, NKSH, PE47, RDBK, VCWS, VRW group size 2.6 kg date AD 200-60	early 3rd c
11	AD 81 +	—	–	AHSU, BB1, BB2, BBS, DR20, HWC, KOAN, LCWS, LOMI, **NGGW**, NKGW, NKSH, PE47, RDBK, RHOD, VCWS, VRR, VRW group size 5.0 kg date AD 200-300	early 3rd c
12	—	–	–	**AHFA**, **BB1**, BB2, HWC, **NVCC**, VCWS group size 1.0 kg date AD 240-350	mid/late 3rd c or later
15-35 Copthall Avenue, watching-brief (KEY 83)					
—	—	—	–	**BB1**, **BB2**, DR20, HWC, NKSH, **VCWS**, VRMA, VRW date AD 140-200	drainage ditch infilling probably mid 2nd c., other features undated
44 London Wall					
—	—	–		**BB1**, **BB2**, COLC, HWC, **KOLN**, MICA, **NVCC**, PE47, SAM (DR 31, 18, 18/31, 37, **45**), VCWS, VRW date AD 140-200	mid/late 2nd c

Fig 103 Summary of dating evidence for Period II

Phase	Dendrochronology	Coins	Stamped samian	Other pottery	Suggested date for phase
43 London Wall					
1				AHSU, **BB1**, **BB2**, C186, **CGBL** CGWH, DR20 FMIC H70? HWC KOAN, **KOLN**, LCWS, MICA **MOSL** NKSH PE47 VCWS, VRW date AD 200+	early 3rd c
2		radiate, late 3rd c		**AHFA**, BB2, CGBL DR20 MICA NKSH **OXMO** PE47 date AD 250-300	late 3rd c
4-6 Copthall Avenue					
1				**AHFA** AHSU BB1 BB2 COLC DR20, HWC, NVCC **OXRC**, VCWS VRMI? VRW date AD 250-400	late 3rd c
2				VCWS date AD 40-200	late 3rd c or later
3		Trajan sestertius AD 98-117		BB1 BB2 **C306** CGBL COLC DR20 KOLN MOSL **NVCC OXMO** PE47, VRW date AD 250-350	late 3rd - early 4th c
Telegraph Street					
1				**BB1**, **COMO** GROG HWC LOEG LOMI LONW, **VCWS VRW** date AD 150-200	construction ?early 2nd c ; external dumping pre-Phase 2 mid/late 2nd c.
2				BB1, BB2, DR20, HWC, KOAN, LOMI LONW MICA NKSH **OXMO** PE47 VCWS, VRW date AD 240-300	late 3rd c

Fig 103 continued

Timber buildings were erected beside the road on its east side above the levelling dumps and covering an area 14m x 12m (Fig 104). The controlled excavation provided the details of one of these buildings (A). It was constructed on timber baseplates, laid onto the piles of the Period I path, and therefore was not aligned with the Period II road but with that of Period I. The evidence suggests that the walls were of wattle and daub or timber.

Two of the baseplates (oak) found in situ measured 0.18m wide x 0.07m and 0.12m deep. One of the baseplates could not be retrieved but on the other mortices were cut along its length apparently 0.14m-0.18m apart and measuring 0.22-0.32m x 0.11m, but probably distorted through decay. Into these timber studs could have been set which either carried a wall-plate or tie beams, or supported the infill of the wall. Perring suggests that the former method of building may imply a box-framed construction (Perring & Roskams forthcoming). If the size and spacing of the mortices is presumed to be accurate, however, a vertically timbered wall is more likely. Botanical evidence suggests that the roofing material could have been wheat-straw though it is considered more likely that the evidence derived from the floor covering (p 110).

Partitions were supported on oak ground-beams set in very shallow slots (though the slots could have resulted from the downward pressure of the walls). They were rather smaller than the baseplates, but also had a series of mortices cut into their upper face. One of the ground-beams - apparently reused timber - was particularly well preserved (411); it measured 1.94m long x 0.12m wide x 0.07m deep and five mortices were spaced 0.27m - 0.37m apart. The other surviving ground-beam (393) was in a very poor condition but supplied more information about the construction of the wall itself. It measured at least 3.35m in length by c 0.16m wide x *c* 0.14m deep. Decayed mortices were visible and, in addition, the remains of small timber uprights which could have been either the tenons of more substantial uprights or uprights which supported the infill of the wall. Apparently interconnecting the mortices were two parallel grooves aligned along the length of the ground-beam, that on the west side being 20mm wide x 40mm deep, that on the east side being 10mm wide by 60mm deep, though the fashioning of such grooves probably resulted in a considerable variety of depths (Fig 105). Both grooves were filled with decayed wood and clay. These grooves may have anchored vertical rods for wattle panels while the timber studs supported the horizontal rods. The uprights could have been retained in position either by the insertion of wedges into both grooves or by the upright occupying the mortise and overlapping the grooves. A clay and brickearth-based daub is suggested by the fill of the grooves and by a deposit of clean brickearth surviving on the upper face of the ground-beam.

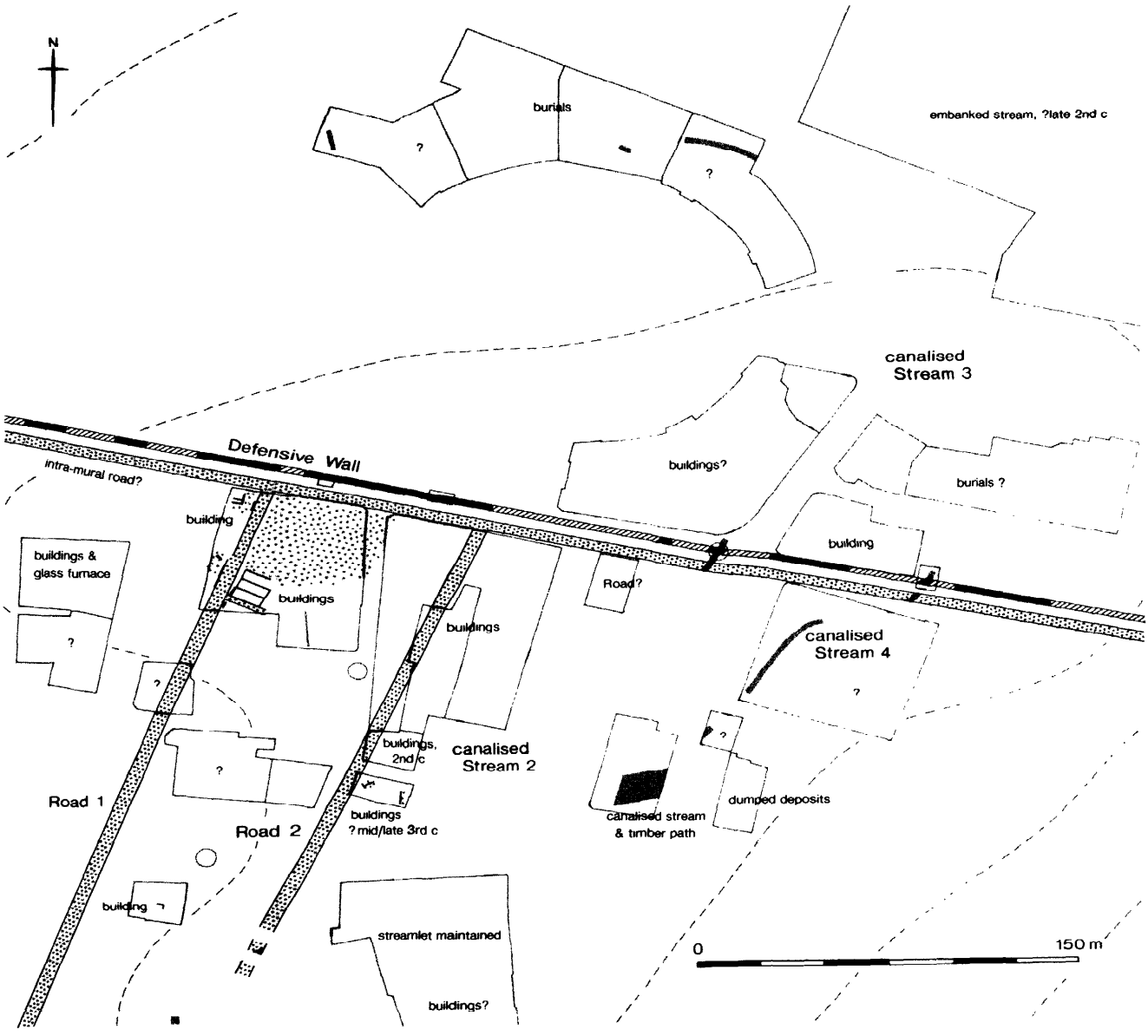


Fig 104 Study area: plan of Period II features, c late 2nd century (unless otherwise stated)

In its earliest phases (1-5) rooms within the building were narrow and frequently modified. A drain and gully were inserted on the west side of the building in *c* AD 140 (Phase 6), probably at the same time as a western extension was added to the latter. Larger rooms were created thereafter and in Phase 9 the south wall of the building was opened up. Floor surfaces declined in quality in the eastern rooms in Phase 10, in contrast to those in the western room. A revetted drain or sump was inserted into the external surface along the south edge of the building in Phase 11, perhaps connected with activities within the building. In its final Phase, 12, the south end of the building may have been extended westwards or a covered floor surface added outside the building above the infilled drain and gravelled surface.

Within the building the rooms were characterised by the number of hearths, pits and scorched floor surfaces. Many of the pits had either been burnt and/or contained burnt material, especially charcoal and sometimes slag, implying that these were sunken hearths. They were often constructed on two levels or had a shallower 'arm' extending from the main pit, possibly as flues. Some, constructed as slabs or bases of baked clay, may have been ovens, particularly where evidence of a superstructure survived. Strategically positioned stakes and slots containing decayed wood imply that these were built of wattle and daub.

There are indications that the west and east sides of the building were occupied differently. The greatest proportion of pits, hearths and ovens was situated in the

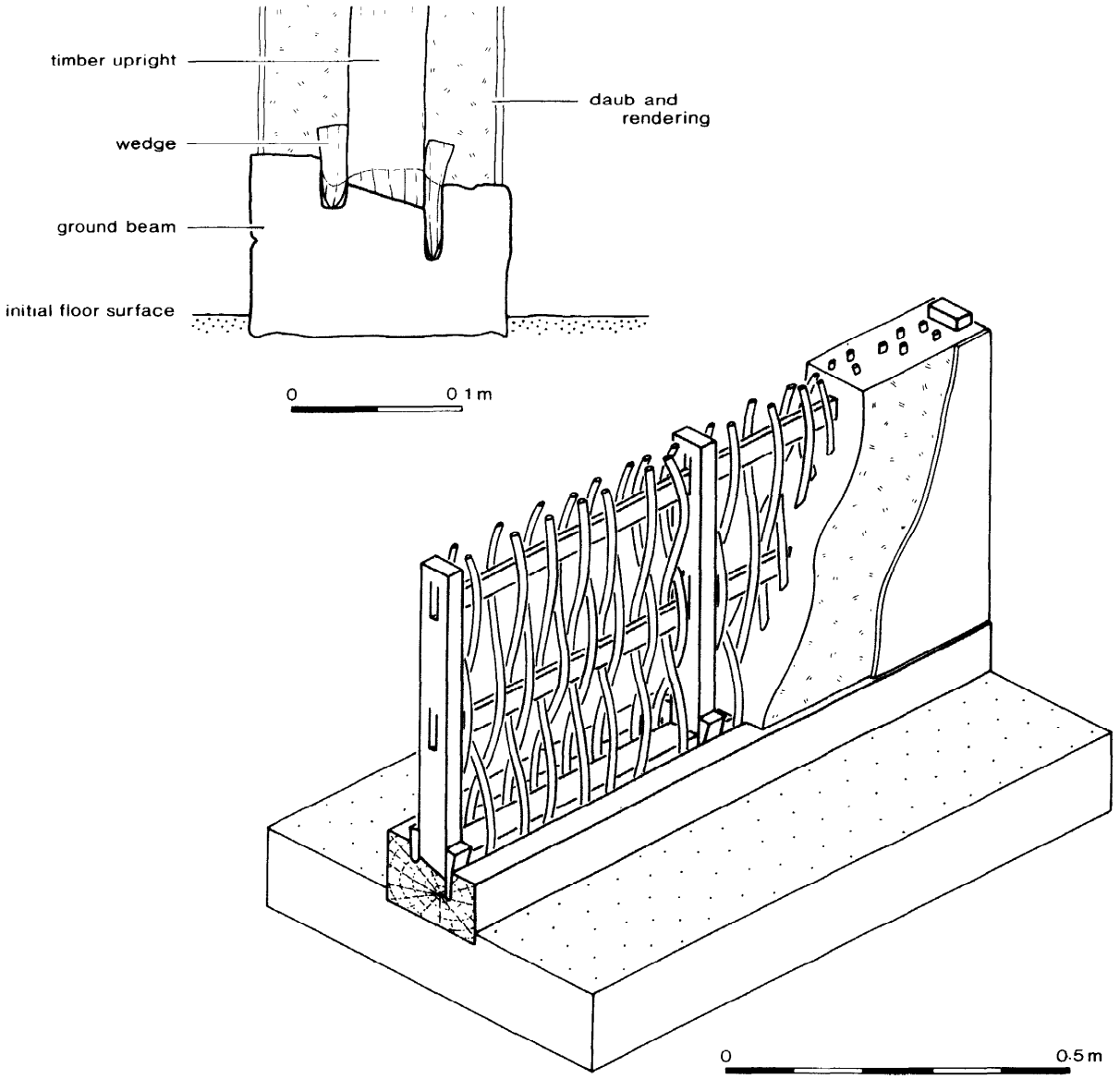


Fig 105 15-35 Copthall Avenue, controlled excavation: cross section through ground-beam (393) with conjectural wall above (grey represents timber as found), and reconstruction of partition wall (grey represents timber)

central or eastern rooms where the floors were often very worn and stained; and environmental analysis of samples from Room vi, for instance, produced no traces of domestic occupation (Part 8 p 108). The westernmost room (xi) had by comparison fewer hearths, only three, though the uppermost floors had been truncated. Here also the floors were cleaner, not scorched and the rooms were less obviously used than those to the east. Charred cereals from one of the sunken hearths and a layer of grasses and rushes from another, reinforce the implication that Room xi was domestic in character (Part 8 pp 108, 110).

The hearths and ovens would seem to indicate that the building had an industrial function, with possibly domestic quarters located at its western end. There is, however, very little to indicate what the industrial function might have been. In general, the number of all finds associated with the building was not great and it would appear to have been kept clean. Among the industrial residues iron slag was the most common but not in large enough quantities to conclude that this was a smithy (p 83). It may have been connected with a process including ironworking, as suggested for buildings at Newgate Street (Perring & Roskams, forthcoming). Other possible evidence includes small quantities of glass slag and waste, an awl from one of the floor surfaces which may have been used in leatherworking and, from the Phase 1 channel infill, a

crucible used for the cupellation of silver (p 83). Apart from these industrial residues, items from the building are all normally associated with domestic activities (see also Conclusions, Part 10, p 122).

No demolition debris overlay the latest surfaces of the buildings, indicating that they were carefully dismantled and the site cleared.

The road and the building overlooked an extensive surface of compacted gravel which had been laid on the ground to the north of the former tributary, infilling at the same time any drainage facilities. Some surfaces had been re-laid a number of times, possibly those nearest the road, where most activity might be expected. There was nothing, apart from a very few timber uprights, to suggest the use to which such an extensive surfaced area was put.

To the south where organic material had infilled the canalised stream, a large land drain was constructed which must have been connected with other drains to dispose of water within the former tributary. The construction of the buildings and surfaces were clearly contemporary, part of a planned development of the area, perhaps an industrial zone. Such an interpretation is supported by the siting of the buildings in - apparently - the worst possible place, the damp if not wet former stream, leaving the higher, drier ground to be surfaced. This is surely significant and implies that immediate access to water was the most important factor above all others.

Both the drain and some of the surfaces could have been in use after the middle of the 2nd century but it is not known how long they lasted. It might be expected that as long as there was occupation in the area, supporting amenities or services would be maintained. The extent of the surfacings and the size of the drain, however, would at least indicate an official operation, so that occupation and maintenance of services need not be complementary. Although the quantity of pottery recovered was extremely small, no date later than AD 160-200 was obtained from it, which may imply that the maintenance of services - including the land drain - ceased in the second half of the 2nd century.

The area on the west side of the road was also metalled but its extent is not known and it may have been associated with buildings as yard surfaces. A ditch, probably associated with this surface, and a late timber-lined drain are both likely to have emptied into the roadside drain: they testify to the continuing necessity for controlled drainage. That the environment was still wet, though disturbed, is demonstrated by the macroscopic and insect remains from the controlled excavation (Part 8 p 110).

43 London Wall

Two timber-lined drains dated *c* AD 140-200 (Period I, p 40) at 43 London Wall may have been associated with the later drainage system at 15-35 Copthall Avenue (above). In the early 3rd century a building was erected on this side of the road at 43 London Wall. Very little survived but its south wall was constructed of timber posts, and a possible covered external corridor was supported on a brickearth sill. There was not enough evidence to indicate the character of the building. Gravelled surfaces had been laid on its east and south sides, either part of an extensive surface or pertinent only to the building. In the mid 3rd century or later the area to the south of the building was resurfaced and a major drainage and perhaps boundary ditch was dug. Dating from the fill of a refuse pit in the surface suggests that the building could have been occupied until the late 3rd century.

8 Telegraph Street

At Telegraph Street a stone-founded building was constructed in the early 2nd century upon and above the earlier revetment. Indeed the revetment and its associated dumps may have been specifically designed as a platform for this and possibly other buildings which removed them from any danger of flooding. Its north-east wall was timber built or perhaps a portico. A superior rebuild took place after the ground had been raised, retaining its north wall but replacing its timber wall with one carried on rectangular stone bases, possibly an arcade wall. This is dated to AD 150 + , for its levelling dumps and AD 240-300, when it was robbed. It is possible that the date of its robbing was the same as its disuse, the building having been pulled down as soon as it was no longer required. Certainly a stone-founded building could have lasted one hundred years or more; this is also perhaps implied by the depth of the deposits accumulated within the building. The small stakeholes associated with the latest floor may suggest that this part of the building at least did not have a domestic function.

4-6 Copthall Avenue

At 4-6 Copthall Avenue, timber buildings were erected over the infilled drainage channels in the late 3rd century or later. There were two phases with a complete rebuild on a different alignment in the second phase, perhaps indicating a lack of pressure on space and that the buildings were not influenced by the alignment of the road. Buildings A-C were bordered - if not separated from other buildings - by gravelled alleys. Recent excavations on the adjacent site of 10-12 Copthall Avenue (Site 31), however, have uncovered two 2nd century timber-framed buildings fronting onto Road 2, and separated by a gravelled alley and timber-lined drain (Lees 1989). Occupation of this building had ceased by the late 2nd-first half of the 3rd century, indicating that there were two periods of building construction beside Stream 2. Evidence from this site also indicates that Road 2 may have been in use in the 3rd century which, when considered with the apparent sealing of the east edge of the road in the mid 2nd century at 4-6 Copthall Avenue, may imply that it had been reduced in width or its surface raised. The history of this road should be clarified by current excavations at 20-56 Copthall Avenue/ 52-62 London Wall (Site 29) where it has been located together with a timber-framed building and a flimsier structure, associated with gravelled surfaces, but these are as yet undated (D Lees and A Woodger LOW 88, pers comm).

Close to 4-6 Copthall Avenue and Telegraph Street, trenches just to the east of Angel Court (Site 34) revealed evidence of buildings (Blurton 1977). Sequences of floor surfaces were observed in two trenches. These were composed of clay or brickearth, laid above (?)make-up layers of clayey gravel and associated with timber uprights. A substantial building is suggested by the continuation of floor surfaces for a length of at least 17m, unless more than one building was was involved. In another trench an approximately north-south drain ran beside a possible building. No reliable dating evidence was recovered. At the north end of the site a further revetment was constructed in the canalised stream and its banks were repaired twice as silts accumulated during the late 2nd-mid/ late 3rd centuries.

At 55-61 Moorgate (Site 15) buildings were erected in the mid 2nd century and occupied until *c* AD 180 (Drummond-Murray 1988), and at 85-86 London Wall (Site 10) a building was constructed, perhaps towards the end of the 2nd century (Sankey 1989). Current excavations at 22-25 Austin Friars have revealed a substantial stone building with tessellated floors which would have overlooked the eastern tributary (Stream 4) (D Dunlop and D Shotliff AST 87, pers comm).

During this period the main Walbrook stream (3) at Broadgate (Site 5) was further embanked. This is dated by pottery to some time after AD 180-300. Some attention must have been given to the Walbrook streams when the city wall was constructed at the end of the 2nd century and it is suggested (R Malt, pers comm) that this phase of embankment could represent part of the reorganisation of the streams that must have taken place.

In conclusion, it is clear that, though damp, the upper Walbrook valley was extensively developed from the early-mid 2nd century with the construction of timber and stone buildings. There is not enough evidence to suggest the density of this occupation and there was certainly a large open area at 15-35 Copthall Avenue. Glassworking was carried out in a building constructed around the middle of the 2nd century at 55-61 Moorgate (Site 15), the recovery of painted wall plaster associated with this building implying that it had a domestic function as well and it is suspected that other buildings may have been industrial workshops as well as residences. The drainage system appears to have been efficient, for a while at least, though an apparent break in occupation beside Stream 2 may have been caused by drainage problems. Elsewhere buildings seem to have been in use as late as the 3rd century.

Period II buildings, with the possible exception of those at 4-6 Copthall Avenue, were demolished in the 3rd century and one site at least, 15-35 Copthall Avenue, was apparently abandoned though precise dating evidence for this is poor. The last phase of activity in Period II at 15-35 Copthall Avenue occurred in the 3rd/ mid 3rd century and re-occupation took place in the mid 4th century so that a period of *c* 100 + years elapsed between Periods II and III at this site. The reason for this was not apparent.

5. Period III: Late Roman Developments - 4th Century

At 15-35 Copthall Avenue maintenance of the road continued, external surfaces were laid and a sequence of large regular pits was dug, the latter possibly associated with an industrial activity. Period II buildings at 4-6 Copthall Avenue were demolished and the evidence from all sites indicates that drainage was becoming less effective: dumping to raise the ground level and the digging of drainage ditches was resumed. Macroscopic, insect and parasite remains from 15-35 Copthall Avenue indicate an urban environment and damp muddy conditions (Part 8, p 112).

15 - 35 Copthall Avenue: controlled excavation

Phase 1 - 4th century (Fig 106)

The ground level east of the road was raised some 0.25m by means of a dump of pebbly clay. Its surface was cut by two pits, one of which was regular and *c* 1.5m in diameter (Fig 106). It is likely that a ditch was cut beside the road, if so it would have been truncated.

Phase 2 - mid-late 4th century (Fig 107)

Two large cut features - possibly construction cuts - were filled with a gravelly clay that included a great quantity of furnace lining (Part 7, p 84). In the west this material became the foundation for a good external surface, composed of compacted gravel in a clay matrix, which was raised some 0.3m above the adjacent ground to the level of the road; at the same time the road was repaired and resurfaced along its eastern edge. This surface terminated in the east, and was perhaps unfinished, and here the foundation material was used as a surface. A ditch, 1.5m wide x 0.75m deep and probably revetted (OPT *130),* was dug beside the road. Such a substantial ditch was obviously designed to drain off more water than could be expected from the road; this, with the raised surface, suggests that the ground was wet.

Phase 3 - mid-late 4th century (Fig 107)

Four pits, three of them intercutting an earlier similar pit, shared a number of characteristics which suggested that they may have been connected with an industrial process (OPT *172)* (Fig 107), though no indication of this was apparent from the finds (Part 7, p 84) or macroscopic and insect remains (Part 8, p 111). They were cut into the poorer surface of Phase 2 which could have been laid specifically for them. They were all fairly large - 1.5m + in diameter or 2.2m + in length, 0.4-0.5m deep and, apart from the latest pit, contained a number of fills which had accumulated over a period of time, the earliest of which was always a thick layer of organic silty clay with lenses of sand. The surface associated with the pits was then raised to the same level as the adjacent, better quality surface and sealed the pits.

Organic clayey silt had meanwhile accumulated in the bottom half of the roadside ditch (OPT *133, 134, 138, 140, 144, 145, 146, 147),* macroscopic, insect and mollusc remains suggesting muddy, almost stagnant water (Part 8, p 112).

phase 4 - mid-late 4th century (Fig 108)

The ground level to the south of the external surfaces was raised with dumps of clay and pebbles which partly infilled the roadside ditch at the same time. A possible structure was built, partly on the Phase 2 raised surface which was cut away, and partly on a sill consisting of banked pebbles and tile fragments in a matrix of clay (Fig 108). Aligned north-south, this feature abutted the Phase 2 surface. No internal surfaces survived but a pit may have marked the position of a post.

Phase 5 - mid-late 4th century (Fig 109)

The Phase 4 structure was short lived for it was soon dismantled and, south of the Phases 2 and 3 surfaces, the ground level was raised again (Fig 109). East of the structure the dumps were of rubble and clay while above

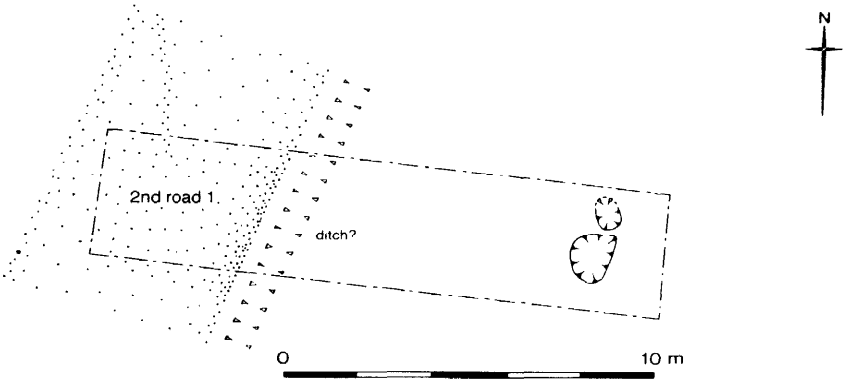


Fig 106 15-35 Copthall Avenue, controlled excavation: plan of Phase 1 features

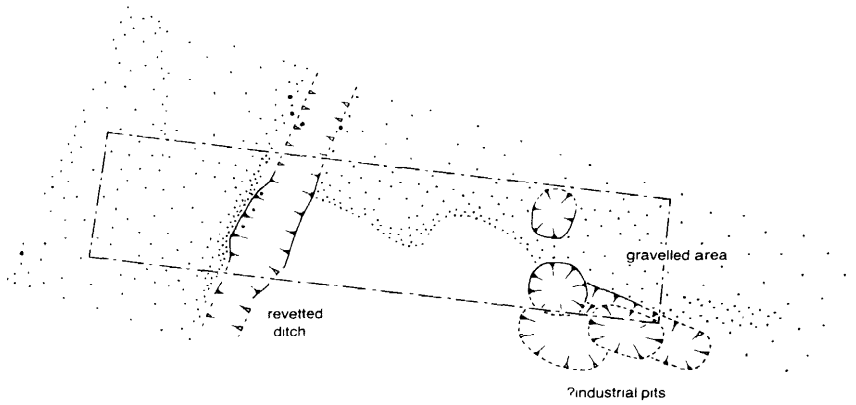


Fig 107 15-35 Copthall Avenue, controlled excavation: plan of Phase 3 features

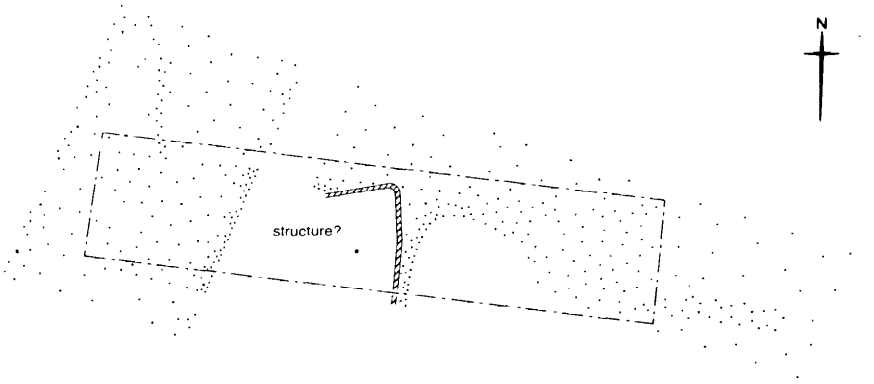


Fig 108 15-35 Copthall Avenue, controlled excavation: plan of Phase 4 features

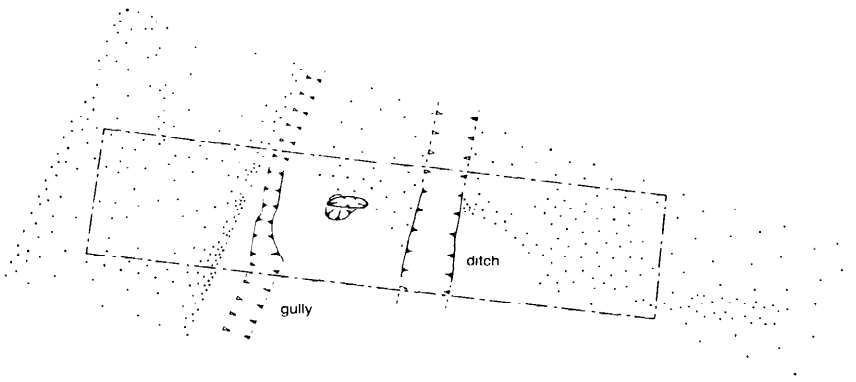


Fig 109 15-35 Copthall Avenue, controlled excavation: plan of *Phase 5 features*

it and beyond they consisted of silty clay which may have included waterborne material.

Beside the road, a crude gully was dug, replaced quite quickly with another which became silted up. Further east a shallow north-south aligned drainage ditch was cut through the east end of the raised surface of Phase 2, while a pit encroached onto its western side. Both the ditch and the pit were recut.

Analysis of the large number of insect remains from and the character of the peaty till of the pit (OPT *110)* suggests that it accumulated slowly (Part 8 p 111),

15-35 Copthall Avenue: watching brief and 44 London Wall

(Figs 110, 111)

In many sections dumped deposits, usually of clay with a high ferruginous content, sealed the sequences of occupation surfaces representing buildings (Figs 88; 89) and the gravelled surfaces towards the north and east sides of the site (Figs 12-15). In the south the land drain had fallen into disrepair and eventually silted up (Fig 53; 111). Only one piece of pottery dated AD 70-180 was recovered from its truncated fill, a date not dissimilar to that for the construction of the drain. A section very close to the drain indicated that clay dumps raised the ground level here *c* 0.4m. The gravelled surface in two sections were sealed by organic dumps but these are considered from their level and dating (p 56) to have been of an earlier date (see Period II) (Figs 17; 19).

There are indications from some sections that peaty deposits filled large regular cut features (Figs 17; 19; 92). Whether these were Roman or medieval is not clear.

Dumps were recorded close to both edges of the road (Figs 10; 47; 91-4); often they included peaty material (Figs 10; 91; 92) suggesting a degree of wetness. Above the west edge of the road a layer of clay is considered from its level of *c* 8.61m OD to have been Roman in date, (Fig 85). Generally, dumping seems to have occurred in all areas of the site except where the former stream changed direction, and southwards (Figs 20-2). Towards the north end of the site, the eastern edge of the Period I road was covered by compacted gravels which were truncated at a level of 9.05m OD (Fig 49). They also extended beyond the edge of the road and can possibly be compared in the controlled excavation with the raised external surface of Phase 2.

At 44 London Wall dumps of similar ferruginous clay raised the level of each resurfacing of the road (Fig 87). These ground raising dumps, which were not confined to the road, were all dark in colour, sometimes containing visible organic material, orange ferruginous material and freshwater snail shells, suggesting that they became waterlogged. Two of the resurfacings were rather basic or had worn away (Fig 87), and did not extend as far west as the original edge, however, one of the latest re-surfacings extended beyond the west edge of the road. The level of the road was thus raised on four separate occasions, a depth of over 0.5m, to a level of 9.16m OD before truncation.

43 London Wall (Fig 110)

The demolition of the Period II building was followed by two main phases of dumping over the entire site (Fig 110).

Phase 1 - 4th century

Grey dark-grey silty clays which contained a light ferruginous content and soft red-brown woody material were laid. Two stakes had been inserted into the top of this dump sequence.

Phase 2 - 4th century

Dumping continued with deposits very similar to those of Phase 1 but contained a proportion of gravel suggesting that a degree of stability was required. Towards the east the dumps were less gravelly, even darker in colour (dark grey-black) and contained organic matter.

The dumps raised the ground level to *c* 9.3m OD, a depth of over 0.5m; deposits above this level were closely comparable but contained medieval pottery.

A clear break in the sequence of dumping demonstrates that it was not deposited in one major operation. Small groups of pottery from these dumps are dated *c* AD 313-400.

8 Telegraph Street (Fig 112)

Dumped deposits consisting basically of grey silty clays sealed the robbed Period II building and a crude drainage channel, north-west to south-east, was cut from its surface.

Pottery from the dumps and the channel is dated *c* AD 120-250, earlier than that of the robbed building (AD 240/300) and therefore residual. This sequence of dumps and drainage channel following demolition of buildings is common to all the sites in the study.

4-6 Copthall Avenue

Phase 1 - late 3rd-4th centuries

The Period II buildings were dismantled (Figs 64; 65; 99; 100) and a series of dumps raised the ground level by 0.4m - 0.5m (not illustrated). In the western trench these dumps were composed of grey and brown silty clays, often containing small building debris fragments and suggesting destruction debris (Figs 64; 65). In the eastern trench they consisted of dark grey silty clays, obviously waterlogged (Fig 99). Here the dumps were cut by a pit or ditch (Fig 99).

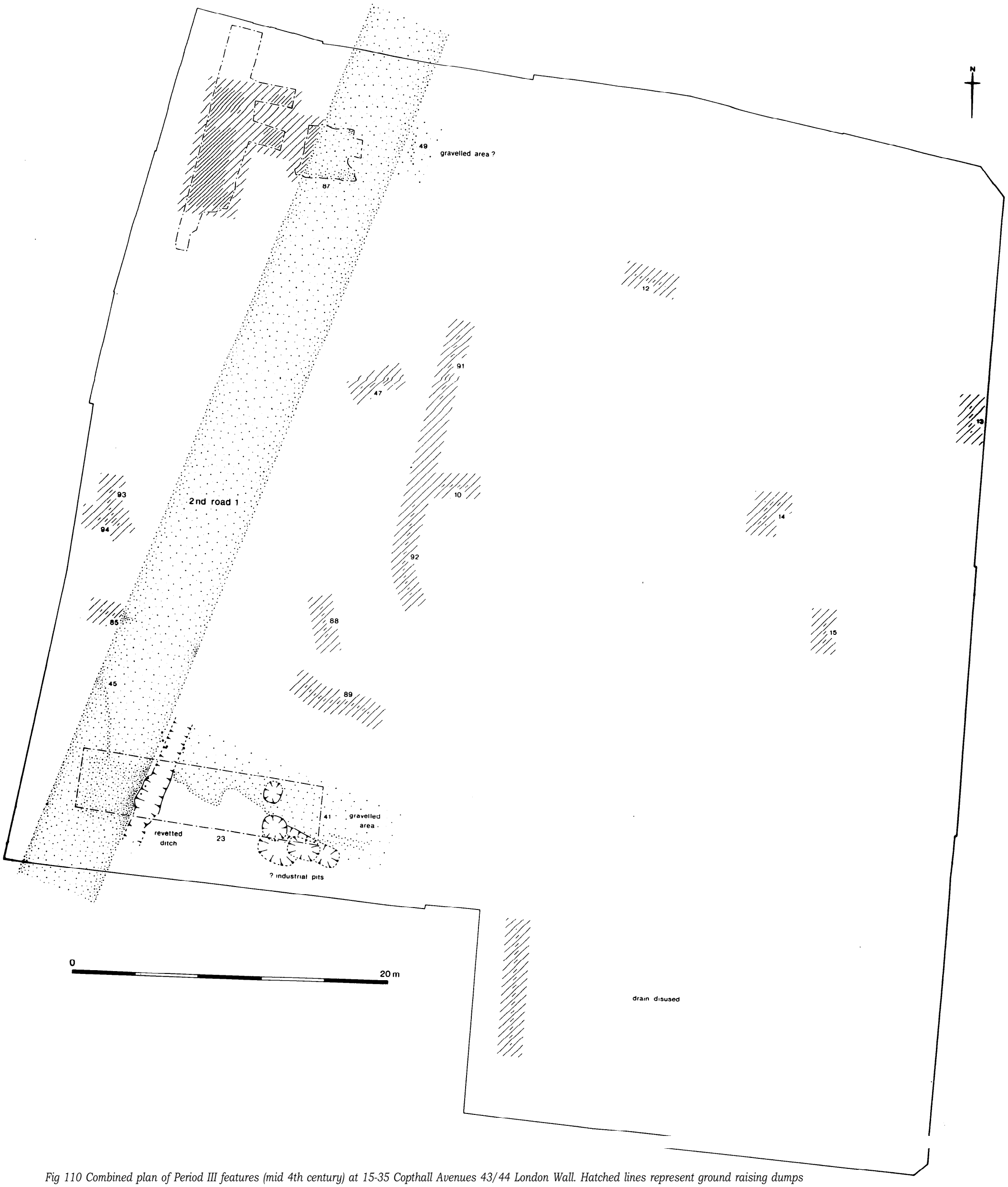


Fig 110 Combined plan of Period III features (mid 4th century) at 15-35 Copthall Avenues 43/44 London Wall. Hatched lines represent ground raising dumps

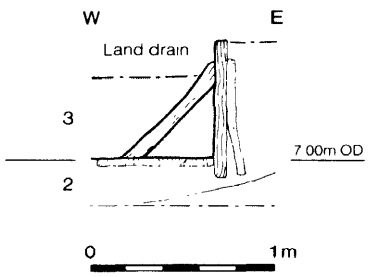


Fig 111 15-35 Copthall Avenue, watching brief: section

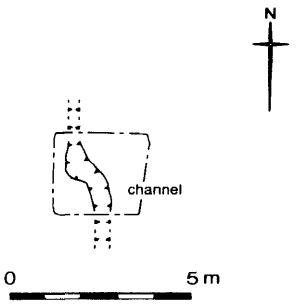


Fig 112 8 Telegraph Street: plan of Period III features

Phase 2 (Fig 113)

Two substantial ditches, clearly designed for drainage, were cut into the dumps. These ditches ran north-east to south-west (Figs 64; 113) and west-northwest/ east-southeast and unless they stopped short, must have interconnected. One of them was later re-cut (Fig 100). They contained naturally accumulated fills of organic clays with very few inclusions. No dating evidence was recovered.

Dating (Fig 114)

This period belongs broadly to the 4th century, but any refinement of the basic framework is beset with problems. None of the sites produced very many finds, and the bulk of those were coarse pottery sherds, mostly locally-made, which are not susceptible to close dating. Very few stratified sequences of 4th century Roman pottery from London have been studied until recently, and the detailed chronology of fabrics and forms is yet to be evaluated. More precise evidence is provided chiefly by coins - which in some cases may be residual, just as much of the pottery clearly is - and by pottery types imported from outside the London region and dated on sites elsewhere.

At 44 London Wall the latest road surfaces and associated dumps may date from as early as the late 3rd century. Three radiate copies were found within them, and the Oxfordshire wares are not those typical of the latest (post-350) output of that region. The material from the Phase 1 deposits at 15-35 Copthall Avenue, which includes a radiate coin and an imitation DR 45 *mortarium* in Oxfordshire ware, might also be given a late 3rd/ early 4th century date were it not for the occurrence of sherds from a Calcite Gritted Ware jar. Current theory dates this to 350 or later, but future study may ultimately prove it to have been introduced earlier. Phases 2-5, on the other hand, can be confidently assigned to the second half of the 4th century on the grounds of their containing Porchester D type pottery.

The dumps observed in the watching-brief at 15-35 Copthall Avenue are assumed to have been deposited in the 3rd or 4th centuries, even though they contained only residual sherds, but those on two of the other sites have exclusively 4th century dates. At 43 London Wall they contained a coin of Constantine, which provides a *terminus post quem* of 313-6, and at 4-6 Copthall Avenue they overlay the demolished Period II building, the final phases of which are dated to the late

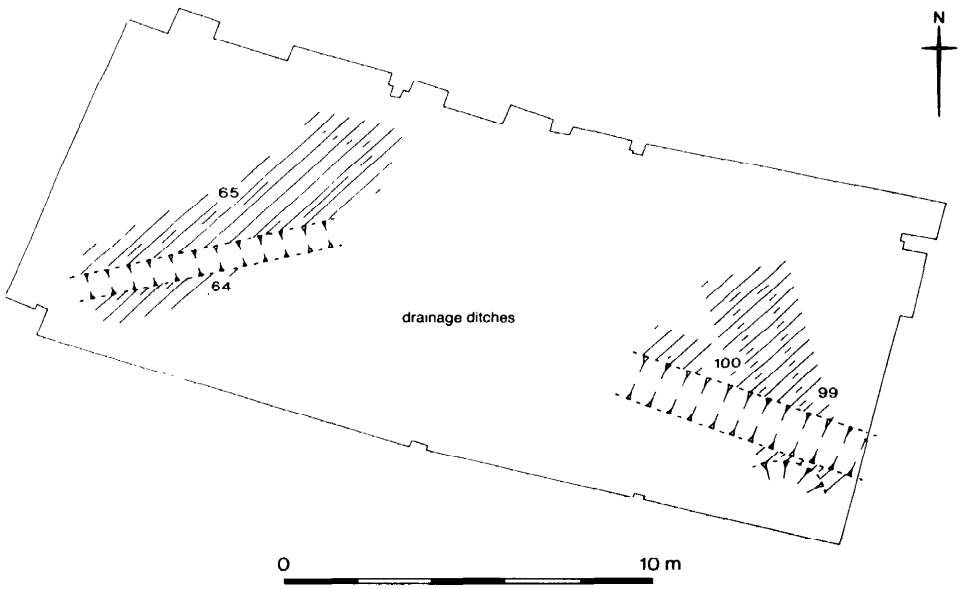


Fig 113 4-6 Copthall Avenue: plan of Phase 2 features

Phase	Dendrochronology	Coins	Stamped samian	Other pottery	Suggested date for phase
15-35 Copthall Avenue, controlled excavation (OPT 81)					
1	—	Radiate, late 3rd c ?Radiate, late 3rd c	—	BB1, BB2, BBS, **CALC** COMO C306, DR20 HWC KOLN, LOMI MHAD MOSL NKGW, NKSH, NVCC NVMO, OXCC OXMO, **OXRC** PE47 PRW3, RDBK, RHOD, VCWS VRW date AD 300-400	4th c
2	—	Antoninus Pius, As, AD 143-4	none relevant	BB1, BB2 BBS, COLC DR20 HWC, KOLN LOMI MOSL NKSH, NVCC, OXMO PE47 **PORD**, VCWS, VRW date AD 350-400	mid/late 4th c
3	—	—	none relevant	AHFA BB1, BB2, BBS **CALC** DR20 **EPON?**, FMIC HWC KOAN LVRW MHAD? MICA MOSL NGGW NVCC OXMO **OXRC**, PE47 **PORD** VCWS VRW date AD 350-400	mid/late 4th c.
4	—	—		AHFA BB1 BB2 BBS CGBL COLC, COMO DR20 EIFL HWC LRMA, MHAD MICA MOSL NVCC NVMO OXMO **OXRC** PE47 VCWS VRW date AD 300-400	mid/late 4th c
5	—	Tetricus I, AD 270-3 Carausius?, radiate AD 286-93		AHFA BB1 BB2 BBS **CALC** CGBL DR20 EIFL? GROG KOAN NKSH NVCC NVMO OXCC OXMO **OXRC** PE47, **PORD** VCWS VRW date AD 350-400	mid/late 4th c
15-35 Copthall Avenue, watching-brief (KEY 83)					
—	—	—	—	Roman residual	3rd/4th c ?
44 London Wall					
—	—	Radiate copies (three), late 3rd c	—	**AHFA** BB1, BB2, BBS DR20 LCWS NVCC OXMO PE47 VCWS VRW date AD 240 400	late 3rd c or later
43 London Wall					
1	—	Radiate copies (five) late 3rd c Constantine I, follis, Constantinine I? AD 310+?	-	**AHFA** BB1 DR20 LCWS NVCC? **OXCC** OXMO **OXRC** PE47 VCWS early medieval (intrusive?) date AD 300-400	early 4th c
2	—	—		**AHFA** BB1 BB2 COLC DR20 KOLN MOSL **NVCC** PE47 RDBK VCWS VRW date AD 300-400	early 4th c or later
4-6 Copthall Avenue					
1	—	—	—	AHFA BB1 HWC NVCC date AD 250-400	early 4th c or later
2	No significant dating evidence				—
Telegraph Street					
No dating evidence					

Fig 114 Summary of dating evidence for Period III

3rd/ early 4th centuries (see above, p. 63); on neither site, however, were there finds to prove that the sequence necessarily extended into the second half of the 4th century.

Discussion (Fig 115)

15-35 Copthall Avenue

The reason for the abandonment of the buildings in the ?3rd/ mid 3rd century is not understood, but it may be that the buildings had become uncomfortably damp or that the reasons for their siting in the area were no longer relevant.

Activity re-commenced at 15-35 Copthall Avenue when the ground level was raised some 0.25m (Phase 1); the east side of the road was repaired and brought up to the same level as a raised external surface on its east side (Fig 115). A substantial ditch, cast beside the road and the external surface, was clearly designed to carry more than surface run-off (Phase 2) though environmental evidence indicated near stagnant water (Part 8 p 112). Evidence from 44 London Wall suggests that the last good road surface extended westwards beyond the edge of the Period II road.

The Phase 2 raised surface may have been associated with an industrial process, for a succession of large distinctive pits were cut from that part of the surface furthest from the road. Within the dumped foundation of the surface were found large quantities of furnace-lining which suggests that it was derived from the area. Thereafter, although pits were dug throughout this period and some sort of structure was built in Phase 4, activity was mainly confined to drainage, particularly beside the road, and the dumping of clay and gravels to the south of the raised surface (Phases 4-5). Environmental evidence from the controlled excavation testifies to continuing occupation and wetness of the area (Part 8 p 112).

Successive dumping, drainage ditches and gullies and the raised surface of Phase 2 are suggestive of drainage problems. Because there were no flood layers, the problems are considered to have been caused by the ground becoming saturated with water.

Dumped deposits were noted in many sections exposed during the watching brief. The buildings were sealed by dumps of clay, as were the gravelled surfaces on the east side of the site and possibly the land drain in the south. On both sides of the road dumps were recorded, sometimes above peaty deposits. These peaty deposits may also have been dumped or they could have represented *in* situ waterlogged deposits, either case indicating wet ground conditions. The dumps may therefore have been attempts at reclamation.

43 and 44 London Wall

Evidence from 43 and 44 London Wall also implies that ground conditions had become wet. At 44 London Wall the road was re-surfaced above four separate dumps which altogether raised the ground level by over 0.5m. This corresponds closely to a similar level of dumping on the adjacent site, No 43. Darker, more organic deposits above and in the vicinity of the Period II roadside ditch suggest that water continued to accumulate here. Saturated ground - also confirmed at No 44 by the freshwater mollusc shells within the dumps - presumably prompted the raising of the contemporary ground level and the resurfacing of the road. Characteristics of the dumping, common to both the Roman and medieval dumps (organic matter, ferruginous material, mottling), were probably the result of waterlogging.

From this period at 44 London Wall, there is only one good group of pottery dated *c* AD 260-300 from the earliest of the dumps. At 43, London Wall, however, the contemporary dumps are dated *c* AD 313-350/ 400.

Further south the resurfacings of the road at 15-35 Copthall Avenue were not laid onto raised ground in the way that they were at 44 London Wall. Here the road was always much higher than the surrounding ground level (apart from the Phase 2 raised surface and that suggested towards the north end of the site) and there were no indications of drainage problems before *c* AD 350-400.

8 Telegraph Street and 4-6 Copthall Avenue

A similar sequence was recorded at Telegraph Street. Some time after *c* AD 240-300, the ground level was raised and a small drainage channel cut. Following the demolition of the buildings at 4-6 Copthall Avenue, the ground level was artificially raised by means of dumping, probably in the 4th century. Two drainage ditches cutting into these dumps could have been Roman or medieval. Just to the south at Angel Court (Blurton 1977) late 4th century water-borne silts, with a possible pathway between them, covered the entire site.

To the north of the city wall (constructed *c* AD 190-220) ground conditions may have degenerated more quickly than those to the south. A small excavation against the north of the wall took place in 1982 in a telecommunications hole in London Wall street (Site 12) (Pye 1985). Here a peaty deposit pre-dated the wall but seems to have been a fill within a ditch. Above this another sequence of peaty deposits had built up against the outer face of the wall: one of these is dated *c* AD 70-200. This evidence suggests that ground conditions, if not marshy before the construction of the wall, became so soon afterwards.

Further north at Broadgate (Site 5) (Malt 1987), some time after the city wall was built, the creation of a marshy or swampy environment was represented by the filling of the main stream channel with peaty clays containing freshwater mollusc shells. Further archaeological excavations to the north of the wall are needed before the date for the onset of the marsh here can be confirmed. The evidence from London Wall and Broadgate, however, does seem to support Reader's thesis (1906, 184) that the wall effectively became a dam, either because the culverts were not cleared out and silted up, or because not enough were provided. Silting would have been aggravated by rapid erosion. On this side of the wall at least, the result would be an accumulation of water which eventually led to the development of a marsh.

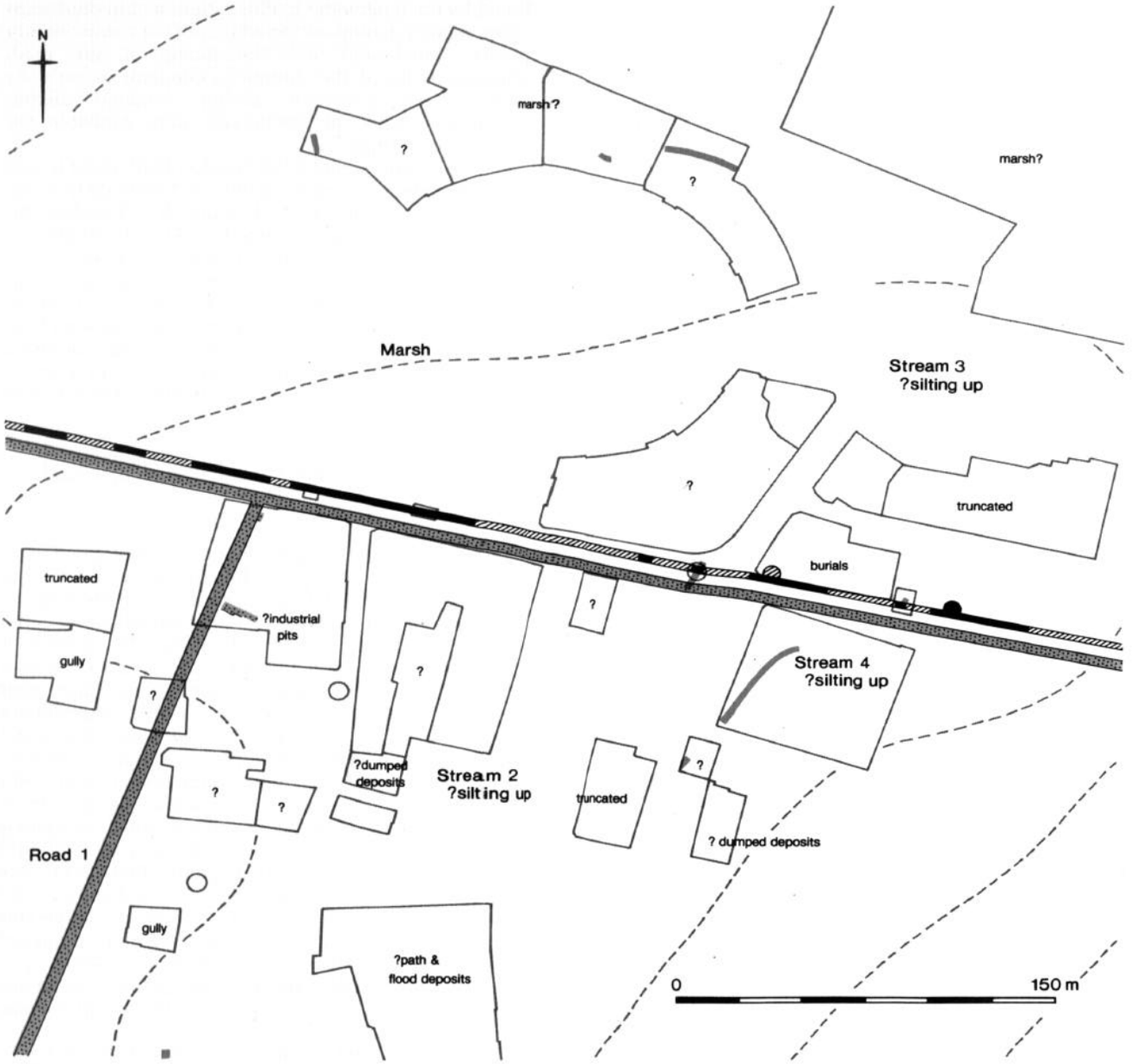


Fig 115 Study area: plan of Period III features, c mid 4th century

6. Period IV: Post Roman Development - a Summary

15-35 Copthall Avenue: controlled excavation

The abandonment of the site was marked by the formation of a marsh. The earliest of the marsh deposits contained both mid-late 4th century and 11th century pottery. Because these deposits were naturally formed and would have grown over a long period of time and, because their formation was directly linked with the Roman occupation of the site, this part of the post-Roman sequence is presented in detail. Thereafter the development of the site will be summarised.

Phase 1 - 11th-mid 12th century

The site, including the Roman road, was covered by a blue-grey peaty clay which contained rootlets and, at its lower levels, lenses of plant remains and aquatic mollusca (OPT *99)* (Fig 23). This is typical of the lower levels of a waterlogged marshy formation in which the finest particles sink to the bottom. A crude shallow channel and a large pit had been cut in this peaty layer.

Phase 2 - 11th-mid 12th century

Grey clay containing 'strands' of ferruginous material and freshwater mollusca was dumped onto the marshy deposits, infilling the Phase 1 channel and pit. Above it, an area of pebbles in a matrix of the same clay may have been the remains of an external surface. To the east a large north-west to south-east aligned cut feature, the purpose of which is not clear, was filled with this clay (Fig 41). It probably acquired its characteristics from waterlogging.

Phase 3 - 11th-mid 12th century

Dark grey-black peaty clay which contained freshwater mollusca and plant remains sealed all earlier features (Fig 23, OPT *94*). In places it was rust-red where it had oxidised.

This clearly demonstrated marshy conditions in which plant life decayed *in situ* in waterlogged ground. A pit, the only feature associated with this peaty deposit, had gradually filled by this means.

15-35 Copthall Avenue: watching brief

Peaty deposits were in the main observed in the former valley of the tributary, representing the development of marshy conditions. These deposits formed the uppermost levels of the surviving archaeological sequence and on excavation were either beyond reach or had been rendered dangerously unstable by their soft texture; they were therefore summarily recorded.

In most sections in the centre of the site (Figs 17; 18; 91; 92) very peaty deposits sealed the gravelled surfaces.

All sites in study area (Fig 116, 117)

Marshy deposits were not noted on any of the other sites in the study area, though the medieval sequences had been truncated at 44 London Wall and 4-6 Copthall Avenue. It is probable that the course of former streams influenced the colonisation by marshy deposits of the upper Walbrook valley south of the defensive wall. Evidence from the sites in the area of study indicates that reoccupation first occurred at the southern end of the upper Walbrook valley at Telegraph Street. Here, ground conditions seem to have been as wet as sites further north and dumping re-commenced in the Saxon period. This was followed by a wattle and daub building of the same date.

The steady formation of marshy deposits at 15-35 Copthall Avenue (controlled excavation) - represented by deposits which ranged from strong-smelling black organic silt to red-brown fibrous organic matter (OPT *64, 70, 74, 81)* - was interrupted by a brief period of what may have been industrial activity. Four large, deep pits, one at least of which had been lined with wattle, were dug into what would have been the relatively dry ground of the Roman road, and the surrounding area surfaced (Fig 23). They were infilled in the early 12th century with organic matter including numerous leather off-cuts (OPT *82, 213*). Two cut features recorded in the watching brief appear to be similar: they were large, deep and cut into a Period II gravel surface (Fig 18). Here and elsewhere the Roman pattern of reclamation by means of ground raising dumps and drainage ditches continued as though the intervening centuries had not passed, the wet ground even resulting in comparable deposits (Period IV). At 15-35 Copthall Avenue and 43 London Wall where the later sequence survived (besides Telegraph Street), both dumping and the cutting of ditches re-commenced in the late 11th-early 12th century. Macroscopic, insects, mollusc and ostracod remains from the peaty fills of a ditch at 15-35 Copthall Avenue - probably contemporary with the ?industrial pits (above) - (OPT *69, 218, 119, 124* and *131)* (Fig 41) indicate that the environment was wetter, possibly with some slow-running water, and more natural than it had been during the Roman period (Part 8, p 114). These findings are therefore compatible with a marshy environment that had been allowed to develop unchecked over seven centuries. Interestingly, however, there is a hint of cultivation in the area (Part 8 p 112).

Reclamation or attempts at reclamation of the marsh is well attested in the historical record though the references are to the 'moor' outside the city's walls,

Moorfields. Here the marsh was evidently much more persistent. First mentioned by Fitzstephen writing in the 12th century (Stow 1970, 380), the ditches were re-cast in 1415 when the Moorgate postern was built but Moorfields must have remained wet for in 1512 the mayor 'caused divers dikes to be cast... with bridges arched over them, and the grounds about to be levelled... but yet it stood full of noisome waters' (Stow *ibid).* These attempts continued until the early 17th century when the ground level was successfully raised for the last time.

Inside the walls the evidence from 15-35 Copthall Avenue and 43 London Wall indicates that, though the marsh persisted for a while after re-occupation on the former site, determined efforts produced comparatively dry ground by the 12th-13th centuries. Inside the walls the Walbrook had been re-established as a network of streams and was extensively employed as ward boundaries (Stow 1970; 158, 167, 214, 224, 232, 234-5, 248,253). A fair amount of documentary evidence about medieval conditions in the Upper Walbrook has been collated by Tony Dyson (1977, 15-6). The upper Walbrook was evidently very wet and marsh like, even as far south as Angel Court (Site 34). At the north end of

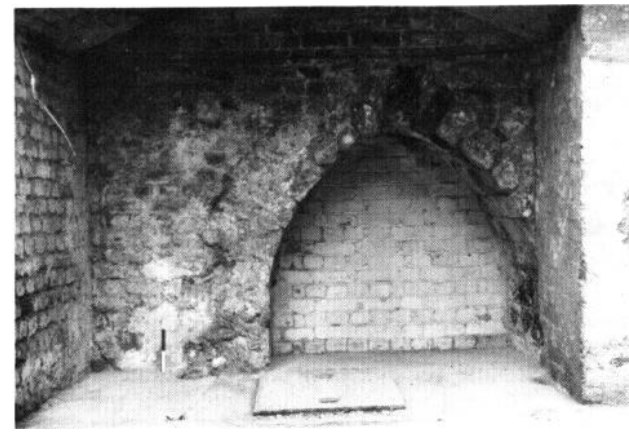


Fig 116 15-3.5 Copthall Avenue, watching brief: blocked-in medieval culvert on London Wall frontage. Scale in 0.10m units

15-35 Copthall Avenue, beneath the pavement of London Wall, a stone arch was located on the line of the Coleman Street ward boundary (Fig 116) and has

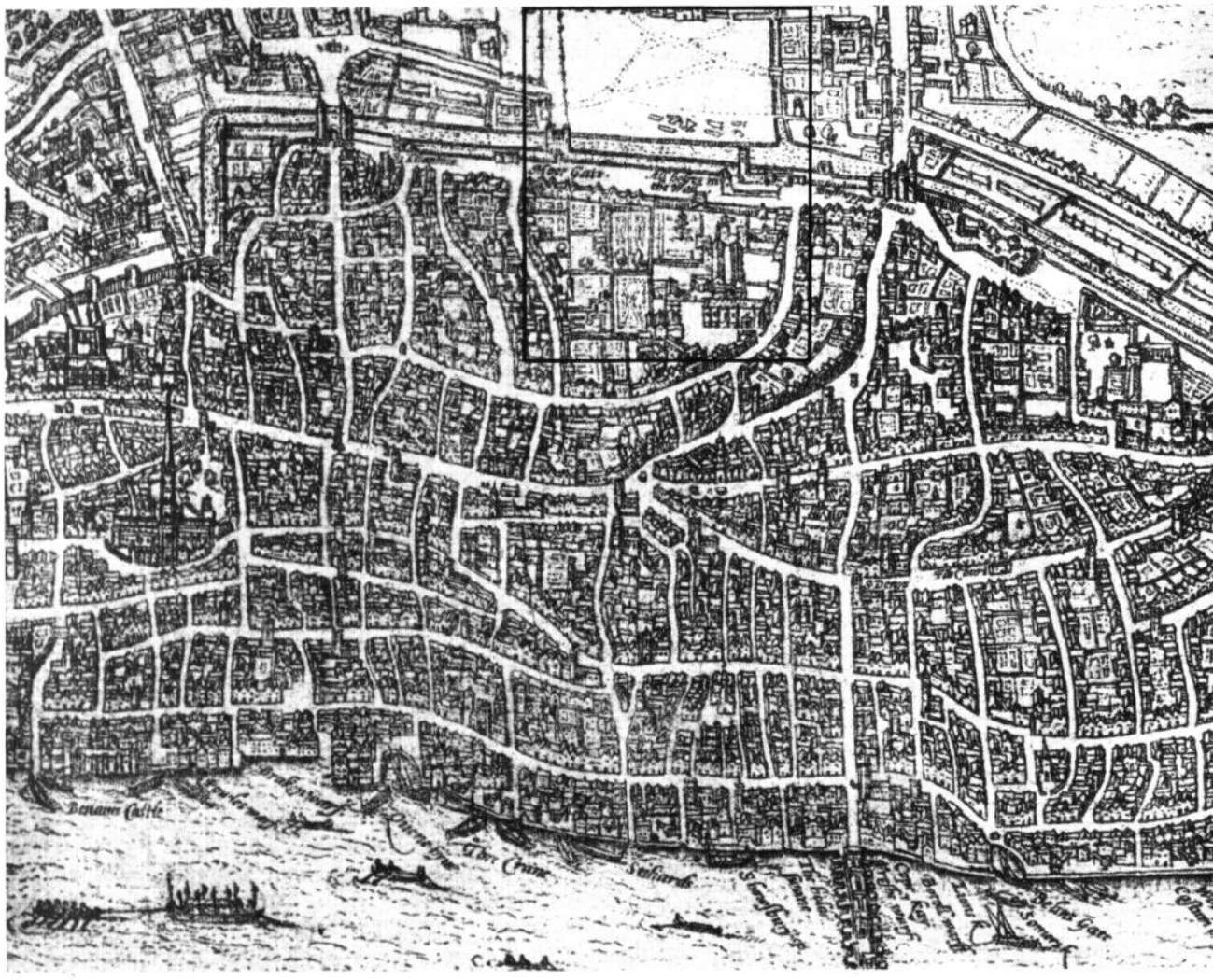


Fig 117 Detail of map of the City by Braun and Hogenburg (1574 German Atlas of European Cities *first published 1572), showing upper Walbrook area (outlined) largely undeveloped*

recently been found just to the north of the site in the defensive wall (Site 13) (T McKinder LWL 87, pers comm). It has been provisionally dated to the 15th century or later and presumably represents a culvert for the passage of a Walbrook tributary. This tributary is marked as the Common Sewer on a plan of part of the site by Ralph Treswell in 1614 (Schofield 1987, fig 31). Its location bears no resemblance to the prehistoric stream because, as this study demonstrates, this had been blocked in the Roman period and replaced with a sequence of channels and drains which were eventually either filled in or silted up. The course of the stream as defined by the culvert and the Coleman Street ward boundary was formed after the Roman period in dumped and 'marsh' deposits. A post-Roman channel, either naturally or artificially formed, was, however, recorded above a well-buried prehistoric streamlet (Fig 12); its location may identify it with this medieval tributary (see plan of sections, Fig 7b). During the medieval period the streams were gradually bridged over until the Walbrook became an underground stream (Stow 1970, 15).

As in the Roman period, the upper Walbrook valley became an area for industrial activities. This in part presumably reflected the poor nature and therefore low value of the land but on the periphery of the city, where unpleasant smells could be tolerated, this was a suitable area. A good water supply could also be exploited. At 15-35 Copthall Avenue large, regular pits dated to the 11th/ 12th centuries (above) may have been associated with a tanning industry; the upper Walbrook was for a long time associated with the leather trade. In the later medieval period curriers, for example, were noted by John Schofield as having lived in the Parish of St Stephen Coleman Street as 'an early nucleus' and from there spread to the parishes along the northern limits of the city (Schofield 1989). Leathersellers Buildings are marked on Horwood's plan of 1799 in the forerunner of Copthall Avenue. Between the 12th and 15th centuries the site was utilised for the production of bronze and, in particular, bronze buckles (Armitage *et al* 1981). Schofield has also noted that 'Of the metalworking trades, the founders concentrated in four northern parishes (St Lawrence Jewry in the west to St Mary Lothbury in the east)' during the 15th-16th centuries. In a series of late medieval wills, founders in the city numbered 29 (15th century) and 19 (16th century); curriers numbered 19 and two for the same periods *(ibid).*

From the end of the medieval period a slow transformation of the upper Walbrook took place as streets and dwellings were built. The draining of the 'Moor' north of the city wall in the 17th century hastened this transformation. Properties in the area fronted onto the well-established streets of Coleman Street, Broad Street and London Wall, the poor ground conditions probably accounting for their extensive gardens (Fig 117). Gradually properties came to be built behind these frontages with access via a number of alleyways. Little Bell Alley, the forerunner of Copthall Avenue, is shown on Ogilby and Morgan's map of 1677. At 15-35 Copthall Avenue, the only site in our area of study where the strata survived, this period is represented by ground raising dumps, garden soil, yard surfaces and pits, the latter mainly in north-south rows and often superimposed, suggesting property boundaries.

During the 19th century Moorgate street was laid out, Little Bell Alley was replaced with Copthall Avenue and larger properties began to appear. Much of the Copthall Avenue site was occupied by the Coleman Street Ward School. This change was noted in the archaeological record by the different alignment of the services represented by brick drains and a sewer pipe. A great number of ceramic ink-pots were found in backfill material, providing a clear link with the school.

By the later part of the 19th century the area was extensively developed specifically for office accommodation although the school was re-built in 1894. It was buildings dating from this period that were demolished in the 1980s and provided the opportunity for archaeological investigations.

7. Summary Finds Report

by J Groves

Introduction

The finds from the 1981-4 excavations are of particular importance in considering usage of the upper Walbrook valley because, prior to 1981, the only other site subject to modern excavation techniques was that at Angel Court (Fig 2, Site 34) (Blurton & Rhodes 1977). They provide, therefore, an excellent comparative assemblage and a reliable means of testing theories based on the evidence from earlier sites.

Period I (reclamation and drainage)

Domestic and personal items form the largest category of finds. Within this category, leather shoes (fragments of approximately 180) are the most common item, followed by sherds from nearly 70 glass vessels, mostly in 'self-coloured' greens or blues and forming an unremarkable assemblage. Ribbed flagons or jars, bowls and square bottles are the identified forms. There is a diverse range of other personal/domestic items including an amber bead, a pair of copper-alloy tweezers, a shale couch leg, a bone pin and a copper-alloy brooch.

Some of the finds are indicative of industrial processes. Leatherworking is represented by leather offcuts from shoe production. These have a notable concentration in the road foundation (OPT 81, Phase 2, 625), and indeed this layer was so thick with the material that it seems likely that the work-shop which produced it lay nearby. Two double-sided wooden combs with bowed ends and coarse and fine teeth may be associated with the leather industry for a comb of the same type, excavated at *Vindolanda,* had animal hairs, probably from cattle, attached (Birley 1977, 123-4; pl 60). This has led to the suggestion that this type of comb was used in the tanning process *(ibid).* Previous evidence for leatherworking in the Walbrook valley was found at Bucklersbury House by Grimes (1968, 96-7) in the form of a pegged-out hide on a hut floor.

Boneworking is represented by at least 17 cattle scapulae with pieces sawn from the blade, and by four other examples of bone/antler waste. There is a scattered distribution of woodworking waste, predominately oak, with some concentration (33 pieces) from one of the road surfaces (OPT 81, Phase 6, *303*). Since oak is a very durable wood it is normally used for heavy construction work and may, therefore, be evidence of building activity.

Potentially more significant are seven pieces of glassworking waste. Waste of a similar type - which includes raw 'bulk' glass, droplets from working, waste from the ends of blowing-irons ('moiles'), and occasional fragments of furnace structure - has recently been excavated on a number of other sites in this area, and although it is possible that it was taken from elsewhere in the city to be dumped here, the large quantities that have been recovered suggest that the glasshouse was actually situated nearby. A small quantity (75gm) of furnace lining is also present in Period I and although it is not possible objectively to determine the industrial process that produced it, its association with glassworking waste suggests it may have come from a glass furnace (J Bayley, pers comm). The remaining evidence for industrial activity consists of a crucible fragment and a few pieces of iron slag which have not been scientifically analysed.

A wooden writing tablet with a broad central groove, 23mm wide, is a possible indicator of commercial activity. This type of tablet, which was part of a triptych, was often used to record business transactions, the function of the groove being to accommodate seals (Chapman 1978, 397-400; figs 182, 183). Fragments of three other writing tablets were also recovered, which, together with an iron stylus, may similarly have had commercial or administrative functions. The presence of the Roman army in London is represented by a few leather finds - in particular, parts of tents, a saddle and a shield cover - but it is not known whether these came from the nearby Cripplegate fort or were redeposited from elsewhere in the city.

The only votive object found was an antler amulet from one of the road surfaces (OPT 81, Phase 6, *303).* In addition to peripheral holes for suspension or attachment it has a drilled central hole which would have held a carved bone phallus (S Greep, pers comm). Phallic objects were regarded by the Romans as good luck charms (Johns 1982, 62), but it is very unlikely that this was deposited as a votive offering: it was found on a road surface and, besides, here the natural stream of the Walbrook had been filled in and replaced by artificial drainage by the time of its deposition.

The pottery, as might be expected of material redeposited in make-up layers, consists mainly of small sherds, sometimes crushed and abraded. The remaining finds are building materials - bricks, tiles, *tesserae,* painted wall-plaster, nails and window glass, all in small quantities. This material is so mixed and fragmentary that it is unlikely to have derived from the demolition of any single building and must have been redeposited.

It seems, therefore, both from the largely mixed quality of the finds generally and from the fragmentary condition of the pottery and building materials, that the assemblage consists mainly of redeposited rubbish which was dumped in the Walbrook valley as landfill. The source was probably households and workshops in the surrounding area and/or the City generally, but the only finds which may with any certainty be related to activities in the immediate vicinity are the glassworking and leatherworking waste. The survival of a relatively large quantity of leather and wood reflects the very waterlogged conditions of the site and the high proportion of material from the road surface itself shows clearly that the area was still subject to flooding.

Period II (buildings)

Levelling deposits at 15-35 Copthall Avenue (Phase 1)

These deposits contained by far the majority of the finds from Period II. As in Period I, domestic or personal items dominate the small finds assemblage, with parts of 45 shoes and sherds from nearly 50 glass vessels being the most common types. The vessel glass is very similar to that from Period I, whereas the other finds in this category include six bone pins, two needles, a copper-alloy furniture handle, an iron brooch, an iron knife and two glass beads.

Most types of industrial waste present in Period I recur here. Glassworking (13 waste fragments), boneworking (16 fragments, including 13 cattle scapulae), leatherworking and woodworking are attested, and there are parts of two crucibles. One of these was used for brass melting, while another was possibly used in gold refining. Two wooden handles, one of which is bound with cloth, appear to be from tools rather than ordinary knives, and may thus be regarded as further evidence of crafts and industries.

Again as in Period I, these deposits contained writing-tablets (two) and styli (five). The large number of styli indicates the extent to which written records - chiefly, no doubt, bureaucratic or commercial - were used in early Roman London. The Bucklersbury House site in the lower Walbrook valley yielded an even greater number (16), but there they were found in a layer which is thought to represent clearance from a nearby blacksmithy; besides the styli, there were large quantities of ironworking waste and thousands of scrap iron objects which had apparently been salvaged for re-processing (Hume 1956, 67; Wilmott forthcoming).

The religious life of the city is further represented at 15-35 Copthall Avenue by two ceramic figurines. One is of Venus, the other is probably a Mother Goddess. Their presence in the make-up dump with general domestic rubbish suggests that they may have belonged originally to domestic shrines and been discarded with other refuse. Finally, there is one find, a wooden bobbin, which possibly falls into the military category. This may be a fastening for a tent door and is paralleled at Angel Court (Chapman 1977, 67; fig 20, no 487). The building material is very similar to that from Period I. Window glass is absent but there are two pieces of a wooden window frame. Only two other examples are known from Britain: from Angel Court (Chapman 1977, 67; and fig 21, no 491) and from Cramond, Scotland (N Holmes, pers comm). Another rare item is a glass *tessera*. This would have been used to pick out details on a floor or wall mosaic, or, possibly, as decorative inlay in a piece of furniture.

The pottery assemblage differs from that of Period I in that it consists of much larger sherds, some of which join to form complete vessels. This might be explained partly by the soft, loosely-filled nature of the deposit, and partly by the fact that the material had not been redeposited. Nevertheless, it is likely that the pottery was brought in from elsewhere in the City, since two contexts *(499* and *518*) contain mostly burnt sherds which may be from properties destroyed in the Hadrianic Fire.

Overall, therefore, the finds from this deposit are very similar in character to those from Period I, but without the notable concentration of leather waste. Household rubbish, at least some of it redeposited, is again the most likely source.

Building A at 15-35 Copthall Avenue

The pottery assemblage is small, unexceptional and typical of a standard household. As in Period I and the Phase 1 levelling-deposits, the 'small finds' largely fall into the domestic/ personal category. There are sherds from nearly 20 glass vessels, a bone die, three bone pins, a copper-alloy nail cleaner, an iron bucket loop, an iron needle and a stud. In addition, there is an iron staple and a split pin - objects which might be expected in a timber-framed building - an iron stylus and an awl. The latter is possibly a leatherworking tool, home-made from a nail bound with leather rings to form a handle. The nail shank has a square section for most of its length but is more rounded towards the tip. This object possibly links the building with leatherworking.

The occupation surfaces and pits within the building yielded some other residues of industrial processes, including a small quantity of smithing slag (1504g), seven pieces of glass waste, and nearly a kilogram of furnace lining. The latter is of the same nature as that from Period I (see p 00). Although the quantity of smithing slag from the building is small, it is possible that smithing was undertaken here; the absence of similar material in earlier groups tends to suggest that it is not redeposited. Since workshops were probably kept clean large amounts of metalworking residues would not be expected to be found in workshop areas in any great quantity but are more likely to occur in secondary deposits as a result of dumping. It seems unlikely that the hearths in the building were used for smithing because they were at floor level; it is normally thought that Roman smiths would have used a waist-level hearth (J Bayley, pers comm).

Other evidence for industrial use of the building is also inconclusive. The material is possibly residual, having been brought to the surface from the underlying layers when, for instance, the internal pits were dug. The presence of similar material in earlier contexts reinforces this interpretation. As mentioned earlier (above, p 82), the interpretation of the furnace lining is problematical.

Finds from other buildings and features in the study area

The buildings excavated on the remaining sites were themselves devoid of associated finds apart from small quantities of pottery and building materials and, at Telegraph Street, a stone mortar. Other features of this period contained a range of finds very similar to that described from the building at 15-35 Copthall Avenue, though in much smaller quantities. Among the domestic/ personal items are about 20 glass vessel sherds, fragments of bone pins or needles, fragments of approximately 10 shoes, three coins and an iron key.

Industrial processes are represented by iron slag (not analysed), and glass, leather and woodworking waste. There are also five crucibles, three of which were probably used for melting debased silver. Of the others one was used for assaying/ refining small quantities of silver; the other for melting gold. The small assemblage of building material is mixed and fragmentary. It is unlikely, therefore, to come from the demolition of buildings in the immediate area and is probably redeposited.

Period III (late Roman developments)

The 'small finds' form a small assemblage composed of personal / domestic items similar to those found in the earlier periods. There are, however, only a few shoes and no wooden objects. The industrial debris is also similar to that from the earlier deposits although leather and woodworking waste are absent. Much of this material, which includes almost 7000g of furnace lining (see p 70) from the ground raising dump (OPT 81, Phase 1) and foundation deposits (OPT 81, Phase 2), can be presumed residual. The scarcity of leather and wooden finds, however, may reflect a real change in the nature of dumping and occupation in the area because the environmental evidence <see p 112) indicates that conditions were still suitable for the preservation of organic material.

The pit finds give little indication of function. The primary fill of the trench and interconnecting pit (OPT 81, Phase 2, context 183) contained a crucible used for assaying/ refining small quantities of silver, in addition to two pieces of glassworking waste (almost certainly residual), a stone hone, a few fragments of vessel glass and some building material and pottery. The remaining pits contained no more than pottery and building material.

There are 20 coins from Period III: 16 late 3rd century (mostly radiate copies); two early 4th century, one 2nd century and five unidentifiable (also Fig 114). This compares with a total of only three coins from the whole of Periods I and II, but, as Reece has shown (1972, 269-76), a sharp increase in coin-loss during the late 3rd century is normal on many Romano-British sites. The upper Walbrook sites may thus be seen as conforming to a general trend, whereas those previously excavated in the lower Walbrook - whose identified coins are almost exclusively 1st and 2nd century - deviate from it. This discrepancy is to be explained either by the fact that the late Roman layers had been removed on sites such as Bucklersbury House before archaeological observation began, or by the likelihood that untrained building-site workers would fail to recognise (or have no interest in) the small, often poorly-made, coins of the later Roman empire (see further, Hall in Wilmott forthcoming).

Conclusions

A remarkable contrast emerges when the material from Angel Court (Blurton & Rhodes 1977, 56-7) and the present sites is compared with that from earlier Walbrook excavations. The greatest proportion of the 'small finds' from recent sites are leather items, whereas previous excavations - at Bucklersbury House, for instance - produced an extremely high proportion of metallic finds and comparatively little leather, or indeed, pottery. This contrast is almost certainly explained by a difference in collection-policy. During the early excavations, which were essentially watching-briefs, only the more complete leather objects were retained. It is also apparent that the workmen were selective in the retrieval of finds - shiny metallic objects obviously having more attraction than other materials. The site notes written at the time reinforce this explanation, since they include references to vast deposits of leather (Wilmott forthcoming). There is certainly a major disparity between what was actually present and what was collected.

Although there are a few finds from the present sites which may be assigned to the 'military', 'business/ administration' and 'votive' categories, most are 'domestic/ personal' in character. They certainly would not support the hypothesis that the Walbrook - or, at any rate, the upper reaches of it - was either a busy market area or a stream used for ritual purposes. The sites produced various types of industrial debris, but this does not necessarily imply that the immediate area was the source of it all. Recent excavations have shown that in the 1st and 2nd centuries the central parts of the city were densely built up and, rather than dig pits, it may have been common practice to take rubbish to outlying, more deserted, areas for disposal. The only industries which definitely seem to have been situated in the area are glassworking (waste found on a number of sites nearby), leatherworking (very large deposits of waste material and a tool possibly used in leatherworking) and, perhaps, blacksmithing (smithing slag from Period II building). Nevertheless, it is impossible to prove conclusively from the finds that any of the buildings or pits were industrial.

Finally it is of interest to note that the material dumped during Periods I and II is, perhaps, largely from a different source from that of Period III for the organic finds, which are so prominent in the earlier periods, occur only in small quantities in Period III, despite the prevalence of waterlogged conditions.

8. Environmental Analysis

edited by D de Moulins

Parts 2-6 of this study examine the evidence from a number of sites in the upper Walbrook valley; this part, however, considers only one site, 15-35 Copthall Avenue (OPT 81). It was not possible to carry out environmental investigations on all the sites. During the controlled excavation of OPT 81, the preservation of organic material was found to be excellent. Macroscopic plant remains such as whole leaves of box, *Buxus sempervirens,* were hand picked from the deposits and willow or poplar tree stumps uncovered and - as described above (Part 7) - many leather and wooden objects were preserved. A preliminary investigation of the soil samples showed that the preservation of seeds and insects was equally good.

This project was the first multidisciplinary investigation of the environmental evidence for London. The location of the site on a tributary of the Walbrook made it important, the topography and environment of the valley being a major consideration of the archaeological studies in this area (Part 1). The stratigraphic deposits ranged from pre-Roman to modern times with pre-Roman, Roman and medieval periods represented. The good preservation of the organic remains by waterlogging meant that the character of the natural landscape before the Roman occupation, the conditions of the streams, and the evolution of the landscape at various later stages, might be determined. It was expected that a study of different types of environmental evidence would allow the possibility of tracing some human activities and evaluating the human impact on the environment of this marginal area. This account of the environmental studies of 15-35 Copthall Avenue has been compiled using the various specialists' reports. The reports themselves can be found in the archives of the Environmental Archaeology Department (Museum of London), the insect archive report can also be found at the Ancient Monuments Laboratory, Historic Buildings and Monuments Comission and at the Environmental Archaeology Unit, University of York (EAU).

The biological remains

In order to carry out this investigation, it has been necessary to examine as many different remains from plants and animals as possible. At 15-35 Copthall Avenue pollen and macroscopic remains of plants, insects, molluscs, ostracods and parasites were analysed. Some samples were studied for diatoms but all proved negative. The interpretation of these biological remains presents some problems when they are found in an urban context. Many of these have been discussed by a number of authors in Hall and Kenward (1980; 1982) and a few additional points are made below (pp 87-9).

Two column samples were taken for pollen analysis of which one was studied by Dr R Scaife (HBMC). Besides its well-established position in the study of palaeoenvironments and its value in providing a regional background to human activities, pollen analysis also has a role to play in the description of the local human environment. In urban deposits it does, however, present problems of interpretation because of the difficulty, among others, in distinguishing the local from the regional input of pollen. The origin of the local input could be from a great number of sources and therefore reflect many activities (Greig 1982; and below p 88). Pollen analysis may also reinforce the results obtained from other evidence used to reconstruct the natural environment. The pollen column used for this study came from the base of the east section (Fig 41 a and b). The samples analysed from it were from an early flood horizon (OPT *601)* from Period I, two channel silt deposits above it (OPT *589, 591),* also from Period I and two organic dump deposits (OPT *523* and *535*) of Period II.

Plant remains from waterlogged deposits can give indications of the local vegetation around a site. The evolution of the vegetation through time and the impact of human activities may be recorded by changes in composition of the plant remains through the deposits. They can also be interpreted as indicating certain human activities linked with food transport, diet or animal husbandry. The preservation of the botanical macroscopic remains by waterlogging was excellent throughout the deposits. As a consequence, their analysis has been possible for many sampled contexts and includes all the periods uncovered during the excavations at 15-35 Copthall Avenue. Their study therefore provides a background against which the other evidence can be compared.

Seeds and fruit are the part of the plant most commonly recovered from the deposits; other plant parts have been recovered and mentioned whenever possible but they are less often identifiable than seeds. However, seeds do not represent the whole plant in a straightforward way and their interpretation in terms of the reconstruction of the environment is difficult. Utilising more than one type of evidence to confirm a conclusion is therefore important. The problems posed by the interpretation of botanical evidence have often been pointed out, in particular by Green (1982) in his studies of medieval urban material.

Plant remains preserved by charring usually yield information about diet and human activities such as food preparation, crop processing and rubbish disposal that may have taken place on the site. Some evidence of this type was recovered from 15-35 Copthall Avenue, chiefly from the pits, hearths and floor surfaces associated with the building in Period II but charred remains were also sporadically present in other layers. The analysis of the plant remains was undertaken by Anne Davis and Dominique de Moulins (Museum of London).

The analysis of insect remains from urban archaeological deposits rests on the known habitat preferences of the identified species in order to reconstruct the environment (Fisher 1943; Kenward 1978, 1982). Some beetles are associated with a specific

plant species or with decaying matter and many species are synanthropic, *ie,* closely associated with habitats created by human activities, including human dwellings. A number of urban studies have been carried out in York, Amsterdam and Oslo but few in London so far. The insect remains used in this study were extracted from the same samples as those of the plants and, although less abundant, were recovered from all periods and most types of context. Their analysis was carried out by Enid Allison and Harry Kenward (EAU York).

The study of mollusca, land and water snails, is used in the reconstruction of palaeoclimates and microenvironments to illustrate the zonation of habitats and for their direct exploitation as a food resource. On an urban site such as 15-35 Copthall Avenue, the evidence obtained from molluscs might add to the information from other biological remains in order to reconstruct the scenery of the pre-Roman environment and the conditions prevailing in the channels and ditches. Similar studies have been carried out before, in the London Wall area (p. 114). The molluscs were not very abundant at 15-35 Copthall Avenue. They were recovered from contexts which had been identified as including molluscs when sorting for plant remains and insects. They were found in 15 of the contexts from all periods except for Period II. Their analysis was carried out by Dr Richard Preece (Cambridge University, Quaternary Department).

The presence of ostracods, small aquatic crustaceans with marked ecological preferences, can indicate the conditions prevalent in a body of water and, combined with the evidence of the aquatic molluscs and plants, would help to define the aquatic environment. All the species found at 15-35 Copthall Avenue prefer slow-flowing water courses if not standing water of lakes and ponds, The slightest current flow is sufficient to sweep away ostracods, which are poor swimmers. Ostracods moult their shells through their period of growth from egg to full grown adult (about eight growth stages) and the presence of several growth stages or moults in the studied samples is sufficient to speak of quiet, undisturbed waters, Current flow would separate small from larger valves as they have a hydrodynamic difference within a stream flow. The ostracods were sorted from the samples used for the mollusc analysis and were studied by Dr Eric Robinson (University College London). Only five of these samples, which came from the pre-Roman period and Period IV, contained ostracods.

The study of parasites of the human intestine is usually related to the presence of people in any environment; in an urban environment, it can tell us much about the state of cleanliness of the town which, of course, has implications concerning the state of health of its inhabitants. A number of samples from all periods were studied for parasite eggs. The purpose of the study was not to determine if the local population was infested with intestinal worms; widespread infestation has already been demonstrated by previous work on Roman and medieval material (Kenward et al 1986; Pike 1975). Instead, the samples were examined to see if the presence of parasite eggs indicated the disposal of or contamination by faeces in the channels and ditches on the site, and if the concentrations obtained reflected the level of human disturbance and occupation during the various periods. Of a total of 17 samples studied only six were found to contain parasite eggs; these came from all the periods except for the pre-Roman period. The study of the parasite remains was carried out by Clare de Rouffignac.

Methods

Sampling on site

Many samples *(c* 150) were taken for environmental analysis. Most of the sampling was carried out by the excavation team though the environmentalists from the DUA often visited the site and kept in touch with the excavation. The samples were all 'judgement' samples taken when a layer or a deposit seemed promising. Two ten kilogramme samples of soil were collected in plastic bags from each sampled deposit and stored for later analysis. The samples were kept moist in sealed plastic bags and none had dried out by the time they were processed.

The soil samples came from all archaeologically defined periods on the site and from a variety of identifiable layers or contexts including the following: valley fills; peat or marshy deposits; channel and ditch sediments; the foundations of roads or of raised surfaces; levelling dumps; and surfaces associated with industrial activity. Other samples were taken from the building in Period II and included surface or occupation deposits, hearth fills and pits; still others were thought to be garden soil or from the fills of pits.

Sample selection

A system of priorities was established to assist in the selection of samples for analysis from the large number available, It was considered important to cover all the archaeological periods so as to observe changes through time, and to analyse samples from the junctions between periods. Many samples specifically associated with human activities and the building were also analysed.

Addressing topographical and environmental questions has been a major priority of the archaeology of the Upper Walbrook, particularly determining the position and extent of the Walbrook streams and the period and extent of the marsh revealed in earlier excavations in the area. Priority was therefore given to the organic and marsh deposits, which included layers from both Roman and medieval periods and to the natural valley sediments and channel and ditch fills. Most of the samples from these deposits were fully analysed, with the insect and molluscs remains providing additional complementary information to the botanical evidence.

In total, 65 samples were studied representing all periods and deposit types. Most of these produced plant and insect remains but the other remains were less ubiquitous.

Processing techniques

The processing and extraction of pollen and molluscs from the samples followed standard procedures (Sparks 1961; Evans 1972; Moore & Webb 1978). The ostracods were recovered from five of the samples used in the molluscan analysis. The parasite eggs were extracted from 2g of sample disaggregated in 28ml of 0-50% sodium triphosphate solution and the suspension filtered through a 250 µm mesh sieve. 0.15ml aliquots of the filtrate were then examined under a light microscope at xl00 magnification. A minimum of two aliquots were examined per sample; all eggs were identified to species where possible, counted and their condition noted (see Jones, A K 1985) and the egg counts per sample used to calculate the number of ova per gram (opg) of soil.

The recovery of seeds and insects was carried out in two stages. The first stage was undertaken soon after the excavation, using a standard 1kg of sediment; 25 samples were sorted. They proved to be very rich and the work was consequently so time consuming that it was decided to sort an initial 250g of soil from the remaining samples (Badham & Jones 1985). In order to standardize the results, a target number of 500 seeds for all the samples was aimed at (van der Veen & Fieller 1982) rather than a standardized amount of soil (Orton 1983) and further subsamples were analysed until the target number was reached. The insect fragments were sorted from the same samples and the same quantities as the plant remains.

The seeds were identified using a low power binocular microscope at magnifications up to x50 and with the help of the seed collection of the Museum of London, the collections at the Institute of Archaeology, London, and the Botany Department of the Natural History Museum. Some identifications were also made or confirmed by Alan Hall from the Environmental Archaeology Unit (EAU), University of York and by Mark Robinson from the University Museum, Oxford. The plant remains were analysed by computer using ecological and usage groupings compiled from various sources (Clapham et al 1962; Grigson 1958; Sinker et al 1984). The insects were identified using a low power binocular microscope, standard works (Kloet & Hincks 1964, 1977) and the insect collections at the EAU, University of York.

Presentation of the data

The lists of seeds from the study are tabulated in Figures 118, 119 and Figures 131-5. They are arranged in taxonomic order following Clapham et al 1962. Figure 118 is a summary table of the results of the analysis for waterlogged plant remains by period and by context type; all the samples in each context type have been added together within each period. The charred remains are listed in Figure 119, which gives a summary by period and context type. The data for waterlogged and charred plant remains are also shown in Figures 131-5 (Appendix), where they are arranged by context number, context type and period.

Figure 120 illustrates the seeds which were most characteristic of the 15-35 Copthall Avenue samples. They were not the most numerous but had some ecological significance, appeared in many of the contexts, or, as in the case of *Satureja hortensis,* were a first find from Roman levels in London.

The pollen data are presented in Figure 121 as counts of pollen for each species or type within each of the five samples studied. A list of *Coleoptera* (beetles) and *Hemiptera* (bugs) recorded from each period is given in Figure 122 and micrographs of some fossils are presented in Figure 123. A list of other invertebrates recorded from the insect samples is given in Figure 124. Figure 125 lists the number of ostracod valves and carapaces for each species by sample and Figure 126 the occurrence of mollusc finds within each period. The parasites are listed on Figure 127. A summary table of the environmental samples studied, listing their phasing, the contexts from which they come and the preserved material within them can be found in the Appendix (Fig 136).

Problems posed by pollen and waterlogged seeds from archaeological contexts

A site such as 15-35 Copthall Avenue presents two problems to the environmental archaeologist. One problem is archaeological and common to all categories of environmental evidence, and the other is purely botanical.

The archaeological problem is that of an urban environment, much disturbed, much trampled over and perpetually altered, which causes objects and remains to be constantly moved from their place of origin. This problem is also particularly relevant to plants both because certain plants favour disturbed ground and also because people's continuous activity in and around towns contributes to the disturbance and encourages the transport of certain plants or seeds. Plant transport and the distribution of their various parts on the site is itself of archaeological interest but makes the search for a 'natural' vegetation in such an urban environment problematic.

Greig (1982) has discussed in detail the problems associated with interpreting pollen spectra from urban archaeological contexts. He has drawn attention to the usually diminutive presence of tree pollen from contexts such as those analysed here as well as those from wells, ponds and ditches. As noted below, at 15-35 Copthall Avenue tree pollen values are low and therefore difficult to interpret. The tree pollen may be representative of local growth but it is swamped by herb pollen from local sources (natural or human component, see Greig 1982). Considering the nature of the deposits analysed, a local source for much of the tree pollen seems most plausible and it is thus impossible to ascertain clearly the nature of the regional woodland. Similarly, the shrub taxa found may be of local origin, forming an important component of waste ground in, and fringing, the urban area.

As noted by Greig (1982; also Scaife 1982a) pollen spectra from urban archaeological sites are characterised by high percentages of *Gramineae, Compositae* and *Leguminosae* pollen. Since it is not possible, on pollen

evidence alone, to separate wild *Gramineae* to even genus or tribe, it is not possible to be specific about the source of these high grass pollen values. However, it is now widely accepted that, in urban contexts, such grass pollen must come from a number of sources. These range from, and may include, relatively natural growth in glades, waste ground and other urban niches. Human sources are also important and may include animal feed, bedding, floor coverings, thatch and roofing turves. The pollen of grasses and herbs in hay may readily pass through the gut of animals and remain in the dung. The latter of course can be a prime constituent of urban organic dumps and may thus contribute substantial quantities of pollen to such contexts. A similar mechanism is also evident through the human digestion of bread, which may contain quantities of trapped pollen of cereal and associated weed taxa from the cereal husks (Robinson & Hubbard 1977). This pollen becomes incorporated in faeces and ultimately in the deposits in latrines, river channels and on waste ground - that is, in all areas where faecally-contaminated waste was dumped (Greig 1979, 1982; Scaife 1982a, 1986). Thus, in organic dump deposits, pollen taphonomy is extremely complex and the interpretation of the pollen spectra from such urban contexts presents many problems which relate to the differing modes of pollen derivation and burial. Greig (1982) has noted the differences in the pollen spectra obtained from Roman and medieval urban sites. In the former he has noted the preponderance of a Gramineae/ local pollen spectra, whilst the latter have cereal/ human generated pollen characteristics *(ie* cereal pollen of the secondary derivation noted above).

Similarly, the taphonomy of seeds can be quite complex. One factor is the differential preservation of seeds. This is sometimes due to the repeated drying and wetting of the sediments, often an anthropogenic effect which destroys the more fragile seeds. Furthermore, the sort of adventitious plants encouraged by people are often cosmopolitan, tolerant of many conditions and have very efficient ways of reproducing. They often produce great numbers of seeds: for example *Stellaria* spp (chickweeds) produce 2200-2700 seeds per plant; *Capsella bursa-pastoris* (shepherd's purse), 3500-4000 seeds per plant; *Hypericum* spp (St John's wort) 26,000 - 34,000 seeds per plant and *Juncus* spp (hard rush) 200,000-234,000 seeds per plant (Salisbury 1961).

Archaeobotanists have noted that as a result most of the seed lists from waterlogged urban deposits all over Europe are very similar (Green 1979). The problems of residuality and of long range transport have also been noted (G Jones *et al* in press).

Another factor to take into consideration is the longevity of seeds in the earth. Seeds with a hard coat are more likely to survive than others, so if some time elapses before waterlogging then hard coated seeds will be overrepresented. Experiments on buried soils of known dates (Carter 1987) have shown that species of *Carex* spp (sedges), *Sambucus* sp and *Urtica* spp (nettle) survive longest. Similar resilience can be expected of the *Polygonum* (knotweed) and *Rumex* (docks) which have hard seed coats.

Other botanical factors that complicate environmental reconstruction include plant and seed behaviour. One of the most obvious points about dispersed seeds which is not always stressed is that they are found underground, therefore hidden, while we are aware of and use the vegetation above ground. This simple point is important because the events underground do not exactly reflect those above ground (Fenner 1985; Harper 1977).

How do seeds arrive in a particular spot? They may, after travelling some distance, drop off the feet or fur of animals; be carried by insects such as ants; or be dropped by birds. Adaptations such as pappuses or bladders enable the seeds to be transported by air or water. The seeds of *Chamaenerion angustifolium* (rosebay willowherb) or *Cirsium arvense* (creeping thistle) may today be seen floating over the City of London. Human interference is also important in seed dispersal of palatable or useful plants. So apart from the local vegetation, the origin of many of the seeds present at any one spot and making up the seed bank can be quite varied.

Another mechanism which ensures that the seeds may have a chance to grow in a particular spot is dormancy. This is a period during which seeds actually wait for the right conditions of temperature, humidity and light level to prevail before they can germinate (Harper 1965). Seeds remain dormant for varying lengths of time and at different times of year and among them, those from plants producing very large numbers of seeds, remain dormant for long periods (Grime 1979). The situation underground is therefore very complex and soil samples are likely to include all sorts of seeds which have no direct relevance to the vegetation at any one time. It has been said (Major & Pyolt in Fenner 1985) that there is no complete description of an area without knowing the composition of the seed bank because the seed bank represents an historical record: some of the past conditions, the present one and potentially the future.

Seedlings also face hazards of predation or of competition. Not many reach the adult plant stage and reproduce. Plants therefore produce large numbers of seeds many of which are supernumerary in the seed bank.

The various ways in which plants reproduce must also be taken into account. Plants do not rely solely on seeds for reproduction and many will do so more successfully in a vegetative way through roots or stolons. Annual plants may thus be over represented in the seed bank by comparison with biennals or perennials.

From the discussion above, it follows that the numbers of seeds recovered from the soil may bear little relation to the number of seeds on the plants above ground. There is a tendency for small-seeded plants to set a very large number of seeds down and for those plants to be of the opportunistic 'quick set type'. This tendency is reflected in assemblages where a great many *Chenopodiaceae, Polygonaceae, Urticaceae* and *Juncus* spp are often present. But it can also be seen that many fragile seeds are absent, for instance, the very small *Caryophyllaceae* which are relatively fragile are usually present in low numbers. Therefore, presence of a species is as important in an assemblage as abundance. On the other hand, because seeds can be carried in such diverse ways, it is probably best not to give too much weight to those which appear in the assemblages in ones and twos. Numbers of seeds must therefore be treated with

caution but should not be disregarded altogether. One encouraging result of this study was that when comparing the results from the various samples belonging to a context type, for instance, those from the channel, it was found that there was a certain consistency in numbers from sample to sample for any one species with a high number of seeds. The same consistency could be observed between subsamples.

Trends for change in the natural vegetation have been looked for but special attention has also been given to man-made features where the situation may be less complicated than in nature, although their interpretation may also be very difficult.

Analysis by period

Prehistoric period

Evidence for this period comes from macroscopic plant remains, insects, molluscs and ostracods recovered from samples taken from the natural valley fills. No pollen was analysed for this period. The contexts that contained seeds and insects were: OPT *709, 712* and *719; 723* included a few insect fragments and a very few seeds (above pp 17 and see Fig 23). Molluscs were present in *709* and *712* and both molluscs and ostracods in *719.*

Seeds of ruderal plants common in damp habitats, as well as the usual ubiquitous ruderals, and many other species of damp environments and two fully aquatic species, were found in all the samples. The fully aquatic species were *Chara* sp (stonewort) and *Zannichellia palustris* (horned pondweed).

Species which are usually found growing in water include *Ranunculus* subgenus *Batrachium* (water crowfoots) and *Rorippa nasturtium-aquaticum* (water cress). Plants of damp or marshy areas are *Montia fontana* (blinks), *Ranunculus sceleratus* (celery-leaved crowfoot), *Glyceria* sp (flote-grass), *Myosoton aquaticum* (water chickweed) and *Eleocharis palustris* or *uniglumis. Zannichellia palustris,* although most frequently found in brackish water, also occurs in completely fresh water and cannot, on its own, be regarded as evidence for brackish conditions.

The very small insect assemblages were rich in 'outdoor' forms and aquatic taxa were also recorded from these samples. No synanthropes were present, Although small, these assemblages suggest that the deposits in the natural valley formed before nearby human settlements had reached urban density; otherwise insects typical of Roman occupation sites (Kenward & Morgan 1984a; 1984b; Kenward *et al* 1986; Kenward & Allison 1987) would be expected as part of the 'background fauna'.

Some aquatic molluscs and a few hygrophilous land snails occurred in these levels. The freshwater gastropod *Lymnaea stagnalis,* found only in these levels, suggests that the water body in which the sediments formed was not subject to seasonal desiccation. A small assemblage of ostracods found in sample 719 included a free-swimming species, *Cypridosis vidua,* a burrowing species, *Candona neglecta* and a species associated with plants, *Ilyocypris bradyi,* indicating that fairly fresh aquatic conditions were prevalent.

The biological evidence therefore suggests that the stream found at 15-35 Copthall Avenue was in the pre-Roman period clean and clear and supported aquatic plants and animals. It must have run through a fairly natural marshy area relatively free of human influence, as indicated by the damp loving plants, hygrophilous land snails and outdoor and aquatic insects. These findings confirm the deduction made on site that the stream must have been fairly free-flowing although maybe not fast-flowing.

Period I (reclamation and drainage)

The channels and ditches typical of this period are described above pp. 26-34. Pollen from some of the channel fills was extracted from the base of the column sample (OPT *601, 589* and *591;* see Figs 41a and b). The results of the analysis gave a very low arboreal pollen count of *Pinus, Alnus* and *Quercus,* probably the product of long distance transport. Most of the 61 pollen taxa found at the site are represented in this period and make up a diverse herbaceous pollen. A number of possible sources are represented, including wetlands, meadow/ grassland, ruderals and cereals and associated segetals. Many of the taxa present also undoubtedly represent the by-products of materials used in the urban environment of Roman London and are therefore only indirectly representative of those habitats noted above. It is likely that the pollen of cereals and weeds often associated with arable land resulted from the dumping of a range of organic debris. Of those taxa recorded, the following may be representative of arable and waste ground areas nearby: Cereal, *Chenopodium* type, *Spergula* type, *Plantago* major type, *Hornungia* type, *Sinapis* type, *Convolvulus, Polygonum aviculare, Artemisia, Malva* type, *Polygonurn persicaria, P aviculare.* The cereal elements are undoubtedly of the human component category described by Greig (1982) and probably largely derive from straw being, human and/ or animal faeces or nearby crop processing activities. In all samples, *Gramineae* is the overwhelmingly dominant taxon followed by *Compositae* spp, *Plantago lanceolata* and *Papilionaceae* spp. The remaining taxa represent a diverse range of herbs but only occur sporadically or were recorded as a single grain (Fig 121). *Filipendula, Succisa, Lychnis* type, *Hydrocotyle, Sparganium* type and *Caltha* type are representative of a damp/ fen habitat. These may be indicative of a stream channel. Many of the pollen taxa are not referable to a lower taxonomic level. The pollen spectrum for this period therefore shows both the natural vegetation and a human input.

The plant macrofossils (Fig 131) from the channel and ditch fills (OPT *642, 646, 601, 604, 547, 562, 563, 564, 588, 591, 593;* Figs 23; 41) belong to ecological groupings reflecting both the natural environment and human activities and disturbance. Among the latter, a great increase in ruderals such as *Chenopodium glaucum* or *rubrum* and *Urtica dioica* showed that the ground had become disturbed. These samples also contained many glume bases of wheat, especially in 604 (Fig 23), and many seeds of *Ficus carica.* The channel deposits also included seeds of plants from woodlands or hedgerows. Wild fruits from a woodland environment or hedgerows

Fig 118 15-35 Copthall Avenue: plant remains by period and feature type. Waterlogged preservation

Species	Common name	Habitat	Periods														
			Pre-Roman	*I*			*II*				*III*			*IV*			
				Chan	Turf	Drain	Pit	Dump	Hearths	Occ	Chan	Peat	Pits	Pits	Chan	Peat
Cereals:																	
Triticum *cf* spelta	spelt spikelet fork	FI		1													
Triticum sp	wheat spikelet fork	FI		6			1										
Triticum sp	wheat glume base	FI	8	669			1		16	21							
Triticum sp	wheat rachis	FI		2													
cf Triticum sp	wheat	FI									3						
Hordeum sativum	barley	FI					1										
Hordeum/Triticum sp	barley or wheat	FI		78													
Avena sp	oat	AI		1													
cf Avena sp	oat	AI		6													
Cerealia	ind cereal straw	FI		7													
Other plants:																	
Chara sp	–	E	212	14	27		1							17	128		
Pteridium aquilinum (L) Kuhn	bracken	CDGH		2													
Caltha palustris L	marsh marigold	CE		1													2
Ranunculus acris/repens/bulbosus	buttercups	ABCDEG	49	438	128	41	199	205	1067	144	100	6	6	22	5	138	
Ranunculus *cf* acris/repens/bulbosus	buttercups	ABCDEG							1	1							
cf Ranunculus acris/repens/bulbosus	buttercups	ABCDEG							4								
cf Ranunculus arvensis	corn crowfoot	A					1										
Ranunculus sardous Crantz	hairy buttercup	ABE	14	31				8	2	2	1	1		6		22	
Ranunculus *cf* sardous	hairy buttercup	ABE	9	13				23			1						
Ranunculus *cf* parviflorus	small-flowered buttercup	CD		2			2										
Ranunculus *cf* auricomus	goldilocks	C		12													
Ranunculus *cf* lingua	great spearwort	E						8		1						2	
Ranunculus flammula L	lesser spearwort	EG		36	3	8	1	9	5	6	9		2	2		19	
Ranunculus *cf* flammula	lesser spearwort	EG	12	9	3		1		16		2		1				
cf Ranunculus flammula	lesser spearwort	EG					1		1								
Ranunculus sceleratus L	celery-leaved crowfoot	E	40	115	27	12	155	4	35	12	1979	125	116	127	28	1161	
Ranunculus *cf* sceleratus	celery-leaved crowfoot	E	3	15						1						11	
cf Ranunculus sceleratus	celery-leaved crowfoot	E					1										
Ranunculus subgen Batrachium (DC)A	crowfoots	E	1	1	1						1			6		3	
Ranunculus *cf* subgen Batrachium	crowfoots	E												1			
Thalictrum flavum L	common meadow rue	DE			1												
Thalictrum *cf* flavum	common meadow rue	DE		3			1										
Ranunculus sp	–	ABCDEG		7			1		1	1	1						
Papaver rhoeas L	field poppy	ABGH							3								
Papaver *cf* rhoeas	field poppy	ABGH					1							1			
Papaver *cf* argemone	long prickly-headed poppy	A														1	
Papaver somniferum L	opium poppy	BGHI		7		13					5			1		4	
Papaver *cf* somniferum	opium poppy	BGHI	1													1	
cf Papaver somniferum	opium poppy	BGHI		2					1								
Papaver sp	poppy	ABGHI		11	1		2			1				1		1	
Papaver spp	poppy	ABGHI														3	
cf Papaver sp	poppy	ABGHI		1													
Fumaria officinalis L	fumitory	A		2					1		2						
Fumaria sp	fumitory	A		3			2										
Brassica *cf* nigra	black mustard	BI											1				
Brassica sp	wild cabbage/turnip/mustard	ABI	4	1							1					9	

Fig 118 continued

Species	Common name	Habitat	Periods													
			Pre-Roman	*I*			*II*				*III*			*IV*		
				Chan	Turf	Drain	Pit	Dump	Hearths	Occ	Chan	Peat	Pits	Pits	Chan	Peat
Brassica spp	wild cabbage/turnip/mustard	ABI		2												5
cf Brassica spp	wild cabbage/turnip/mustard	ABI								3						
Raphanus raphanistrum L	wild radish/charlock	A		1												1
cf Raphanus raphanistrum	wild radish/charlock	A		1												
cf Lepidium sp	–	ABDE		1												
Thlaspi arvense L	field penny-cress	AB		1							7					
Capsella bursa-pastoris (L) Medic	shepherd's purse	AB	4	30	10				1		7			1		1
cf Capsella bursa-pastoris	shepherd's purse	AB			2	32	1									
Rorippa nasturtium-aquaticum (L)Ha	watercress	IE	26	7						1	71	1				2
Rorippa *cf* nasturtium-aquaticum	watercress	IE		1												
cf Rorippa nasturtium-aquaticum	watercress	IE												1		
Rorippa *cf* microphylla	one-rowed watercress	E												7		17
Rorippa islandica (Oeder) Borbas	marsh yellow-cress	E	3	24	5	13	1	2		1	14					1
Rorippa *cf* islandica	marsh yellow-cress	E	1	4												
cf Rorippa islandica	marsh yellow-cress	E											3			
cf Camelina sativa	gold of pleasure	AHI	1													
Cruciferae	–	ABCDEGFI		7						1	4					
Reseda luteola L	weld-dyer's rocket	ABHI	2	21		1	3	1	29	1						6
cf Reseda luteola	weld-dyer's rocket	ABHI			1											
cf Reseda sp	weld/mignonette	AB									3					
Viola sp	violet	ABCDG		2					1		1					
cf Viola sp	violet	ABCDG					1		1		1					
Hypericum sp	St John's wort	CDE	1	3			2				3					
Silene dioica (L) Clairv	red campion	CD						1								
Silene *cf* dioica	red campion	CD														1
Silene *cf* alba	white campion	ABC		3					1							3
Silene dioica/alba type	white/red campion	ABCD					2									
Silene vulgaris (Moench) Garcke	bladder campion	ABDF														3
Silene *cf* vulgaris	bladder campion	ABDF														1
Silene sp	campion/catchfly	ABCDF		3			1		1							3
Silene spp	campions/catchflies	ABCDF		9												
cf Silene sp	campion/catchfly	ABCDF												1		
Lychnis flos-cuculi L	ragged robin	CDE	1	21			2	5	4	1				2		9
cf Lychnis flos-cuculi	ragged robin	CDE		2			1		1	1						
Agrostemma githago L	corn cockle	A	10	46	8	1			1	1		1		5		20
cf Agrostemma githago	corn cockle	A							1							1
cf Saponaria officinalis	soapwort	CEH		2												
Cerastium sp	mouse-ear chickweed	ABD	5	10		10										4
Cerastium spp	mouse-ear chickweed	ABD		6					68							
cf Cerastium sp	mouse-ear chickweed	ABD		1					1	2						
Myosoton aquaticum (L) Moench	water chickweed	E	5	9	2				1	1	397	1	46		71	
cf Myosoton aquaticum	water chickweed	E	2	139					1		144					13
Mysoton/Stellaria sp	chickweed/stitchwort	ABCDEG		12				18			8		6			2
Stellaria media (L) Vill	chickweed	AB	47	185	65	80		1	22	2	1232	2	53	7		42
Stellaria *cf* media	chickweed	AB		2						1				1		1
cf Stellaria media	chickweed	AB					3									
Stellaria holostea L	greater stitchwort	CG	2	4	4											
cf Stellaria holostea L	greater stitchwort	CG	1	4			1									
Stellaria graminea L	lesser stitchwort	CD	15	142	32		73	27	87	39	52		10	1		6

Fig 118 continued

Species	Common name	Habitat	Periods														
			Pre-Roman	*I*			*II*				*III*			*IV*			
				Chan	Turf	Drain	Pit	Dump	Hearths	Occ	Chan	Peat	Pits	Pits	Chan	Peat
Stellaria graminea type	lesser stitchwort	CD					21										
cf Stellaria graminea	lesser stitchwort	CD		1			3										
Stellaria graminea/palustris	stitchwort	CDE	3	143		15	30		35	19	33						21
Stellaria alsine Grimm	bog stitchwort	E		16													2
Stellaria *cf* alsine	bog stitchwort	E	3	4						3							2
Stellaria sp	chickweed/stitchwort	ABCDEG	4	2		1			2			1					3
Stellaria spp	chickweed/stitchwort	ABCDEG									8						
Arenaria serpyllifolia L	thyme-leaved sandwort	ABD		1													
Arenaria leptoclados (Rchb) Guss	leeser thyme-leaved sandwort	AB															1
cf Aenaria leptoclados	lesser thyme-leaved sandwort	AB		1													
Arenaria serpyllifolia/leptoclades	thyme-leaved sandwort	ABD		4													
cf Areneria sp	sandwort	ABD		1			1		1								
Arenaria/Cerastium sp	sandwort/chickweed	ABCD	2														
Spergula arvensis L	corn spurrey	AF															2
cf Spergula arvensis	corn spurrey	AF															1
Scleranthus annuus L	annual knawel	AB															4
Caryophyllaceae indet	–	–		7	2				1						11		
Montia fontana ssp chondrosperma L	blinks	AE	18	68	9		25	2	9	22	7						4
cf Montia fontana ssp chondrosperma	blinks	AE	2														
Montia *cf* perfoliata	–	BI									14						
Chenopodium *cf* bonus-henricus	all-good	BCDF															11
Chenopodium *cf* polyspermum	all-seed	AB	39	2			3		1								
Chenopodium album L	fat hen	ABFH	5	26	6		12	1	4		456	6	24	1			84
Chenopodium *cf* album	fat hen	ABFH	51	126		1	54		1		41			1	16		11
Chenopodium album type	fat hen	ABFH		28	3		11	1	1					11	1		6
Chenopodium murale L	nettle-leaved goosefoot	BD		3			7			3	30						7
Chenopodium *cf* murale	nettle-leaved goosefoot	BD							2		14		1				1
Chenopodium rubrum/glaucum	red/glaucous goosefoot	AB	5	729	40		105	2	9	2	3078	21	83	86	16		77
Chenopodium *cf* rubrum/glaucum	red/glaucous goosefoot	AB		70	21				2								6
Chenopodium sp	goosefoot etc	ABFH	1	7	3	1	4		8	4	4			4			9
Chenopodium spp	goosefoot etc	ABFH	3				4	2		4	12						23
cf Chenopodium sp	goosefoot etc	ABFH	1														
Atriplex hastata/patula	orache	ABFGH	9	90	3		12	2	4		495		23	11	23		39
Atriplex *cf* hastata/patula	orache	ABFGH	1				1						1	1	2		
cf Atriplex hastata/patula	orache	ABFGH															6
Atriplex sp	orache	ABFGH	1			1	1		3								1
Atriplex spp	oraches	ABFGH		34							289	39		4	3		116
cf Atriplex sp	orache	ABFGH								1	7						
cf Atriplex spp	oraches	ABFGH															3
Chenopodium/Atriplex sp	goosefoots/oraches	ABFGH	1				7	1	1								
Chenopodium/Atriplex spp	goosefoots/oraches	ABFGH					7										
Chenopodiaceae indet	–	–		2		1	1		2	1	39			1	12		11
Caryophyllaceae/Chenopodiaceae/Port	–	ABCDE		38													
cf Caryophyllaceae/Chenopodiaceae/	–	ABCDE		2													
Malva sp	mallow	BCDF	1	4		1	4		1								
Linum usitatissimum L	cultivated flax	I		35										2			16
cf Linum usitatissimum	cultivated flax	I								1	1						
Linum catharticum L	purging flax	D		18		1	1	4	6		3		1				
Vitis vinifera L	vine	I								1							

Fig 118 continued

Species	Common name	Habitat	Periods													
			Pre-Roman	*I*				*II*			*III*			*IV*		
				Chan	Turf	Drain	Pit	Dump	Hearths	Occ	Chan	Peat	Pits	Pits	Chan	Peat
Trifolium sp	clover	ABDI		9												
Ornithopus perpusillus L	birdsfoot	D	1	43		2		16								
cf Ornithopus perpusillus	birdsfoot	D							1							
Vicia sp	vetch	CD							3							
Filipendula ulmaria (L) Maxim	meadow-sweet	CDE		7		9	1		1							
cf Filipendula ulmaria	meadow-sweet	CDE	1					1								
Rubus fruticosus agg	blackberry	CFGH		47	2	21	6	4	5	3	5			1		2
Rubus *cf* fruticosus agg	blackberry	CFGH		36			13				1	1		1		3
Rubus fruticosus/idaeus	blackberry/raspberry	CFGH		15	1				1		4					
Potentilla *cf* palustris	marsh cinquefoil	E						1								
Potentilla argentea type	hoary cinquefoil	D							14							
Potentilla *cf* argentea	hoary cinquefoil	D		14			3		37	3						
Potentilla erecta (L) Rausch	tormentil	CDEGH		34	4		12	70	23	6	96		8			
Potentilla erecta type	tormentil	CDEGH									9					
Potentilla *cf* erecta	tormentil	CDEGH		49		6	12	2	18	3	16					2
cf Potentilla erecta	tormentil	CDEGH							1							
Potentilla argentea/erecta type	hoary cinquefoil/tormentil	CDEGH		3			12		9							
Potentilla *cf* argentea/erecta type	hoary cinquefoil/tormentil	CDEGH							1							
cf Potentilla argentea/erecta	hoary cinquefoil/tormentil	CDEGH							1							
Potentilla reptans L	creeping cinquefoil	BC(D)	1	7			4	3	33							
Potentilla reptans type	creeping cinquefoil	BC(D)								19						
Potentilla *cf* reptans	creeping cinquefoil	BC(D)		27			5		42	3						3
Potentilla sp	cinquefoil/tormentil	BCDEFGH	1	2		5	3	2	14	3	6	1		1		
Potentilla spp	cinquefoil/tormentil	BCDEFGH					7		5	29						
cf Potentilla sp	cinquefoil/tormentil	BCDEFGH		1												
Fragaria vesca L	wild strawberry	CDF		38				1	1							1
cf Fragaria vesca	wild strawberry	CDF		5					7							
Potentilla/Fragaria sp	–	BCDEFGH		1			1									
Alchemilla *cf* vulgaris agg	lady's mantle	CDE		1												
cf Alchemilla sp	lady's mantle	CD								1						
Aphanes arvensis agg	parsley piert	ABD	2	22	1	2	6	3	3	1				1		
cf Aphanes arvensis agg	parsley piert	ABD			1											
Rosa sp	rose	CGI					2				1					
Prunus spinosa L	sloe/blackthorn	CFG		1			1				1		1			
Prunus domestica L	plum/bullace	CI		1												
Prunus *cf* cerasus	sour cherry	CI		3												
Prunus avium/cerasus	sloe/cherry	CFGI		1												
Prunus sp	–	CFGI							1							2
Malus sylvestris	crab apple	CFH		1												
Pyrus/Malus sp	pear/apple	CFI		8												1
cf Pyrus/Malus sp	pear/apple	CFI										1				
Rosaceae indet	–	–		8	2		1		2	2						
Lythrum salicaria L	purple loosestrife	E														7
cf Callitriche sp	–	E		1							9				4	
Torilis arvensis (Huds) Link	spreading hedge-parsley	A		1												
Torilis cf arvensis	spreading hedge-parsley	A		5												
cf Torilis nodosa	knotted hedge-parsley	AD							1							
Torilis japonica/nodosa	hedge-parsley	ACD		5												2
Torilis sp	hedge-parsley	ACD														1

Fig 118 continued

Species	Common name	Habitat	Periods													
			Pre-Roman	*I*				*II*			*III*			*IV*		
				Chan	Turf	Drain	Pit	Dump	Hearths	Occ	Chan	Peat	Pits	Pits	Chan	Peat
cf Torilis sp	hedge-parsley	ACD							1							
Coriandrum sativum L	coriander	I		4		2	1			1						
cf Coriandrum sativum	coriander	I		1					2	1						
Conium maculatum L	hemlock	CEG		88	1	1	15		3	6	560		3			8
cf Conium maculatum	hemlock	CEG		1					1							
Bupleurum *cf* rotundifolium	hare's-ear	A		1												
Bupleurum sp	–	ABCD														3
Apium graveolens L	celery	EI		53		10	23		15	3	43	1	7	3		2
Apium *cf* graveolens	celery	EI					12			7				2		
cf Apium graveolens	celery	EI							1	6						
Apium nodiflorum (L) Lag	fool's watercress	E	70	23	13			1			624	10	30	2	10	174
Apium *cf* nodiflorum	fool's watercress	E		1			1				252					1
cf Apium nodiflorum	fool's watercress	E	1													
Apium graveolens/nodiflorum	wild celery/fool's watercress	E		14			30			58						
cf Apium inundatum	–	E							1							
Apium sp	–	EFI	4	8		1	1		4	11	15					
cf Apium sp	–	EFI			1		1									
cf Apium spp	–	EFI							3							
Berula erecta (Huds) Coville	narrow-leaved water-parsnip	E		2												
cf Berula erecta	narrow-leaved water-parsnip	E		10												
Seseli libanotis (L) Koch	–	CD		1												
Oenanthe *cf* fistulosa	water dropwort	E				1			1			1				
Oenanthe pimpinelloides L	dropwort	DE		1												
Oenanthe *cf* pimpinelloides	dropwort	DE		3						1						
Oenanthe crocata	hemlock water dropwort	E		1												
Oenanthe *cf* crocata	hemlock water dropwort	E									1					
Oenanthe aquatica (L) Poiret	fine-leaved water dropwort	E									2	40		9		664
Oenanthe *cf* aquatica	fine-leaved water dropwort	E									9				10	
cf Oenanthe aquatica	fine-leaved water dropwort	E												1		
Oenanthe aquatica/crocata	water dropwort	E														235
Oenanthe sp	dropwort	DE		1				1		2	1					3
Oenanthe spp	dropwort	DE														13
cf Oenanthe sp	dropwort	DE		1				1							18	
Aethusa cynapium L	fool's parsley	A							1							3
Anethum graveolens	dill	BFI	1	42			1			1						9
cf Anethum graveolens	dill	BFI		10		2			4	2						
Foeniculum vulgare Miller	fennel	BDFIG		4										5		
Daucus carota L	wild carrot	ACDGI		10			2			1				2		
cf Daucus carota	wild carrot	ACDGI		2		2	1	1		1						
Umbelliferae indet	–	–	2	13		2	13	1	6	9	43			1		5
cf Umbelliferae indet	–	–					1			1						
Umbelliferae/Compositae indet	–	–									1					1
Bryonia dioica Jacq	bryony	CG	1	2		1			1							
Bryonia *cf* dioica	bryony	CG		1												
cf Bryonia dioica	bryony	CG									1					
Polygonum aviculare L	knotgrass	ABG	15	319	2	38	7	9	7	6	44	1	2			31
Polygonum *cf* aviculare	knotgrass	ABG		3			4			1						
Polygonum bistorta L	bistort	DF		1												
Polygonum persicaria L	persicaria	ABEH	7	126	11		2	1	4		150		54		13	18

Fig 118 continued

Species	Common name	Habitat	Periods													
			Pre-Roman	*I*				*II*			*III*			*IV*		
				Chan	Turf	Drain	Pit	Dump	Hearths	Occ	Chan	Peat	Pits	Pits	Chan	Peat
Polygonum *cf* persicaria	persicaria	ABEH		13		5	1	1	2		123		3			11
Polygonum lapathifolium L	pale persicaria	ABE	2	27	4							1				
Polygonum *cf* lapathifolium	pale persicaria	ABE		4	4											
cf Polygonum lapathifolium	pale persicaria	ABE		1				2	2							
Polygonum persicaria/lapathifolium	persicaria	ABEH	2	76	8											
Polygonum *cf* persicaria/lapathifol	persicaria	ABEH	5	2												
cf Polygonum persicaria/lapathifol	persicaria	ABEH					1				10					
Polygonum hydropiper L	water pepper	E		118	7								1			2
Polygonum *cf* hydropiper	water pepper	E		20				1								3
Polygonum convolvulus L	black bindweed	ABF		4					4							
Polygonum sp	–	ABCDEFG		2		1										
Polygonum spp	–	ABCDEFG	2				3		1	1						
cf Polygonum sp	–	ABCDEFG						214	380	144	28	1		4		60
Rumex acetosella L	sheep's sorrel	AD	58	605	125	38	353									
Rumex *cf* acetosella	sheep's sorrel	AD					31		1							
cf Rumex acetosella	sheep's sorrel	AD					3									
Rumex obtusifolius L	broad-leaved dock	BC	1													
Rumex obtusifolius type	broad-leaved dock	BC		4												
Rumex *cf* obtusifolius	broad-leaved dock	BC	2					37	131	44	138	6	6	3	2	106
Rumex acetosa/crispus/obtusifolius	dock	ABCD	78	362	204	25	31									10
Rumex *cf* acetosa/crispus/obtusifo	dock	ABCD					5	21	1							
Rumex sanguineus/conglomeratus	dock	BC	4				4									
Rumex sanguineus L	red-veined dock	BCD		142							15	7		3	19	127
Rumex maritimus L	golden dock	EJ		6				10	19	6	9					12
Rumex sp	dock	ABCDEFGI	7	26			29	5	16	2	18			4		
Rumex spp	docks	ABCDEFGI	6	62	8	7	29	1	1	1			4	1	2	2
Polygonaceae indet	–	–	4	16			3		34	14	279	1	12	1		7
Urtica urens L	small nettle	AB	2	119	4	10	29			3						
Urtica *cf* urens	small nettle	AB														2
cf Urtica urens	small nettle	AB					1	26	105	51	4694	7	29	8	1	9
Urtica dioica L	stinging nettle	BCDEFGH	45	1445	58	118	350							1		
cf Urtica dioica	stinging nettle	BCDEFGH	1						2							
cf Urtica sp	nettle	BCDEFGH						8	11	4						
Ficus carica L	fig	I	1	201		6	14			4						
cf Ficus carica	fig	I		1												
Morus nigra	mulberry	FHI		1				1	1	2						9
Corylus avellana L	hazel	CF		3			1			1						
cf Corylus avellana	hazel	CF					1							1		1
Anagallis arvensis L	scarlet pimpernel	AG	8	3					1							
Menyanthes trifoliata L	bogbean	EFG														
cf Myosotis	forget-me-not	BCDE	1				1		20		2					1
Hyoscyamus niger L	henbane	BDG		4		3	4									
Solanum dulcamara L	woody nightshade	BC					2			1	47		1	1		2
Solanum nigrum L	black nightshade	BF		5	1		1									
cf Solanum nigrum	black nightshade	BF		1												
Solanum sp	nightshade	BD					1									
Limosella aquatica L	mudwort	E		2			1									
cf Limosella aquatica	mudwort	E	1	3												
Veronica *cf* anagallis-aquatica L	water-speedwell	CE	3	87					1			1	1			

Fig 118 continued

Species	Common name	Habitat	Periods														
			Pre-Roman	*I*				*II*			*III*			*IV*		
				Chan	Turf	Drain	Pit	Dump	Hearths	Occ	Chan	Peat	Pits	Pits	Chan	Peat
Veronica officinalis L	common speedwell	CD	1													
cf Veronica spp	speedwell	ACDE		5					1							
cf Rhinanthus minor	yellow rattle	D		1					224	6						
Rhinanthus sp	yellow rattle	ABDGH		4							1					
cf Rhinanthus sp	yellow rattle	ABDGH						2	4					1		
Mentha sp	mint	ABCEFGI	3	2		10	5		1							
cf Mentha sp	mint	ABCEFGI					1				10					
Mentha spp	mint	ABCEFGI						3	1		48	2	1			2
Lycopus europaeus L	gipsy-wort	EH		4	81		1									
Lycopus europaeus type	gipsy-wort	EH					2									
cf Lycopus europeaus	gipsy-wort	EH		1												1
Origanum vulgare L	Marjoram	CD						1		1	2					
Satureja hortensis	summer savory	FGI		7			3									
Satureja hortensis type	summer savory	FGI		1												
cf Satureja hortensis	summer savory	FGI		1			2									
Calamintha sp	calamint	D		1				16	417	11	18					13
Prunella vulgaris L	self-heal	BCDG	4	236	8	106	30	3	1	1						
cf Prunella vulgaris	self-heal	BCDG		2			2									2
cf Stachys sp	woundwort	ACEG									2					
Ballota nigra L	black horehound	CG		2												1
cf Ballota nigra	black horehound	CG									4					
Lamium sp	dead-nettle	ABC		3												
cf Lamium sp	dead-nettle	ABC		2			1		2							
Nepeta cataria L	cat-mint	C		1						2	4					3
Labiatae indet	–	ABCFEFI	1	3		5	1		7	3	55	3	3	4	28	32
Plantago major L	great plantain	ABC	97	44			13							1		
cf Plantago major	great plantain	ABC	2						2	1						
Plantago media L	hoary plantain	D		45												
cf Plantago media	hoary plantain	D			1				1							
Plantago lanceolata L	ribwort	D							3							
Plantago *cf* lanceolata	ribwort	D					1			1	1					
cf Plantago lanceolata	ribwort	D		10							2					
Plantago sp	plantain ribwort	ABCD							3		26	10		3		103
Sambucus nigra L	elder	BCFGH		31		11	11		2							
Sambucus *cf* nigra	elder	BCFGH		1				1	1							
Sambucus nigra/ebulus	elder/danewort	BCFGH	1	3			1	1								
Valerianella dentata (L) Pollich	corn salad	A												1		
Valerianella sp	Lamb's lettuce corn salad	AC										1				
Bidens cernua L	nodding bur-marigold	E	2	14												
Bidens *cf* cernua	nodding bur-marigold	E		4							2					4
cf Bidens cernua	nodding bur-marigold	E									1					
Bidens tripartita L	tripartite bur-marigold	E		22												1
Bidens *cf* tripartita	tripartite bur-marigold	E		4												
Bidens sp	bur-marigold	E	1	1		1			1							
Senecio *cf* jacobea	ragwort	BG												1		
Senecio sp	ragwort	ABCDEG		2												
cf Senecio sp	ragwort	ABCDEG		8						1	1			25		328
Anthemis cotula L	stinking mayweed	ABGH				4					1					
Anthemis *cf* cotula	stinking mayweed	ABGH												3		

Fig 118 continued

Species	Common name	Habitat	Periods													
			Pre-Roman	*I*			*II*				*III*			*IV*		
				Chan	Turf	Drain	Pit	Dump	Hearths	Occ	Chan	Peat	Pits	Pits	Chan	Peat
Anthemis arvensis	corn chamomile	ABGH												1		31
Chrysanthemum segetum L	corn marigold	AH		1								1				
Chrysanthemum *cf* segetum	corn marigold	AH														
cf Chrysanthemum segetum	corn marigold	AH		1												1
Chrysanthemum *cf* leucanthemum	ox-eye daisy	D		1												
Chrysanthemum sp	–	ABCD		1		2										
cf Chrysanthemum sp	–	ABCD														
Anthemis/Chrysanthemum sp	–	ABD		1												
Arctium lappa L	great burdock	B(D)		1												
cf Arctium lappa	great burdock	B(D)		1		1					4	1				
Cirsium vulgare (Savi) Ten	spear thistle	AB							1							1
Cirsium arvense (L) Scop	creeping thistle	AB	2							1						
cf Cirsium arvense	creeping thistle	AB						3		1			1			9
Cirsium sp	thistle	ABCDEFG	2	3			1		2							
cf Cirsium sp	thistle	ABCDEFG		2				5	1	1	1					
Carduus/Cirsium sp	thistles	ABDEG	3	10	2		1									1
cf Carduus/Cirsium	thistles	ABDEG		1												13
Centaurea cyanus L	cornflower	ABGH														7
Centaurea *cf* cyanus	cornflower	ABGH														
Centaurea *cf* nigra	lesser knapweed	BDG		7				1		1	1			1		10
Centaurea sp	knapweed/thistle	ABDGH	1	2		2				1						3
cf Centaurea sp	knapweed/thistle	ABDGH		12					1							
Carduus/Cirsium/Centaurea	thistle/knapweed	ABCD									1					
cf Cichorium intybus	chicory	CD												1		8
Lapsana communis L	nipplewort	BCF		5							1					
cf Lapsana communis	nipplewort	BCF		1				8	3		1			2		
Hypochoeris radicata L	cat's ear	CD		5	1											
Hypochoeris *cf* radicata	cat's ear	CD		6			2				2					1
Leontodon autumnalis L	autumnal hawkbit	BD								1						8
Leontodon *cf* autumnalis	autumnal hawkbit	BD		7		8										
cf Leontodon autumnalis	autumnal hawkbit	BD		1												
Leontodon *cf* hispidus	rough hawkbit	D		4				4	4	1			1	2		1
Leontodon sp	hawkbit	BDF	4	71	1		2				1					
cf Leontodon sp	hawkbit	BDF		1												
Picris echioides L	bristly ox-tongue	BC		1												2
cf Picris echioides L	bristly ox-tongue	BC														
Picris sp	ox-tongue	BCD		3						1						
Sonchus arvensis L	field milk-thistle	ADE		1			1				7					1
Sonchus oleraceus L	milk-/sow-thistle	AB		3							8					1
Sonchus *cf* oleraceus	milk-/sow-thistle	AB						1	5	2	141	1	6	1	1	28
Sonchus asper (L) Hill	spiny milk-/sow-thistle	AB	1	13	1	3	5	3								
Sonchus *cf* asper	spiny milk-/sow-thistle	AB					2									
Sonchus asper/oleraceus	milk-/sow-thistle	AB		18												
Sonchus sp	milk-/sow-thistle	ABE		2						1						
Crepis *cf* capillaris	smooth hawk's-beard	BD														
Crepis sp	hawk's beard	BCE		2												
cf Crepis sp	hawk's beard	BCE		1												
Taraxacum officinale Weber	dandelion	BDFGH					1			1						
Taraxacum *cf* officinale	dandelion	BDFGH														

Fig 118 continued

Species	Common name	Habitat	Periods												
			Pre-Roman	*I*				*II*			*III*			*IV*	
				Chan	Turf	Drain	Pit	Dump	Hearths	Occ	Chan	Peat	Pits	Pits	Chan	Peat
Taraxacum sp	dandelion	BCDEFGH		2				3	2	2	1	1				
Compositae indet	–	–		11			8								267	
Alisma plantago-aquatica L	water-plantain	EG							1	1	1347	68	1	2	688	248
Alisma sp	water-plantain	E	5	5	76	1										113
Alismataceae indet	–	E						2			4					
Triglochin maritima L	sea arrow-head	E	1	13												
cf Triglochin maritima	sea arrow-head	E	2	24			1									
Potamogeton sp L	pondweed	E			1											
Zannichellia palustris L	horned pond-weed	E	19	3				89	11640	1087	175	80	100	25	321	1376
Juncus spp	rush	DE	448	3483	141	670	1081		2		2					
Luzula sp DC	woodrush	CDE	6	4					1	1						
cf Luzula sp	woodrush	CDE		2										3	28	2
Lemna sp	duckweed	E										19		21	118	
Lemna spp	duckweed	E							1				1			2
Typha sp	bulrush/reedmace	E		1												1
cf Typha sp	bulrush/reedmace	E						102	83	37	9	3	1	18		140
Eleocharis palustris/uniglumis	spike-rush	E	34	277	68	8	44									
cf Eleocharis palustris/uniglumis	spike-rush	E	1					30		1						22
Eleocharis sp	spike-rush	E		7												9
Schoenoplectus lacustris (L) Palla	bulrush	E	1													
Schoenoplectus *cf* lacustris	bulrush	E	1													
cf Schoenoplectus lacustris	bulrush	E				1		67	31	18	10			10		49
Carex sp	sedge	CDEH	9	15			19	121	747	49	85	18	30	13	51	48
Carex spp	sedges	CDEH	8	260	25	36	83			1	1					
cf Carex sp	sedge	CDEH	2	3		1					1					
cf Carex spp	sedges	CDEH						2	2		3					
Cyperaceae indet	–	ABCDEFI	2	6									2			
cf Cyperaceae indet	–	ABCDEFI		3							27			1		
Glyceria sp	flote/reed grass	EH	20				1		1		1					10
cf Glyceria sp	flote/reed grass	EH	46	3					4							
Lolium/Festuca	rye-grass/fescue	BCD			1		22									
cf Lolium/Festuca	rye-grass/fescue	BCD		29					82							
Bromus sp	brome	ABD						103	7418	1322	165		68	60	18	313
Gramineae indet	–	ABCDEHIF	187	6062	55	2150	780	5	17	39	22	2		2	3	17
Indeterminate	–	–	14	32	5	13	17									

Key to habitat codes:
A Weeds of cultivated land
B Ruderals. Weeds of waste places and disturbed ground
C Plants of woods, scrub, hedgerows
D Open environment (fairly undisturbed)
E Plants of damp/wet environment
F Edible plants
G Medicinal and poisonous plants
H Commercial/industrial use
I Cultivated plants

Fig 119 15-35 Copthall Avenue: plant remains by period and feature type. Charred remains

Species	Common name		Habitat	Periods												
				Pre-Roman	*I*			*II*				*III*			*IV*	
					Chan	Turf	Drain	Pit	Dump	Hearths	Occ	Chan	Peat	Pits	Pits	Chan	Peat
Cereals:																	
Triticum spelta	spelt	glume base	FI						5								
Triticum *cf* spelta	spelt	glume base	FI						9								
Triticum dicoccum/spelta	emmer/spelt		FI						12								
Triticum dicoccum/spelta	emmer/spelt	glume base	FI						12								
Triticum aestivo/compactum	club wheat		FI														1
Triticum sp	wheat		FI		5					2							
Triticum sp	wheat	spikelet fork	FI		1												
Triticum sp	wheat	glume base	FI		1					55	1						
cf Triticum sp	wheat		FI							1							
Hordeum sativum	barley		FI					1		10			1				
Hordeum sativum	barley	rachis	FI							1							
cf Hordeum sativum	barley		FI					1		1							
Hordeum/Triticum sp	barley or wheat		FI							1							
Hordeum/Secale/Triticum sp	barley/rye/wheat		FI							1							1
Avena sp	oat		AI					1		4	1						1
cf Avena sp	oat		AI							1							
Cerealia	ind cereal	straw	FI		2												
Other plants:																	
Ranunculus acris/repens/bulbosus	buttercups		ABCDEG		2					18	5						
Ranunculus flammula L	lesser spearwort		EG							1							
Brassica *cf* nigra	black mustard		BI									14					
Brassica sp	wild cabbage/turnip/mustard		ABI		1												
cf Brassica sp	wild cabbage/turnip/mustard		ABI							1							
Cruciferae	–		ABCDEGFI							1							
Reseda luteola L	weld-dyer's rocket		ABHI								1						
Viola sp	violet		ABCDG														1
Agrostemma githago L	corn cockle		A							1							
Cerastium spp	mouse-ear chickweed		ABD								2						
Myosoton/Stellaria sp	chickweed/stitchwort		ABCDEG							1							
Stellaria media (L) Vill	chickweed		AB					1									
Stellaria graminea/palustris	stitchwort		CDE								1						
Caryophyllaceae indet	–		–		1					1							
Chenopodium sp	goosefoot etc		ABFH							1							
Malva *cf* sylvestris	mallow		BF							1							
Vitis vinifera L	vine		I		1												
cf Trifolium repens type	white clover		D								1						
Trifolium sp	clover		ABDI							1							
Trifolium spp	clover		ABDI								21						
cf Lens culinaris	lentil		I								1						
cf Vicia sp	vetch		CD							2							
Vicia/Lathyrus sp	vetch/tare/vetchling		CD							3							
cf Vicia/Lathyrus sp	vetch/tare/vetchling		CD		1												
Leguminosae indet	–		–		1												
Rubus fruticosus agg	blackberry		CFGH									1					
Potentilla *cf* erecta	tormentil		CDEGH		1					1							
Potentilla sp	cinquefoil/tormentil		BCDEFGH							1							
Aphanes arvensis agg	parsley piert		ABD							1							

Fig 119 continued

Species	Common name	Habitat	Periods												
			Pre-Roman	*I*			*II*				*III*			*IV*	
				Chan	Turf	Drain	Pit	Dump	Hearths	Occ	Chan	Peat	Pits	Pits	Chan	Peat
Platanus sp	plane	–		1												
Conium maculatum L	hemlock	CEG								1						
Apium *cf* graveolens	celery	EI								1						
Berula erecta (Huds) Coville	narrow-leaved water-parsnip	E		1												
Polygonum lapathifolium L	pale persicaria	ABE							1							
Rumex acetosella L	sheep's sorrel	AD							8							
Rumex acetosa/crispus/obtusifolius	dock	ABCD		2					4	1						
Rumex sp	dock	ABCDEFGI					1		3							
Urtica dioica L	stinging nettle	BCDEFGH														1
Ficus carica L	fig	I		2												
Corylus avellana L	hazel	CF					1									
Veronica hederifolia L	ivy speedwell	A							1							
Prunella vulgaris L	self-heal	BCDG							1	1						
cf Prunella vulgaris	self-heal	BDCG							1							
Labiatae indet	–	ABCFEFI					1									
Plantago lanceolata L	ribwort	D							2							
Plantago *cf* lanceolata	ribwort	D								2						
Plantago sp	plantain/ribwort	ABCD		1												
Galium sp	bedstraw	ABCDE							1							
Sambucus nigra L	elder	BCFGH							1							
Anthemis cotula L	stinking mayweed	ABGH							1							
Chamaemelum nobile (L) All	chamomile	BDFG					1									
cf Lapsana communis	nipplewort	BCF							1							
Eleocharis palustris/uniglumis	spike-rush	E							2							
cf Eleocharis palustris/uniglumis	spike-rush	E							2							
cf Cladium mariscus	sedge	E									3					
Carex sp	sedge	CDEH							2	2						
Carex spp	sedges	CDEH							2	3						
Cyperaceae indet	–	ABCDEFI							1							
Festuca sp	fescue	CDEF		1												
Lolium *cf* perenne	rye-grass	B					1									
Lolium/Festuca	rye-grass/fescue	BCD		3			2		14	1						
Poa spp	poa	ABDE							4							
Poa spp type	poa	ABDE							11							
Bromus sp	brome	ABD							2							
Hordeum sp	barley	BDFI							4							1
Avena/Bromus sp	oat/brome grass	ABCDFI														1
cf Avena/Bromus sp	oat/brome grass	ABCDFI							1							
cf Agrostis sp type	bent-grass	ABCD							12							
Echinochloa/Setaria sp	cockspur/bristle-grass	AB							1							
Gramineae indet	–	ABCDEHIF		96		40	25		318	20	3					
Gramineae indet	– rachis	ABCDEHIF							2							
cf Gramineae indet	–	ABCDEHIF							1							
Indeterminate	–	–		1					4							

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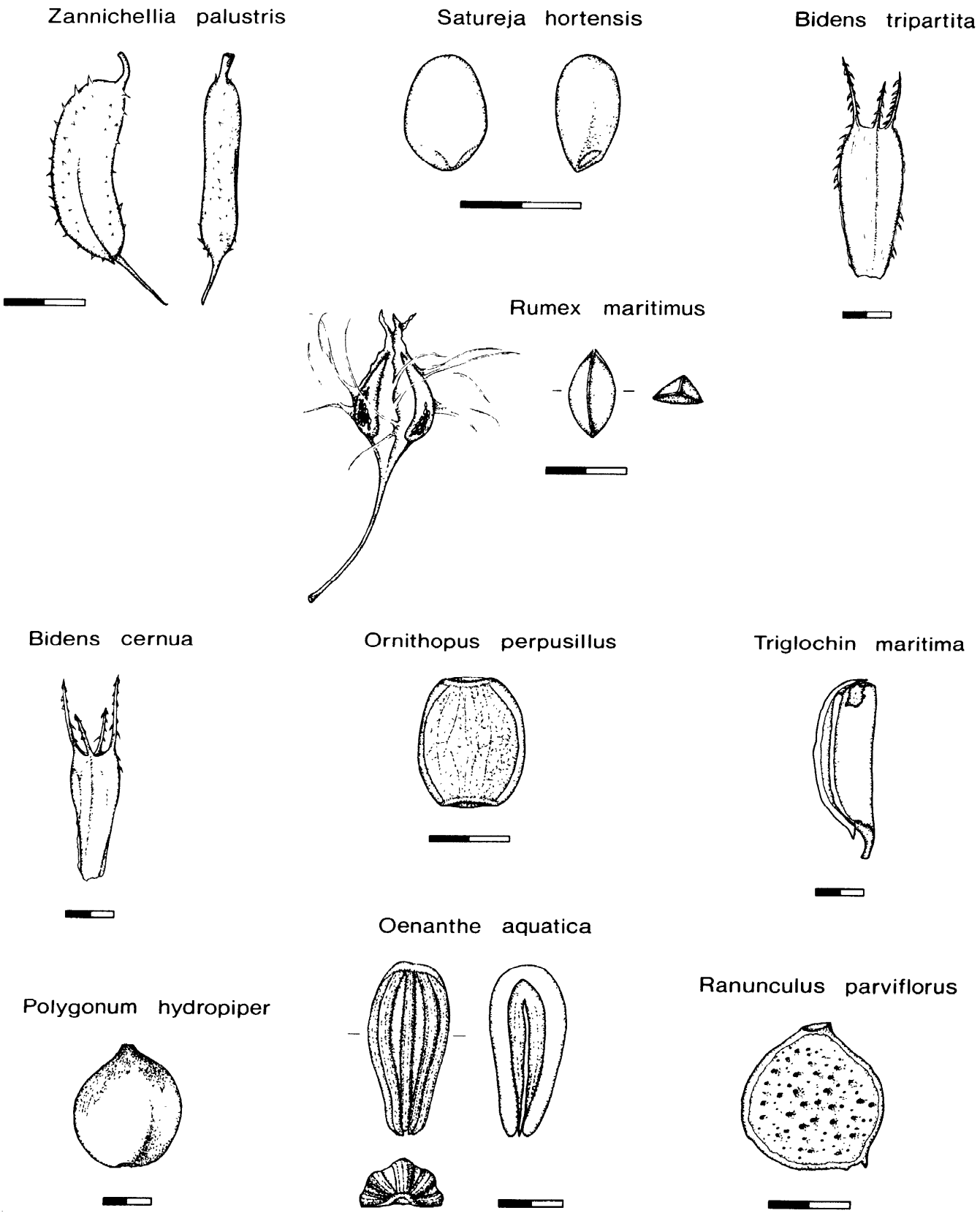


Fig 120 Seeds from the 15-35 CopthaII Avenue samples (drawn by Susan Colledge). Scale represents 1mm

Fig 121 15-35 Copthall Avenue: pollen

Taxa	**Context**	**523**	**535**	**589**	**591**	**601**
Pinus		0	0	1	1	2
Ulmus		0	0	0	1	0
Alnus		0	1	3	0	3
Fagus		0	0	1	0	1
Quercus		3	2	3	2	7
Fraxinus		0	0	0	0	1
Rubus type		0	1	0	0	0
Prunus type		0	0	1	0	0
Corylus type		0	0	4	1	1
Salix type		0	2	0	0	0
Erica		0	1	0	1	1
Calluna		0	1	1	1	0
Ranunculaceae		1	1	3	0	1
Caltha type		0	0	0	0	1
Ranunculus type		5	5	6	1	7
Sinapis type		0	0	2	4	2
Hornungia type		0	2	1	0	0
Lychnis type		0	0	1	0	1
Dianthus type		1	1	2	1	3
Spergula type		1	0	0	0	1
Chenopodium type		1	1	13	2	2
Malva type		0	0	1	3	0
Leguminosae		1	0	0	0	0
Ononis type		0	0	0	2	1
Medicago type		7	2	2	2	0
Trifolium type		8	0	2	10	2
Lotus type		1	1	0	1	0
Astragalus type		0	1	0	1	1
Onobrychis type		0	0	0	1	0
Vicia sylvatica type		0	0	1	0	0
Lathyrus type		0	1	5	4	3
Rosaceae		1	1	1	1	0
Filipendula		1	1	2	1	0
Potentilla type		0	0	1	0	1
Poterium sanguisorba		0	0	0	0	1
Hydrocotyle		0	0	1	1	0
Umbelliferae (2)		0	3	1	2	1
Umbelliferae (3)		0	4	1	0	0
Polygonum aviculare		0	1	2	1	2
Polygonum convolvulus		0	0	0	1	5
Polygonum persicaria		0	0	5	1	0
Oxyria type		1	0	1	0	1
Rumex undiff		0	1	0	1	1
Rumex acetosa		1	1	0	1	0
Rumex acetosella		0	0	3	2	1
Urtica		0	0	5	0	0
Anagallis		0	0	0	1	0
Cynoglossum		0	0	1	0	0
Convolvulus		0	1	1	0	0
Scrophularia type		1	0	1	2	0
Plantago lanceolata		7	13	16	10	22
Plantago m/m		2	0	0	1	2
Rubiaceae		0	1	1	2	1
Scabiosa type		1	0	1	0	0
Succisa type		1	1	1	1	2
Bidens type		1	6	7	2	4
Aster type		2	0	1	2	1
Anthemis type		0	1	5	5	10
Artemisia		0	2	0	0	1
Cirsium type		0	2	0	1	0
Centaurea nigra type		5	30	17	14	10
Scabiosa type		0	0	0	0	2
Taraxacum type		14	48	20	18	34
Liliaceae		0	1	0	0	0
Sparganium type		0	0	0	1	2
Cyperaceae		1	0	1	2	0
Gramineae		438	350	338	406	338
Cerealia		22	12	17	18	22
Pteridium		1	3	3	2	4

Fig 121 continued

Taxa	Context	523	535	589	591	601
Dryopteris		0	0	1	1	5
Polypodium		0	0	1	0	0
Ophioglossum		0	1	0	0	0
Anthoceras		0	0	0	0	1
Ascaris		0	0	1	1	2
Unidentified		0	1	1	2	4

were present in some numbers: *Rubus fruticosus* agg (bramble), *Fragaria vesca* (wild strawberry) and *Malus* (apple) or *Pyrus* sp (pear). Other species from these habitats were *Stellaria graminea* and *Potentilla erecta* (cinquefoil), both of which can also be found in grassland. The channel contexts contained several other grassland species: *Ornithopus perpusillus, Rumex acetosella, Montia fontana, Potentilla argentea* (hoary cinquefoil), *Potentilla reptans* (creeping cinquefoil), and *Rhinanthus* sp (yellow rattle). Some of the species represented in these deposits are characteristic of a wet woodland, such as *Conium maculatum* (hemlock), or wet grassland, such as *Filipendula ulmaria and Veronica anagallis-aquatica* (water speedwell). *V anagallis-aquatica* also grows in ponds, streams or wet mud, as does *Eleocharis* sp. Also present were several seeds of *Polygonum hydropiper, Myosoton aquaticum* and *Apium graveolens* (wild celery), all plants of damp places which grow by or near ponds, ditches, marshes or streams.

Seven of these channel/ditch fills (OPT *562, 583, 588, 592, 593, 601, 604)* contained insect remains. There was some variation between the assemblages obtained but they were generally similar in implication. Several strongly synanthropic taxa, including the grain pests *Oryzaephilus surinamensis, Sitophitus granarius* and *Cryptolestes ferrugineus, were* well-represented, along with other taxa commonly recorded together in urban assemblages (Kenward 1979). Outdoor forms from a variety of habitats made up a fairly high proportion of most of the assemblages. Deposition under semi-natural conditions seems likely, but the channels clearly infilled under conditions which allowed the entry of a fauna characteristic of human settlement, either as 'background' fauna, in outflow water, or in dumped waste, the last two mechanisms being the most likely. The quite large assemblage from context *588* included some taxa which probably lived along the channel, for example *Agonum albipes, Cercyon marinus* and *Custulatus.*

One single fragment of the planorbid mollusc *Anisus leucostoma* was recovered from one of the channel fills *(564)* of Period I; this species is often found under stagnant conditions.

An estimate of *350* opg of *Trichuris trichiura* was made in the roadside ditch fill of *604,* the only deposit in Period I shown to include any parasite ova.

The plants from two samples of turves *(306* and *350),* used as a foundation for the road (p 33), indicated very damp local or semi-local conditions. The sample from *350* had a seed assemblage similar to that of the channels, while *306* may have been taken from a marsh area with very damp-loving plants. The insect remains, which occurred in low numbers in these samples, included a very large outdoor component, with no clear 'turf component and only a few individuals from aquatic and waterside habitats.

The evidence for Period I, the period of reclamation and drainage, shows that a semi-natural grassy and damp landscape existed at this time. The natural environment had been altered and the water seems to have become stagnant or sluggish; this was also observed *in situ* from the nature of the sediments (p 31). The pollen and the plant remains, with their cereal and segetal component, and the synanthropic element including grain beetles, show that human influence on the area had grown. The increase in ruderals also shows that the ground was increasingly disturbed. The decomposer insects suggest that a fauna of urban character was being washed into the sediments or that organic rubbish was dumped into the channels. The parasites in the roadside ditch sample, and *Ficus carica* and *Rubus fruticosus* agg in several other samples, indicate that human faecal material was a pollutant of the channels and ditches. *Chenopodium glaucum* or *rubrum* and *Urtica dioica,* which are both species of nitrogenous rich soils, support this supposition, as they are often but not exclusively found where a high amount of human waste is present. Charred remains, absent in the pre-Roman deposits, may have been thrown or washed into the channels as part of the general rubbish. We know from the finds that rubbish of a varied nature was dumped in Period I (above, p 82). The biological remains indicate a dramatic increase in human activity and influence in this area in Period I and offer evidence of the beginning of urbanisation. One of the possible human activities in this marginal area to the town may have been small-scale cultivation; this would explain the presence of the cereal grains and chaff. However, these may be due to the transportation of foodstuff along the road into the city or inclusion in the general waste.

Period II (buildings in the 2nd and 3rd centuries)

Four samples (OPT *191, 214, 338, 433)* were analysed from the occupation surfaces of the building from Period II (Part 4). For two of the samples, three 250g subsamples had to be processed to recover enough seeds. Three more samples from this category (OPT *289, 292, 406)* did not contain enough seeds and were discarded.

Context *433* from Room vi of Phase 4 (p 49) contained plant remains similar to those from the other occupation surfaces which reflect a damp and disturbed environment. The apparently intense occupation (p.52)

Fig 122 15-35 Copthall Avenue: Coleoptera and Hemiptera

Nomenclature follows Kloet and Hincks (1964 and 1977) sp indet = record may include taxon listed above P present (estimated minimum number of individuals 1–3) C common (estimated MNI 4–9) A abundant (estimated MNI 10–40) *Species*	Period Pre-Roman	I Early Roman		II 2nd + 3rd century			III Mid–Late 4th century			IV 11th–12th century	
	'Natural Valley' 709,712,719,723	Channel Fills 652, 583, 588, 591, 593, 601, 604	Turves 306, 350	Floor 214	?Pit 367	Drain 184	Roadside ditch fills 133, 134A, 144, 146	Pit 172	?Pit 110	Peat 70, 74	Peat 69, 118, 119, 124
Eurydema oleracea (Linnaeus)	–	P	–	–	–	–	–	–	–	–	–
Stygnocoris fuligineus (Geoffroy in Fourcroy)	–	P	–	–	–	–	–	–	–	–	–
Scolopostethus sp	–	–	–	–	–	–	P	–	–	–	–
Saldula sp	–	–	–	–	–	–	–	–	P	–	P
Saldidae sp indet	–	–	–	–	–	–	–	–	P	–	–
Gerris sp	–	–	–	–	–	–	–	–	–	–	P
Auchenorhyncha sp(p)	–	P	–	P	–	–	–	–	–	–	–
Aphidoidea sp(p)	C	A	C	–	–	C	C	–	C	–	C
Hemiptera sp	–	–	–	–	–	–	–	–	–	–	P
Clivina collaris (Herbst)	P	–	–	–	–	–	–	–	–	–	–
Clivina fossor (Linnaeus)	–	–	–	–	–	P	–	–	–	–	–
Trechus quadristriatus (Schrank)	–	–	P	–	–	–	–	–	P	–	–
Trechus obtusus Erichson or quadristriatus	–	–	–	P	–	P	P	–	–	–	P
Asaphidion flavipes (Linnaeus)	P	–	–	–	–	–	–	–	–	–	–
Bembidion lampros or properans	–	–	–	–	–	–	–	–	–	–	P
Bembidion ?assimile Gyllenhal	–	–	–	–	–	–	–	–	P	–	C
Bembidion genei s illigeri Netolitsky	–	–	–	–	–	P	–	–	–	–	–
Bembidion biguttatum (Fabricius)	–	–	–	–	–	–	–	–	P	–	–
Bembidion lunalatum (Fourcroy)	–	–	–	–	–	–	–	–	–	–	P
Bembidion (Philochthus) sp	–	–	P	–	–	–	–	–	–	–	P
Bembidion spp indet	–	C	–	–	–	–	P	–	P	–	P
Pterostichus ?cupreus (Linnaeus)	–	–	–	–	–	–	–	–	–	–	P
Pterostichus melanarius (Illiger)	–	P	–	–	–	–	–	–	–	–	–
Pterostichus nigrita (Paykull)	–	–	P	–	–	P	–	–	–	–	–
Pterostichus spp indet	–	P	P	–	–	P	–	–	–	–	P
Calathus sp	–	P	–	–	–	–	–	–	–	–	–
Agonum albipes (Fabricius)	–	P	–	–	–	P	–	–	–	–	–
Agonum dorsale (Pontoppidan)	–	P	–	–	–	–	–	–	–	–	–
Agonum marginatum (Linnaeus)	–	–	–	–	–	P	–	–	–	–	–
Agonum ?moestum (Herbst)	–	–	–	–	–	–	P	–	–	–	–
Agonum ?muelleri (Herbst)	–	–	–	–	–	–	–	–	–	–	P
Amara sp	–	P	–	–	–	P	P	–	P	–	P
Bradycellus sp	–	–	–	–	–	P	–	–	–	–	?P
Dromius ?meridionalis Dejean	–	–	–	–	–	P	–	–	–	–	–
Metabletus ?foveatus (Fourcroy)	–	P	–	–	–	–	–	–	–	–	–
Metabletus sp indet	–	P	–	–	–	–	–	–	–	–	–
Carabidae spp indet	P	C	–	P	–	P	C	–	P	–	P
Hygrotus ?inequalis (Fabricius)	–	–	–	–	–	–	–	–	P	–	–
Hydroporinae spp	–	P	–	–	–	–	C	–	–	–	P
Agabus bipustulatus (Linnaeus)	–	–	–	–	–	–	–	–	P	–	–
?Agabus sp	–	–	–	–	–	–	–	–	–	–	P
Colymbetes fuscus (Linnaeus)	–	–	–	–	–	–	–	–	–	–	P
Colymbetinae sp	P	–	–	–	–	–	P	–	–	–	–
Helophorus aquaticus (Linnaeus) or grandis Illiger	–	P	–	–	–	–	P	–	P	–	–
Helophorus spp	P	C	–	–	–	P	–	–	P	P	C
Coelostoma orbiculare (Fabricius)	–	–	–	–	–	–	–	–	C	–	C
Sphaeridium bipustulatum Fabricius	–	P	–	–	–	–	P	–	–	–	–
Sphaeridium ?lunatum Fabricius	–	P	–	–	–	–	–	–	–	–	–
Sphaeridium scarabaeoides (L) or lunatum Fabricius	–	–	–	–	–	–	–	–	P	–	–
?Sphaeridium sp	–	–	P	–	–	–	–	–	–	–	–
Cercyon analis (Paykull)	–	C	P	–	–	P	C	–	–	P	P
Cercyon atricapillus (Marsham)	–	C	–	P	–	?P	–	–	–	–	P
Cercyon haemorrhoidalis (Fabricius)	–	P	–	–	–	?P	–	–	–	–	–
Cercyon marinus Thomson	–	P	–	–	–	–	–	–	–	–	P
Cercyon sternalis Sharp	–	–	–	–	–	–	–	–	–	–	C
Cercyon terminatus (Marsham)	–	P	–	–	–	P	–	–	–	–	–

Fig 122 continued

Species	Period: Pre-Roman	I Early Roman		II 2nd + 3rd century			III Mid–Late 4th century			IV 11th–12th century	
	'Natural Valley' 709,712,719,723	Channel Fills 652, 583, 588, 591, 593, 601, 604	Turves 306, 350	Floor 214	?Pit 367	Drain 184	Roadside ditch fills 133, 134A, 144, 146	Pit 172	?Pit 110	Peat 70, 74	Peat 69, 118, 119, 124
Cercyon tristis (Illiger)	–	–	–	–	–	–	–	–	P	–	A
Cercyon ustulatus (Preyssler)	P	P	–	–	–	P	P	P	–	–	P
Cercyon spp indet	P	C	P	–	P	–	P	–	C	–	P
Megasternum obscurum (Marsham)	P	C	P	–	–	P	P	P	P	–	–
Crytopleurum minutum (Fabricius)	–	P	–	–	–	P	P	–	–	–	–
Hydrobius fuscipes (Linnaeus)	–	P	–	–	–	–	P	–	P	–	C
Laccobius sp	–	–	–	–	–	–	–	–	–	–	P
Enochrus ?testaceus (Fabricius)	–	–	–	–	–	–	–	–	P	–	–
Enochrus sp indet	–	–	–	–	–	–	–	–	–	–	P
Cymbiodyta marginella (Fabricius)	–	–	–	–	–	–	–	–	P	–	C
?Hydrochara caraboides (Linnaeus)	–	–	–	–	–	–	–	–	–	–	P
Hydrophilinae spp indet	P	P	–	–	–	P	P	–	C	–	P
Acritus nigricornis (Hoffman)	–	C	–	–	–	P	–	–	–	P	–
Dendrophilus punctatus (Herbst)	–	P	–	–	–	–	–	–	–	–	–
Histerinae sp	P	–	–	–	–	–	–	–	–	–	–
Ochthebius ?minimus (Fabricius)	–	?P	–	–	–	–	–	–	–	P	–
Ochthebius sp	P	P	P	–	–	–	–	–	P	–	A
Hydraena testacea Curtis	–	P	–	–	–	–	–	–	–	–	–
Limnebius sp	–	?P	–	–	–	?P	–	–	C	–	P
Ptenidium sp	–	C	–	–	–	–	–	–	–	–	–
Acrotrichis spp	–	A	–	–	–	P	–	–	–	P	–
Ptiliidae sp	–	P	–	–	–	P	–	–	–	–	–
Catops sp	–	P	–	–	–	P	?P	–	–	–	P
Catopinae spp indet	–	–	–	–	–	–	–	–	–	–	P
Scydmaenidae sp	–	P	–	–	–	–	–	–	–	–	–
Megarthrus sp	–	–	–	–	–	–	–	–	–	P	–
Lesteva ?longoelytrata (Goeze)	–	P	–	–	–	–	–	–	–	–	–
Lesteva sp indet	–	–	–	–	–	P	–	–	–	–	–
Omalium ?rivulare (Paykull)	–	P	–	–	–	–	–	–	–	–	–
Omalium sp	–	P	–	–	–	–	–	–	–	–	P
Xylodromus concinnus (Marsham)	–	P	–	P	–	–	–	–	–	–	–
Omaliinae sp indet	–	P	P	–	–	–	–	–	–	–	–
Carpelimus ?bilineatus Stephens	–	P	–	–	–	P	–	–	–	–	–
Carpelimus fuliginosus (Gravenhorst)	–	–	P	–			–	–	–	P	–
Carpelimus ?gracilis (Mannerheim)	–	C	–	–	–	–	–	–	–	–	–
Carpelimus pusillus (Gravenhorst)	–	C	–	–	–	–	–	–	–	P	–
Carpelimus pusillus group	P	C	–	–	–	–	–	–	–	–	–
Carpelimus bilineatus or rivularis (Motschulsky)	–	–	–	–	–	–	–	–	–	P	–
Carpelimus spp indet	P	C	–	–	–	–	–	–	–	–	–
Aploderus caelatus (Gravenhorst)	–	P	–	–	–	–	–	–	–	–	–
Platystethus alutaceus Thomson	–	P	–	–	–	–	–	–	–	–	–
Platystethus arenarius (Fourcroy)	–	C	P	–	–	P	P	–	P	–	P
Platystethus cornutus (Gravenhorst) group	–	C	P	–	–	P	P	–	–	P	P
Platystethus nitens (Sahlberg)	–	C	?P	–	P	–	–	–	–	–	–
Anotylus complanatus (Erichson)	–	P	–	–	–	–	–	–	–	–	–
Anotylus nitidulus (Gravenhorst)	P	C	–	–	P	P	–	–	–	P	–
Anotylus rugosus (Fabricius)	P	P	–	–	–	P	P	–	C	P	C
Anotylus sculpturatus group	–	P	–	–	–	P	–	–	P	–	–
Oxytelus laqueatus (Marsham)	–	–	–	–	–	P	–	–	–	–	–
Oxytelus sculptus Gravenhorst	–	C	–	–	–	–	–	–	–	P	–
Stenus spp	P	P	P	–	–	–	P	–	C	–	A
Paederus sp	–	–	–	–	–	–	–	–	P	–	–
Lathrobium sp	–	P	–	–	–	–	–	–	–	–	P
Lithocaris ochracea (Gravenhorst)	–	P	–	–	–	–	–	–	–	–	–
?Astenus sp	–	P	–	–	–	–	–	–	–	–	–
Paederinae sp	–	P	P	–	–	–	–	–	–	–	–
Leptacinus ?pusillus (Stephens)	–	P	–	–	–	–	–	–	–	–	–
Leptacinus sp indet	–	P	P	–	–	P	–	–	–	–	–

Fig 122 continued

Species	Period: Pre-Roman	I Early Roman		II 2nd + 3rd century			III Mid–Late 4th century			IV 11th–12th century	
	'Natural Valley' 709,712,719,723	Channel Fills 652, 583, 588, 591, 593, 601, 604	Turves 306, 350	Floor 214	?Pit 367	Drain 184	Roadside ditch fills 133, 134A, 144, 146	Pit 172	?Pit 110	Peat 70, 74	Peat 69, 118, 119, 124
Phacophallus parumpunctatus (Gyllenhall)	–	–	–	–	–	P	–	–	–	–	–
Gyrohypnus angustatus Stephens	–	?P	P	–	–	–	P	–	–	–	–
Gyrohypnus fracticornis (Muller)	–	P	–	–	–	–	–	–	P	–	–
Gyrohypnus sp indet	–	P	–	–	–	P	–	–	–	–	–
Xantholinus longiventris Heer	–	–	P	–	–	–	–	–	–	P	–
Xantholinus sp indet	–	–	–	–	–	–	–	–	P	–	P
Neobisnius villosulus (Stephens)	–	P	–	–	–	–	–	–	–	?P	–
Neobisnius sp indet	–	P	–	–	–	?P	–	–	–	–	–
Philonthus spp	–	P	–	–	–	P	–	–	C	–	A
Gabrius sp	–	–	–	–	–	–	–	–	?P	–	P
Staphylininae spp indet	P	C	P	–	–	P	C	P	–	P	P
Tachyporus ?hypnorum (Fabricius)	–	–	–	–	–	–	P	–	–	–	–
Tachyporus sp	P	P	–	?P	–	P	–	–	P	P	P
Tachinus laticollis Gravenhorst	–	–	–	–	–	–	P	–	–	–	–
Tachinus sp indet	–	P	–	–	–	P	–	–	–	–	P
Cilea silphoides (Linnaeus)	–	P	–	–	–	–	–	–	–	–	–
Tachyporinae sp indet	–	P	–	–	–	–	–	–	–	–	–
Cordalia obscura (Gravenhorst)	–	P	–	–	–	–	–	–	–	–	–
Falagria caesa Erichson	–	P	–	–	–	–	–	–	–	–	–
Falagria caesa or sulcatula (Gravenhorst)	–	C	–	–	–	–	–	–	–	–	–
Falagria sp indet	P	C	–	–	–	–	–	–	–	–	–
Aleochara spp	–	P	–	–	–	C	–	–	–	–	–
Aleocharinae sp	P	A	P	P	P	P	P	–	P	P	C
Pselaphidae sp	–	P	–	–	–	–	–	–	P	–	–
Trox scaber (Linnaeus)	–	P	–	–	–	–	P	–	–	P	–
Aphodius contaminatus (Herbst)	–	P	–	–	–	–	–	–	–	–	–
Aphodius granarius (Linnaeus)	–	A	–	–	–	?P	–	–	–	–	P
Aphodius prodomus (Brahm)	–	P	–	–	–	–	–	–	–	–	–
Aphodius spp	P	A	P	P	P	P	C	–	–	C	C
Aphodius or Colobopterus sp	–	–	P	–	–	–	–	–	P	–	–
Oxyomus sylvestris (Scopoli)	–	C	–	–	–	P	P	–	–	–	–
Onthophagus sp	–	P	–	–	–	–	–	–	–	–	–
Melolonthinae/Rutelinae/Cetoninae sp	–	–	–	–	–	–	–	–	–	–	P
Clambus sp	–	P	–	–	–	–	–	–	–	–	P
Cyphon spp	–	–	–	–	–	–	P	–	P	–	C
?Scirtidae sp	–	–	–	–	–	P	–	–	–	–	–
Dryops sp	–	P	P	–	–	–	–	–	P	–	P
Oulimnius sp	–	P	–	–	–	–	–	–	P	–	–
Elateridae spp	–	P	–	–	–	–	–	–	–	–	–
Trixagus sp	–	–	–	–	–	–	–	–	–	–	P
Cantharidae sp	–	P	–	–	–	–	–	–	–	–	–
Anthrenus sp	–	–	–	–	–	–	P	–	–	–	–
Stegobium paniceum (Linnaeus)	–	P	–	–	–	P	P	–	–	–	–
Anobium punctatum (Degeer)	–	A	P	P	P	A	C	–	P	P	–
Tipnus unicolor (Piller and Mitterpacher)	–	P	–	–	–	P	–	–	–	–	–
Ptinus fur (Linnaeus)	–	P	–	?P	–	P	P	–	–	P	–
Ptinidae spp indet	–	P	–	–	–	–	–	–	–	–	–
Lyctus linearis (Goeze)	–	P	–	–	–	–	–	–	P	–	–
Brachypterus sp	–	P	–	–	–	P	P	–	–	–	–
Meligethes sp	–	–	–	–	–	P	–	–	–	–	C
Omosita sp	–	–	–	–	–	P	–	–	–	P	–
Monotoma bicolor Villa	–	P	–	–	–	–	–	–	–	–	–
Monotoma ?picipes Herbst	–	P	–	–	–	–	–	–	–	–	–
Monotoma sp indet	–	P	–	–	–	–	–	–	–	–	P
Cryptolestes ferrugineus (Stephens)	–	A	P	–	–	P	P	P	–	–	–
Cryzaephilus surinamensis (Linnaeus)	–	A	–	P	–	P	–	P	–	–	–
Cryptophagus scutellatus Newman	–	P	–	P	–	–	–	–	–	–	–
Cryptophagus spp	–	C	–	P	–	P	–	–	P	–	P
Atomaria nigripennis (Kugelann)	–	P	–	–	–	–	–	–	–	–	–

Fig 122 continued

Species	Period: Pre-Roman	I Early Roman		II 2nd + 3rd century			III Mid–Late 4th century			IV 11th–12th century	
	'Natural Valley' 709,712,719,723	Channel Fills 652, 583, 588, 591, 593, 601, 604	Turves 306, 350	Floor 214	?Pit 367	Drain 184	Roadside ditch fills 133, 134A, 144, 146	Pit 172	?Pit 110	Peat 70, 74	Peat 69, 118, 119, 124
Atomaria spp	–	C	–	–	–	P	–	–	P	–	C
Ephistemus globulus (Paykull)	–	P	–	–	–	P	–	–	–	–	P
Phalacrus ?substriatus Gyllenhal	–	–	–	–	–	–	–	–	C	–	–
Phalacrus sp indet	–	P	–	–	–	–	–	–	–	–	C
Orthoperus sp	–	C	–	–	–	–	–	–	–	–	–
?Hippodamia tredecimpunctata (Linnaeus)	–	–	–	–	–	–	–	–	–	–	P
Anisosticta novemdecimpunctata (Linnaeus)	–	–	–	–	–	–	–	–	–	–	P
Coccinellidae sp	–	P	–	P	–	–	–	–	–	–	–
Lathridius minutus group	–	A	–	P	–	P	–	–	–	P	–
Enicmus sp	–	C	–	–	–	–	–	–	–	–	P
Dienerella sp	–	–	–	P	–	–	–	–	–	–	–
Lathridiinae sp indet	–	–	–	–	P	–	–	–	–	–	–
Corticaria sp	–	P	–	P	–	P	?P	–	–	–	–
Cortinicara gibbosa (Herbst)	–	P	–	–	–	–	–	–	–	–	–
Corticaria or Cortinicara sp indet	–	P	–	–	–	–	P	–	–	–	–
Corticarina or Cortinicara sp indet	–	P	–	–	–	P	–	–	–	–	–
Corticariinae sp indet	–	P	–	–	–	–	–	–	–	–	P
Typhaea stercorea (Linnaeus)	–	–	–	–	–	P	–	–	–	–	–
Aglenus brunneus (Gyllenhal)	–	C	–	P	–	–	–	–	–	–	–
Blaps sp	–	P	–	–	–	P	–	–	–	–	–
Tribolium sp	–	–	–	–	–	–	P	–	–	–	–
Palorus ratzeburgi (Wissman)	–	P	–	–	–	P	–	–	–	–	–
?Palorus sp	–	P	–	–	–	–	–	–	–	–	–
Tenebrio obscurus Fabricius	–	P	?P	–	–	–	–	–	–	–	–
Tenebrio sp	–	P	–	–	–	–	–	–	–	–	–
Anthicus formicarius (Goeze)	–	P	–	–	–	P	–	–	–	–	–
Anthicus sp indet	–	C	–	P	–	–	–	–	–	P	P
Bruchinae sp indet	–	P	P	–	–	–	–	–	–	–	–
Donacia sp	–	–	–	–	–	–	–	–	P	–	P
Donaciinae spp indet	–	–	P	–	–	–	–	–	–	–	–
Lema or Oulema sp	–	–	–	–	–	–	–	–	–	–	P
Gastrophysa viridula (Degeer)	–	–	–	–	–	P	–	–	–	–	–
Prasocuris phellandrii (Linnaeus)	–	–	–	–	–	–	–	–	–	–	P
Chrysomelinae spp indet	–	C	–	–	–	P	P	–	P	–	P
Phyllotreta sp	–	–	–	–	–	P	P	–	P	–	–
?Longitarsus sp	P	P	–	–	–	P	–	–	–	–	P
Altica sp	–	P	–	–	–	–	–	–	–	–	–
Chaetocnema arida Foudras group	–	–	P	–	–	–	–	–	P	–	P
Chaetocnema concinna (Marsham)	–	P	–	–	–	P	–	–	–	–	P
Halticinae sp indet	–	C	–	–	–	P	P	–	–	P	P
Chrysomelidae sp indet	–	P	–	–	–	–	–	–	–	–	–
Apion radiolus (Marsham)	–	–	–	–	–	–	–	–	P	–	–
Apion pomonae (Fabricius)	–	–	–	–	–	–	–	–	P	–	–
Apion nigritarse Kirby	–	–	–	P	–	–	–	–	–	–	–
Apion spp	–	C	P	P	–	P	P	–	P	–	C
Phyllobius or Polydrusus sp	–	P	–	–	–	–	–	–	–	–	–
Strophosomus nebulosus Stephens	–	–	–	P	–	–	–	–	–	–	–
Strophosomus sp indet	–	P	–	–	–	–	–	–	–	–	–
Cneorhinus plumbeus (Marsham)	–	P	–	–	–	–	–	–	–	–	–
Sitona hispidulus (Fabricius)	–	–	–	–	–	P	–	–	–	–	–
Sitona ?lepidus (Gyllenhal)	P	–	–	–	–	–	–	–	–	–	–
Sitona ?lineatus (Linnaeus)	–	–	–	–	–	–	–	–	P	–	–
Sitona sp indet	–	P	P	–	–	–	–	–	–	–	P
Hypera punctata (Fabricius)	P	P	–	–	–	–	–	–	–	–	–
Tanysphyrus lemnae (Paykull)	–	–	–	–	–	–	P	–	C	–	A
Sitophilus granarius (Linnaeus)	–	A	–	P	–	P	C	P	–	–	–
Bagous sp	–	–	–	–	–	–	–	–	–	–	P
?Hydronomus alismatis (Marsham)	–	–	–	–	–	–	–	–	–	–	P

Fig 122 continued

Species	Period: Pre-Roman	I Early Roman			II 2nd + 3rd century		III Mid–Late 4th century			IV 11th–12th century	
	'Natural Valley' 709,712,719,723	Channel Fills 652, 583, 588, 591, 593, 601, 604	Turves 306, 350	Floor 214	?Pit 367	Drain 184	Roadside ditch fills 133, 134A, 144, 146	Pit 172	?Pit 110	Peat 70, 74	Peat 69, 118, 119, 124
Notaris acridulus (Linnaeus)	P	P	P	–	–	–	–	–	P	–	C
Notaris scirpi (Fabricius)	–	–	–	–	–	–	–	–	–	–	P
Erirhininae sp	–	–	–	–	–	–	P	–	–	–	–
Cidnorhinus quadrimaculatus (Linnaeus)	–	P	–	–	–	–	–	–	–	–	–
Ceutorhynchus ?contractus (Marsham)	–	P	–	–	–	–	–	–	–	–	–
Ceutorhynchus ?erysimi (Fabricius)	–	–	–	–	–	–	–	–	–	–	P
Ceutorhynchus spp	–	P	–	P	–	–	P	P	–	–	P
Rhinoncus perpendicularis (Reich)	–	–	–	–	–	–	–	–	–	–	P
Ceuthorhynchinae sp indet	P	–	–	–	P	P	P	–	–	–	–
Anthonomus pomorum (Linnaeus)	–	P	–	–	–	–	–	–	–	–	–
Gymnetron spp	–	P	?P	–	–	P	–	–	–	–	P
Curculionidae spp indet	P	C	–	–	P	–	P	–	P	P	P
Scolytidae spp	–	P	–	–	–	–	–	–	–	–	–
Coleoptera spp indet	P	C	P	–	–	–	P	–	P	P	P
Coleoptera sp indet larva	–	–	P	–	–	–	–	–	–	–	–

does not seem to have been domestic or to have left debris generated by people or animals; no insect or parasite evidence was recovered in the sample. The assemblages show that weeds from disturbed areas as well as grasslands, and to a lesser extent wet ground, became incorporated in the occupation layers analysed.

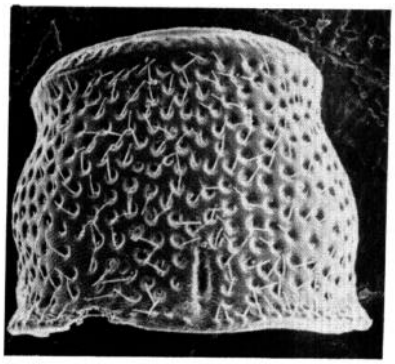
Insects and parasites, as well as waterlogged (but not charred) plant remains were found on floor *214* (Phase 6, Room xi, p 50). The assemblage of insects from floor *214* was not very large, but appeared to be an urban fauna with a few outdoor forms. The more abundant taxa, with the exception of *Aphodius* sp, were generally typical of assemblages found in buildings. This floor had one of the only two counts of parasite eggs *Trichuris trichuria* (200 opg) for the period. The plants included a mixture fairly typical of ruderal and damp grassy environments, a few glume bases of wheat and a single seed of *Ficus* carica. It is not possible from this evidence to say what the floor might have been used for.

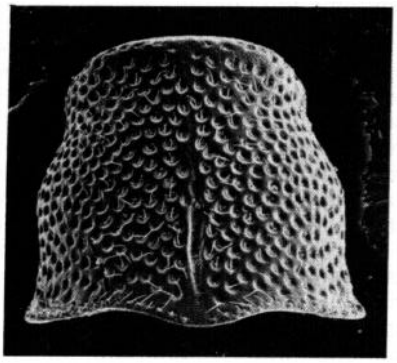
The brickearth floor *(338)* from Phase 8, Room xii (p 52) included an assemblage of carbonised seeds. They belonged to species usually found at 15-35 Copthall Avenue in this period, namely ruderal and grassland species. It also contained a few *Gramineae* seeds and a comparatively high proportion of *Leguminosae* seeds believed to be *Trifolium* sp, (clover), which might have derived from human/animal activity.

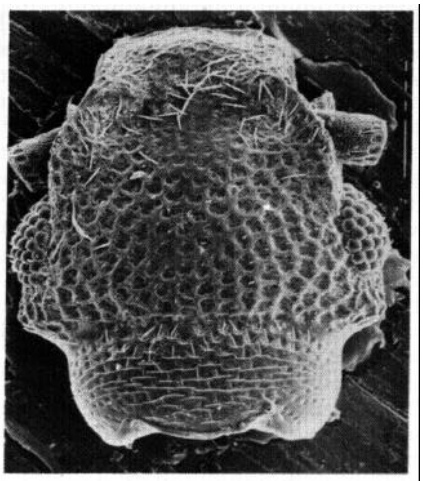
Most of the pits in this period contained only waterlogged plant remains, which included ruderal and damp grass species. There was no significant difference between the two types of assemblage from the sunken hearths and pits except in one or two instances.

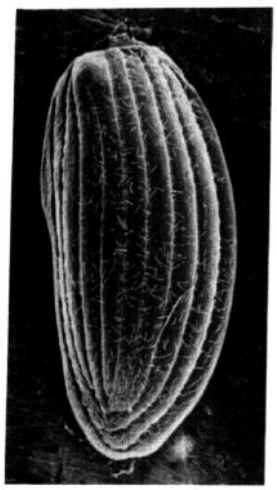
In Room xi of Phase 6, next to floor surface *214* (see 50; Figs 75 and 76), context *222* from one of the

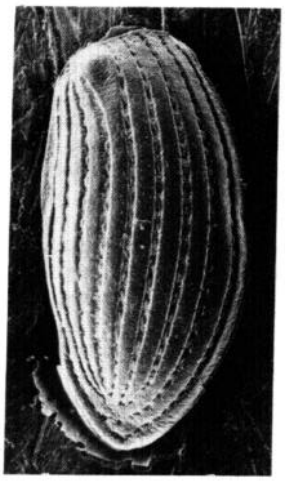
Fig 123 15-35 Copthall Avenue: scanning electron micrographs of beetle remains. ***Top left:*** *pronotum (0.65mm) and below it, elytron (2.15mm) of* Apion radiolus, *a weevilfound on mallows, especially* Malva sylvestris *L.; the posterior rim of the pronotum is slightly expanded in preservation;* ***top centre:*** *pronotum (0.85mm) and below it, elytron (2.5mm) of* Apion pomonae, *which feeds on vetches* (Vicia *and* Lathyrus); ***top right:*** *head (0.65mm) and below it, pronotum (0.6mm) of* Oryzaephilus surinamensis, *the saw-toothedgrain beetle, a grain pest commonly found in Roman deposits;* ***left lower centre:*** *head (0.8mm) of* Tanysphyrus lemnae, *an aquatic weevilfound on duckweeds* (Lemna); ***bottom right:*** *joined elytra (1.25mm) of* Tanysphyrus lemnae, *with detail of scales shown bottom centre;* ***bottom left:*** *head (0.45mm) of* Palorus ratzeburgi, *a strict synanthrope living in storedflour and spoiling cereals. Dimensions given are lengths of sclerites shown here. All sclerites are viewed dorsally except for the head of* Tanysphyrus lemnae *which is shown in profile. Scanning electron micrography by Alan Robertson*

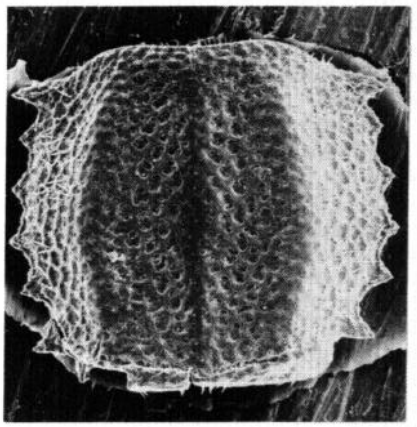


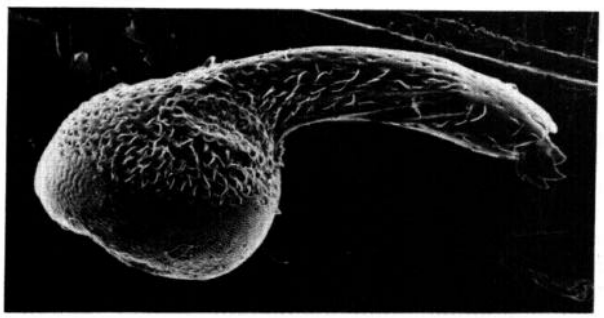


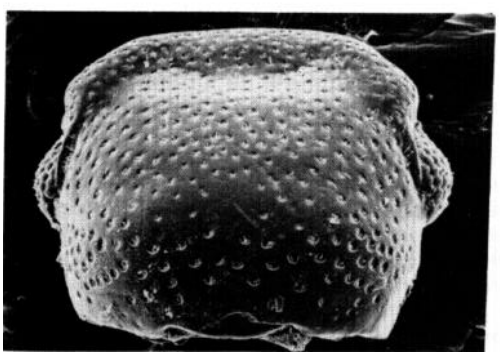


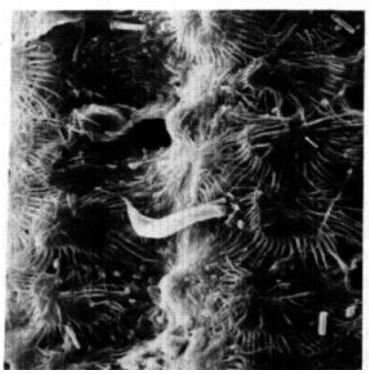


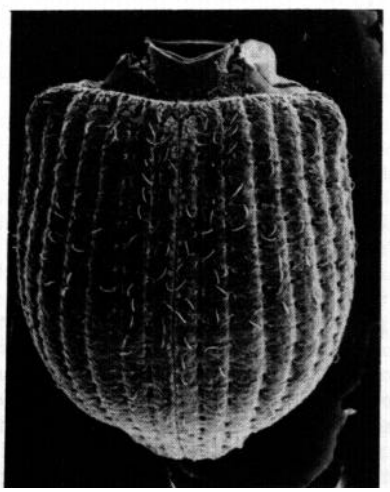












sunken hearths included a very high number of *Gramineae* and rush seeds in one of the subsamples *(222.3;* Fig 133). This could represent dumped flooring material or hay; the rest of the assemblage reflected a grassland habitat. Could it be that dry grasses were used as a fuel in these contexts? This subsample (3) was a discrete organic layer lining the base of the pit. The grassland species, besides the many *Gramineae* and rushes *(Juncus* spp), included chickweed *(Cerastium* spp), *Ranunculus* spp, and *Prunella vulgaris.* There were comparatively few docks *(Rumex* spp) and other seeds of disturbed places and few wetland indicators. The other subsamples *222.1* and *222.2* also had many *Gramineae* seeds, although fewer seeds than in *222.3.* They contained very few or no seeds of *Rhinanthus* sp, few *P vulgaris,* more wet-loving species such as *Apium graveolens, Eleocharis palustris/uniglumis* and more seeds of species of disturbed grounds such as the *Polygonum* spp. They therefore reflect the usual mixture at this site of wet and disturbed habitats. The other sunken hearth in the room *(215)* included the same type of waterlogged assemblage as many others; in addition, it included charred grains of cereals and glume bases of wheat and a few other charred seeds, most of which were probably associated with the cereals. In contrast, the charred remains found in *222* did not include cereals and the wild seed component was similar to the waterlogged assemblage.

It would seem that in Room xi, the sunken hearths received rubbish resulting from domestic activity, perhaps the cleanings from cereals just before the grain was used *(215),* while the fill *(222)* represented a whole layer of Gramineae and rush hay which might originally have been used as bedding or animal feed, but was dumped into the bottom of the northernmost feature. In Room xii of Phase 7, two sunken hearth fills *(344, 355)* and two pit fills (363 and 367) were present. *344* and *355* included very few charred remains, mostly seeds of *Gramineae* similar in number and type to those of *363* and *367.* The assemblages of plant remains preserved by waterlogging did not differ markedly from each other. *344* had more damp-loving species than *355* which was fairly poor in seeds by comparison. *363* and *367* were very similar and it is not possible from the plant remains to say whether *363* held a container or not (p 52) or whether *367* was a rubbish pit. Only ten insect taxa were recorded from *367,* none of which would be out of place in an urban assemblage.

The sunken hearths *(258* and *255)* from Room xiv of Phase 9 (p 52) contained similar plant assemblages to those mentioned above. A sample from sunken hearth *257* (Phase 7, Room xii) gave an estimate of 200 opg *Trichuris trichuria.* Although other pits *(255, 267)* (Phase 7) and an organic dump (523) (Phase 1) were studied for parasites, these proved negative.

Plant and insect remains were well preserved in the Phase 6 drain *184* (Fig 133). The drain was connected to a shallow gully running along the west side of the building which was thought to have been an eavesdrip gully (p 51). The plant remains included species such as *Filipendula ulmaria* from wet grassland or the edge of marshy areas. No species indicating conditions as wet as those in the previous period were present but damp conditions still prevailed.

The assemblage from the Phase 6 drain *(184)* was very rich in insects, 250 grammes of sediment yielding 129 individuals of 85 taxa. The outdoor component was large, forming 33% of the individuals. Aquatic and waterside forms were quite well represented, together making up a third of the outdoor component. Only 39% of the individuals were of decomposer species, those exploiting foul matter being fairly numerous, while taxa typically found in relatively dry rotting material were not especially important. The only abundant species in the assemblage, the woodworm beetle *Anobium punctatum,* probably originated in structural timber, perhaps from the building itself, a nearby fence, the planks lining the drain, or from dumped timber. The rest of the fauna may also have come from more distant surroundings rather than the immediate area of deposition. There was a modest number of individuals of strongly synanthropic species such as the bread beetle, *Stegobium paniceum* and spider beetles. These may have come from the building, have arrived in dumps of rubbish or re-deposited material, or may simply have been part of the background fauna. Rubbish might also be the origin of many rushes and *Gramineae* seeds, which may, for example, have been part of material brought into the building as flooring and subsequently swept into the drain, or derived from roofing material which fell into the drain.

The plant and insect evidence from Period II, the period of the building, reflected the human occupation of the building, including fires in hearths or the dumping of straw material. The evidence from the pits indicated that the environment around the building was still damp and fairly disturbed by human activity.

Period III (late Roman developments in the 4th century)

Eight contexts from the roadside ditch fills in Period III (Part 5), dated to the mid-late 4th century (Phases 3 and 4), were examined (OPT *133, 134, 138, 140, 144, 145, 146* and *147)* (p 70). Several contexts *(133, 134, 144* and *146)* included plant remains, insects and molluscs; *134* also included some parasites.

A very high number of ruderals, especially *Urtica dioica* (stinging nettle) and *Chenopodium rubrum* or *glaucum,* were recorded in most of the roadside ditch samples. *Brachypterus* sp, a beetle found on nettles, was also present. These plants typically grow where there is human or animal disturbance and where the soil has a high nitrogen content, The other components of the plant assemblage that stand out in these samples are those indicating wet and muddy conditions such as *Ranunculus sceleratus* (celery-leaved crowfoot), and *Alisma* sp (water plantain). At the same time, *Eleocharis palustris* or *uniglumis* is very much reduced in numbers in comparison with the contexts from the previous periods. This may indicate that the accumulation in the ditch was a very local one as both these *Eleocharis* species need open conditions (Walters 1949).

The insect assemblages were small and ecologically mixed. Several synanthropic taxa, including some grain beetles, were represented. The

+ present − absent sp indet = taxon may include species listed above *Species*	Period Pre-Roman	I Early Roman		II 2nd + 3rd century			III Mid–Late 4th century			IV 11th–12th century	
	'Natural Valley' 709, 712, 719, 723	Channel Fills 652, 583, 588, 591, 593, 601, 604	Turves 306, 350	Floor 214	?Pit 367	Drain 184	Roadside ditch fills 133, 134A, 144, 146	Pit 172	?Pit 110	Peat 70, 74	Peat 69, 118, 119, 124
Oligochaeta egg capsules	−	+	+	−	+	+	+	−	−	−	+
Claodcera sp ephippia	−	+	−	−	−	−	+	+	+	−	+
Ostracoda sp(p)	+	+	−	−	−	−	+	−	−	−	+
Diplopoda spp	−	+	−	−	−	+	−	−	−	−	−
Forficula auricularia Linnaeus	−	−	−	−	−	−	+	−	−	−	−
Mallophaga or Siphunculata sp	−	+	−	−	−	−	−	−	−	−	−
?Lepidoptera sp pupa	−	+	−	−	−	−	−	−	−	−	−
?Trichoptera sp larval case	−	−	−	−	−	−	−	−	−	−	+
Bibioidae sp	−	+	−	−	−	−	+	−	+	−	−
Sepsidae sp	−	+	−	−	−	−	−	−	−	−	−
Drosophilidae sp	−	+	−	−	−	−	−	−	−	−	−
Diptera spp indet larvae	+	+	−	+	−	+	+	−	+	−	+
Diptera spp indet puparia	+	+	+	−	−	+	+	−	+	+	+
Diptera spp indet adults	+	−	−	−	−	−	+	−	−	−	−
Siphonaptera sp	−	+	−	−	−	+	−	−	−	−	−
Chalcidoidea sp	+	+	−	−	−	−	−	−	−	+	+
Chalcidae sp	+	−	−	−	−	+	+	−	−	−	−
Proctotrupoidea sp	−	−	−	−	−	−	−	−	−	+	−
Parasitica spp indet	+	+	+	−	−	+	+	−	+	−	+
Formicidae sp	−	+	−	−	−	−	−	−	−	−	+
Apis mellifera Linnaeus	−	−	−	−	−	−	−	−	−	−	+
Hymenoptera spp	−	+	−	−	−	+	+	−	−	−	−
Insecta sp indet larvae	+	+	+	−	−	−	−	−	−	+	−
Acarina spp	+	+	+	+	−	+	+	+	+	+	+
Aranae sp	−	−	−	−	−	+	−	−	−	−	−
Gastropoda sp	−	+	−	−	−	−	+	−	−	−	+
?Lophopus crystallina eggs	−	+	−	−	−	+	+	−	+	−	+
?egg masses	−	−	−	−	−	−	−	−	−	−	+

Fig 124 15-35 Copthall Avenue: invertebrates other than Coleoptera and Hemiptera

outdoor component included several aquatic and plant feeding species.

The mollusc evidence complemented that given by the plants although the shells were very sparse. The presence of *Aplexa hypnorum* and *Anisus leucostoma* suggests poorly oxygenated, near stagnant conditions and a water body possibly prone to drying out in summer. This last factor might be the reason for the near disappearance of *Eleocharis* sp from the deposits. In addition to the land and freshwater shells were fragments of larger marine species that had presumably served as food items. Most fragments were indeterminate but *Ostrea edulis* (oyster), *Cerastoderma edule* (cockle) and *Mytilus edule* (mussel) were present in 144 and fragments of *Buccinum undatum* (whelk), were aitionally present in *146.*

One ditch sample, from context *134,* was studied for parasites. A count of 300 opg of *Trichuris trichuria* and 50 opg of *Dicroelium dentriticum* was recorded. No other evidence can be linked to the incidence of parasites which probably reflects low levels of contamination by sewage.

In the same phase as the ditch, Phase 3, a pit containing fill *172* (Fig 134) is thought to have had some connection with an industrial process (p 70; Fig 107). The insect fauna was very small, only nine individuals, and resembled a random subset of an assemblage such as those from the ditch fills of this phase. Three species of grain beetle were represented. The plant remains in pit fill *172* had a very similar ruderal component to the ditch fills and similar damp indicators. A difference between this pit and some of the ditch fills lies in the virtual absence of *Alisma* sp (only one seed) and a greater number of rushes, sedges and *Gramineae* seeds. This may be fortuitous or due to the deposition of material by human beings.

Another pit, context *110,* in Phase 5 (p 72) is slightly different from the other contexts in this period.

Taxa	Periods					
	Pre-Rom			IV		
Context	*719*	*119*	*74*	*118*	*124*	*131*
Cypridopsis vidua (Müller)	1v					
Cyclocypris laevis (Müller)		35c 8v	 2v	16c 4v	10c 5v	2c 1v
Cypria ophtalmica (Jurine)		25c 6v	10c 2v	36c 8v	6c 1v	3c
Candona fabaeformis Fischer		1c3v A-I, 4c2v		1c A-I, 1c	1c	1c
C marchica Hartwig		1c A-II 1c1v A-I 14c	2c A-IV 5c AIII 2v	3v AIII 2v A-II 2v A-I 3c	1c AIII 2v AII 7c A-I 10c 2v	2c 1v
C neglecta Sars		6c AIII 2v 3c*		109c 2v AIII 3v 1c*	8c 3v AII 3v 1c*	2c 1v
Candona *cf* neglecta	10v1c A-III 2+A-II 1+A-I					
C candida Müller		2v			2v	
Ilyocypris bradyi Sars	2v A-I 3v	1v				1c
Eucypris virens (Jurine)				2v	1c+	
Cypris pubera (Müller)				1v	++	

Fig 125 15-35 Copthall Avenue: ostracods

Although most plant species represented are similar in the ditch and in this context, *Lemna* sp, (duckweed), a fully aquatic species, was also present. The insect assemblage was large, 114 individuals from 63 taxa, and predominantly composed of outdoor forms. Aquatic taxa accounted for a third of the assemblages and included the aquatic weevil *Tanysphyrus lemnae* represented by seven individuals, which lives on *Lemna* sp. Decomposers were very poorly represented. This is a most unusual assemblage for a pit fill; typically pit deposits are dominated by decomposers. This fill may have accumulated so that a local fauna from semi-natural habitats entered, or, alternatively, a deposit containing such a fauna may have been used as backfill for the pit.

The ditch samples from Period III differed from the channel/ditch samples from Period I. Although both sets of samples indicated damp conditions and showed some sign of human or animal disturbance, the deposits in the channels seem to have formed in an environment altogether fresher, where there was running water, while the ditch fills indicated fairly stagnant muddy conditions and possibly even drying out in summer.

In the post-building period, therefore, ruderal and damp-loving plants preferring muddy conditions, synanthropic insects and molluscs from a poorly oxygenated, near stagnant water environment, all reflect the various drainage activities described in Part III, such as the maintenance of the ditch by the road. The reason why the drainage was necessary is perhaps indicated by the presence of aquatic plant species in pit *172* and in context *110*.

Period IV (post-Roman development)

The samples from this period (Part 6) came from the 'peat' or marsh deposits forming in the ditches, (OPT *69, 70, 74, 82, 94, 99, 128, 219,* pp 79), from channel fills *(124, 131)* and from two pits *(82, 213;* p 79). In this period, it seems that these deposits formed after the site was abandoned.

In the samples from the channels/ditches the ruderals appear to be much reduced in numbers or even absent. The majority of the plants represented were wet-loving: *Rumex maritimus, Ranunculus* subgenus *Batrachium, R sceleratus, Alisma* sp and *Oenanthe aquatica.* These species grow at the margin of ponds or in shallow water but the crowfoot species may indicate that there was some flowing water as well. Three fully aquatic species are represented in these samples, *Chara* sp, *Callitriche* sp and *Lemna* sp, which confirm that the environment was probably wetter than in the previous period and possibly less influenced by people. Samples *81, 94,* and *118* contained several species of *Compositae* such as *Anthemis cotula, Chrysanthemum segetum* and *Centaurea cyanus.* These appear in much smaller quantities or not at all in the other samples from Period IV and in the previous period. They grow well in disturbed ground and are also associated with cultivation. Most of these *Compositae* are windborne and could have come from some distance away. Their presence in these deposits, along with that of *Agrostemma githago* (corncockle), a weed of cornfields, may indicate that cultivation was taking place in the area. *Agrostemma githago* was not present in Period III. A wetland indicator *Eleocharis palustris* or *uniglumis* was once again widespread after being much reduced in Period III.

The plant evidence from the samples from the marsh deposits of Period IV therefore shows an increased wetness and a less disturbed environment than in Period III, while some segetal species might indicate that cultivation was taking place in the area.

This increased wetness was also illustrated by the insect assemblages from contexts *118, 119* and *69.* The abundance and diversity of aquatic and waterside taxa leaves no doubt that the deposition was aquatic; weedy, still or sluggish water with much emergent vegetation, and litter and spongy vegetation at the swampy water margins is suggested. Further evidence was provided by the resting stages of what appeared to be the bryozoan *Lophopus crystallinus* in context *118.* There was little evidence of human activity; synanthropes were absent and the decomposer component was tiny and as compatible with natural litter as with the presence of people. In context *69,* the most abundant beetle was a *Philonthus* sp, perhaps *P micans,* a species found in marshy places. Among the aquatics, *Tanysphyrus lemnae,* found on duckweeds, and *Cymbiodyta marginella,* found in weedy stagnant water, were the most numerous. *Bembidion ?assimile, Cercyon sternalis, C marinus, C tristis* and *Notaris acridulus,* among taxa

Period		**Pre-Roman**		**I**	**III**				**IV**		
Context		Nat Valley		Channel	Ditch fills				Ditch fills		
Sample number	*709*	*712*	*719*	*564*	*144*	*146*	*74*	*118*	*119*	*124*	*131*
Weight of sample (g)	250	250	500	250	250	250	500	500	250	250	250
Freshwater species											
Valvata cristata (Müller)	–	–	–	–	–	–	2	92	146	24	12
Bithynia tentaculata L shells	–	–	–	–	–	–	–	17	27	2	2
Bithynia opercula	–	–	–	–	–	–	1	13	27	4	6
Aplexa hypnorum (L)	–	–	–	–	1	–	–	2	15	1	–
Lymnaea truncatula (Müller)	1	4	8	–	–	–	2	10	2	1	–
Lymnaea palustris (Müller)	–	–	–	–	–	–	–	1	12	7	3
Lymnaea stagnalis (L)	1	–	1	–	–	–	–	–	–	–	–
Lymnaea peregra (Müller)	4	3	2	–	–	3	2	1	4	1	–
Planorbis planorbis (L)	–	1	–	–	–	1	1	29	38	23	4
Anisus leucostoma (Millet)	–	–	–	1	1	–	–	–	2	5	–
Bathyomphalus contortus (L)	–	–	–	–	–	1	3	27	54	25	4
Gyraulus albus (Müller)	–	?2	–	–	–	–	–	–	–	–	–
Armiger crista (L)	6	2	4	–	–	–	6	57	72	67	6
Segmentina nitida (Müller)	–	–	–	–	–	–	1	48	77	9	8
Sphaerium corneum (L)+	–	–	–	–	–	–	–	1	1	1	–
Pisidium casertanum (Poli)+	1	–	–	–	–	–	–	–	–	–	–
Pisidium obtusale (Lamarck)+	–	–	–	–	–	–	–	–	–	–	–
Pisidium spp+	–	–	–	–	–	–	–	–	1	1	–
Terrestrial species											
Oxyloma pfeifferi/Succinea putris	–	1	1	–	–	–	–	4	4	–	–
Vertigo antivertigo (Draparnaud)	–	1	–	–	–	–	–	–	–	–	–
Vallonia pulchella (Müller)	2	1	–	–	–	–	–	–	–	–	–
Deroceras/Limax	–	–	–	–	–	–	–	–	–	–	–
Cepaea sp	–	–	–	–	1	–	–	–	–	–	

+ = individual valves

Fig 126 15-35 Copthall Avenue: molluscs

Periods	I	II		III		IV
Taxa *Context*	*604*	*214*	*257*	*134*	*74*	*119*
Trichuris trichuria	350	200	200	300	350	
Ascaris lumbricoides					50	250
Dicroelium dendriticum				50		

opg = ova per gram

Fig 127 15-35 Copthall Avenue: parasites

from aquatic-marginal habitats, were all represented by two or more individuals. Many of the other taxa would be at home with these two groups. The small assemblages from contexts *74* and *70* included insect taxa reminiscent of a medieval urban fauna. The assemblage from *70* also included a number of species of aquatic or marginal aquatic habitats and all of the decomposer taxa recorded would be able to live in marshland litter.

The mollusc assemblages found in the ditch fills from this period, especially *118* and *119,* were dominated by *Valvata cristata, Bithynia tentaculata, Planorbis planorbis, Bathyomphalus contortus* and *Segmentina nitida,* indicating a well-oxygenated aquatic environment. *Segmentina nitida* is exceedingly scarce in Britain at the present day, although formerly widespread (Kerney 1976).

The ostracods recovered from the ditch fills were found in contexts *119, 118, 74, 124* and *131* (Fig 125) and include species that are active swimmers, demanding at least several inches of water and suggest open semi-permanent water. Many of the species require the presence of aquatic vegetation, such as pondweed or rushes, and a semi-permanent water body. *Cladocera* (water fleas) are represented by abundant wisps of chitin and are further testimony to an open, aquatic habitat in the ditches.

Parasite eggs were found in 74 where concentrations of 350 opg of *Trichuris trichuria* and 50 opg of *Ascaris lumbricoides* were estimated. An estimate of 250 opg of *Ascaris* sp was calculated in the sample from context *119.* Low concentrations of human contamination are suggested by this.

The samples from the contexts of Period IV ail showed that the wet conditions of the first two periods at 15-35 Copthall Avenue had returned in full in this period and were possibly even more extensive. The vegetation was that of a marsh, and the molluscs and especially the free-swimming ostracods show that the water was well-oxygenated and that a slow but clear watercourse, or possibly some clear standing water such as a pond, was present semi-permanently.

Conclusion

It must be remembered that the 15-35 Copthall Avenue deposits were sampled from drainage channels, ditches, pits, dumps, drains and contexts from a building which all belonged to discrete features. Very few samples were taken from general ground surfaces. The growing 'peat', for instance, was mainly sampled in ditches in Period IV. For this reason, it is only possible to describe the change in environment and conditions on the site in fairly general terms of overall human activity, the degree of wetness and the relative state of the watercourses. It is not possible to extend this interpretation with certainty to the rest of the area dicussed in the archaeological account above, because of the possibility that the conditions prevailing in these features may have been very localised. However, the remains from the channel and ditch fills of Periods I, III and IV are different from each other and reflect the varying conditions in the channels during these periods: a wet grassland with fairly clear running water being characteristic of Period I, while the fills of Period III indicate disturbed, damp and muddy conditions with sluggish water. Finally, fully aquatic conditions and a reduction of the disturbed or human-related elements are typical of the fills in Period IV. Similarly, the pit fills of Periods II, III and IV reflect a variety of conditions broadly in line with the differences noted between the channel fills but in this case the evidence from the plant remains was not as strongly supported by the insect evidence as it was with the channel fills. There is some indication that results across the Walbrook valley are similar (see below). This will only be confirmed when further multidisciplinary studies of material, sampled in a similar way on several other sites, have been undertaken.

Comparison with other London sites

Comparative data for pollen of similar age to the pollen study at 15-35 Copthall Avenue in London are few. Fortunately, Professor W F Grimes obtained samples for pollen analysis in 1954 from his excavation of the Temple of Mithras (Fig 2, Site 23). A series of 11 samples was taken from the peats and peaty silts underlying the temple, providing a comparison with the 15-35 Copthall Avenue pollen spectra since both sites were situated on the River Walbrook (Scaife 1982b). It is interesting that this analysis shows a similar marked diversity of types. The pollen spectra are characterised by low arboreal pollen frequencies as at 15-35 Copthall Avenue. The remaining and diverse herb pollen taxa are referable to aquatic/ fen habitats, ruderals/ waste ground, cereal and associated taxa and also numerous types which, from the pollen alone, are difficult to place within a definite category.

There have been several excavations in the area of London Wall and the molluscan faunas from the recent Copthall Avenue excavations are broadly similar to others of equivalent age described from the immediate area (Kennard 1903; Kennard & Woodward 1902; 1906; 1912). It is interesting to note that *Segmentina nitida,* the most noteworthy species from Copthall Avenue (being rare in Britain today), was also recorded from Romano-British levels at All Hallows Bastion (Kennard & Woodward 1912) and from the Walbrook (Kennard 1903).

Several studies of macroscopic plant remains for the period in the area of this study have been undertaken since the early years of this century, when excavations in the Walbrook valley, both north and south of the city wall, revealed waterlain silts and peats and, in several places, layers of rushes and reeds (Norman & Reader 1912; Lambert 1920).

Mrs Eleanor Reid examined a sample from one of the 'marsh' deposits at Finsbury Circus (Lambert 1921) and identified mainly seeds of plants of marshy ground, but also a waste ground and disturbed element as at Copthall Avenue. The wetland plants she found were also common at Copthall Avenue, with pondweed and golden dock particularly characteristic of the wetter periods ('Natural' and Period IV).

A H Lyell (in Norman & Reader 1912) found several seeds in a sample of peat from an early excavation in Copthall Avenue, to the east of the present site. He identified several plants which suggested a damp but disturbed environment. As only six species were identified, however, this must be a very unreliable sample of the total seed assemblage in the peat.

More recently botanical remains from the Broadgate excavations (Malt 1987; Fig 2, Site 5) have been examined by J Jones (1986). This site was situated 200m north of the Roman city wall but still within the flood plain of the Walbrook stream. The most relevant groups of contexts are all waterlain channel sediments dating from the pre-Roman to post-Roman periods. One sample was also examined from the fill of a medieval boundary ditch. The earliest (group 1) deposits, of apparently naturally laid sands, gravels and silty clays, were not as rich in seeds as the later layers, but did contain quite high numbers of aquatic plants. Marsh-loving species were also common and there was a small disturbed ground component. In general the assemblage resembled that of the natural valley sediments from Copthall Avenue, and may represent the natural environment over the whole of the upper Walbrook valley in the late prehistoric and early Roman periods.

The second category of samples from Broadgate are also from stream bed deposits but are thought to be associated with increasing urbanisation during the Roman period (group 3). These samples contained fewer of the fully aquatic species but damp ground taxa were still common. The main difference from group 1, however, was the presence of quite large numbers of disturbed ground species. *Urtica dioica* and *Chenopodium rubrum/glaucum* were present in even higher numbers than in group 1, suggesting ground rich in nitrogen as well as disturbed. This increase in the disturbed ground species and reduction in aquatics corresponds to the pattern seen in Periods II and III at Copthall Avenue, perhaps because similar activities were causing disturbance both inside the city and out.

The third main group of samples from Broadgate was from a build-up of organic material overlying the previous channel deposits which are thought to have accumulated between the late Roman and early medieval periods. In this case the disturbed ground component of the flora was reduced and was greatly overshadowed by the very large number of wet ground species. This suggests that the site had become a muddy, marshy, and less disturbed environment than in earlier periods, and therefore similar to that of Period IV at Copthall Avenue.

The 13th/14th century ditch fill at Broadgate contained far fewer marshland species and the dominant seeds were grasses and other species typical of damp grassland and meadows. There were also signs of cereal cultivation, though not necessarily locally, in the form of waterlogged chaff and seeds of common arable weeds. It is apparent that by this period the site had been drained more successfully and although still damp was probably used for grazing and/or cultivation.

One other site from the upper Walbrook valley has produced some environmental evidence. This was London Wall (Pye 1985; Fig 2, Site 12), immediately north of the city wall and on the western side of the Walbrook flood plain, where a small trench was excavated as a watching brief and samples were taken from the natural silting of a shallow ditch (Davis 1984). The lower fill (believed to have accumulated before the building of the city wall c AD 200) was extremely rich in seeds, containing aquatic, waterside and wet ground plants. The upper (post-wall) fill contained fewer species, and also fewer wet ground ones with the disturbed ground species becoming more evident. This increased disturbance apparently repeats again the pattern seen in deposits from Periods II and III at 15-35 Copthall Avenue and group 3 at Broadgate.

Evidence from these sites in the Walbrook valley appears to be quite consistent. Seed assemblages from all sites are similar and the same pattern seems to emerge from the three recent sites of naturally marshy land becoming more disturbed, though still wet, during the Roman period. At Broadgate, as well as at 15-35 Copthall Avenue, the ground subsequently became less disturbed and reverted to a more natural wet environment.

Elsewhere in the city seed assemblages of all periods are dominated by ruderals with marshy and wet land species forming only a small proportion (Jones *et al* forthcoming; Davis 1983; 1984). In fact Roman sites outside the Walbrook valley have so far produced few samples rich in organic plant remains.

Waterlogged seed assemblages from urban excavations elsewhere in Britain and north-west Europe tend to be dominated by the same groups of species, mostly from disturbed ground. The aquatic and marshy component obviously varies according to the situation of the site and is usually similar to, though less extensive than, that of Copthall Avenue.

The site at Copthall Avenue thus seems to be unusual in that its marshy ground proved difficult to drain efficiently until the medieval period, leaving an area of damp marginal land within the city wall indicated by large numbers of seeds from aquatic and damp ground plants and fauna of similar habit. The flora and fauna are otherwise similar to that of other towns.

9. Tree-Ring Dating

by J Hillam

The samples (Fig 128)

A total of 47 tree-ring samples from 15-35 Copthall Avenue were analysed at the Sheffield Dendrochronology Laboratory. Forty-six were from the controlled excavation (OPT 81) the other was from the watching brief (KEY 83). The controlled excavation samples consisted of two groups, 37 samples sent originally for analysis and a further nine samples sent at a later date in the hope of refining the initial dating. Figure 128 gives details of only the measured samples in phase order. There were duplicate samples from contexts *276* and *320* whilst *247* was made up of five pieces of wood. There was a single timber *1382* from the watching brief which is also reported here.

The samples were prepared, measured and cross-matched as outlined by Hillam (1985; Hillam & Morgan 1986). Twelve of the original samples were rejected prior to measurement, either because they had insufficient rings *(130, 241, 408, 485, 529, 696),* or because their rings were knotty or unclear *(237, 249, 263, 272, 275, 277).* None of the 1986 samples were suitable for measurement. The ring width data from all the measured samples are stored at the Sheffield Dendrochronology Laboratory, where they can be consulted.

Examination of the ring patterns from the duplicate samples showed that those from context *320* derived from the same timber, but those from *276* may have come from different ones. The ring widths of the *320* sequences therefore were averaged, and the mean *(320M)* used in subsequent analysis. The two *276* sequences were not meaned; they were labelled *276* and *276*B. The five samples from *247* appeared to have come from the same timber. Their ring sequences were also averaged, resulting in a 111-year sequence, *247M.*

The measured samples had between 39 and 111 rings (Fig 128), with the majority having 40-60. Two radii from *721* were measured in order to obtain the maximum number of rings and the most representative ring sequence. The resulting *721*M had 39 rings which it was hoped would be sufficient to date the sequence reliably.

The dating (Fig 129)

The ring sequences were compared visually, one against the other, as a means of establishing the cross-matching. At the same time, they were also tested against dated reference chronologies using a computer program (Baillie & Pilcher 1973). The Roman chronology (City/ Southwark 88), which covers the period 252 BC - AD 255 was used for this latter process, although the Swan Lane Roman master (Groves & Hillam 1987) was occasionally used as a check. (City/ Southwark 88 is made up of sequences from various sites in the City and Southwark; it was compiled by I Tyers, and contains data supplied by Fletcher, Hillam, Morgan and Tyers - see also Sheldon and Tyers 1983. Swan Lane is an unpublished sequence, prepared at Sheffield from the Swan Lane Roman timbers). The visual and computer comparisons resulted in two groups, each containing ring sequences that cross-matched with each other. These were averaged to give two site master curves, OPT1 and OPT2. These two curves matched each other with a *t*-value of 5.1. They, along with *679,* were then combined to produce a single site master, OPT3. Unmatched sequences were tested against OPT3, and four more found to cross-match. A final site master curve of 15 sequences (OPT4) was then made (Fig 129). Two, and possibly three, other sequences were later found to match. These were *235* and *238,* both of which matched other sequences, and the short sequence *721* M, which gave a t-value of 5.5 with OPT4. Despite this relatively high value, and the fact that it seems to match with some of the individual ring sequences, the dating of *721* must be regarded as tentative because of its short ring pattern.

The Copthall Avenue ring sequences generally showed good correlation with the City/ Southwark chronology (Fig 128), although agreement with the Swan Lane master was not as high, and agreement between the individual Copthall sequences was sometimes low.

OPT4 gave r-values of 9.3 and 4.6 with City/ Southwark and Swan Lane respectively when the Copthall curve covered the period 45 BC-AD 96. From this, dates for the individual samples could be deduced.

The sample from the watching brief dated to 72 BC-AD 59. It matched with Roman sequences from London and elsewhere in England (Fig 128).

Interpreting the tree-ring dates

The tree-ring results are summarised in Figure 129. The interpretation of the tree-ring dates *(ie* the estimation of felling and construction dates) is hampered by the lack of sapwood on all but two of the dated timbers. Lack of sapwood is a common problem, particularly in the analysis of Roman timbers from the City of London *(eg* Hillam 1986). Where a few sapwood rings remain however, the date of felling is calculated using the sapwood allowance of 10-55 rings (Hillam *et al* 1987). In the complete absence of sapwood, the felling date is quoted as a *terminus post quem* by adding the minumum sapwood allowance of 10 rings.

The two dated Copthall samples with sapwood were both thought to be reused. *679* seemed to have its entire complement of sapwood rings, *ie* only the bark was missing, and was therefore felled in the winter of AD 86/ 87. *270* has 7 sapwood rings, giving a felling range of AD 69-114.

The timber from the earliest gully on the site (Period I Phase 1) *721* has a tentative date of 15 BC-AD

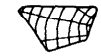
Context number	Archaeological context	Total rings	Sapwood rings	Average ring width (mm)	Maximum dimensions (mm)	Date span	t value to CS88	Sketched cross-section
15-35 Copthall Avenue, controlled excavation (OPT 81)								
Period I								
phase 1								
721	stake	39	—	1.89	70 x 55	15BC-AD24	5.5	
phase 4								
276	post	101	—	1.25	120 x 90	30BC-AD71	5.1	
679	reused post	65	29	2.07	140 x 65	AD22-86	5.0	
phase 5								
250	pile	77	—	1.86	200 x 145	—	—	
261	pile	44	—	2.62	115 x 65	10BC-AD34	3.8	
318	pile	86	—	2.72	240 x 85	45BC-AD41	5.6	
319	pile	42	—	5.46	235 x 140	—	—	
320	pile	100+	—	2.14	230 x 140	+38BC-AD62+3	4.5	
407	pile	89	—	2.32	220 x 130	AD8-96	4.1	
phase 7								
413	stray	62	—	2.05	165 x 90	3BC-AD59	6.3	
Period II								
phase 1								
270	reused post	102	7	1.13	115 x 90	37BC-AD65	4.0	
phase 4								
411	ground beam	59	—	2.05	115 x 75	3BC-AD56	5.0	
phase 5								
400	post	59	—	2.55	155 x 130	—	—	
phase 6								
235	drain plank	58	—	1.99	210 x 30	AD26-83	2.9	
238	drain plank	52	—	1.66	195 x 45	AD35-86	4.2	
240	drain	70+	—	1.80	130 x 70	AD16-85	2.7	
245	drain	53	—	2.68	160 x 95	AD18-70	4.9	
262	drain	55	—	2.46	155 x 70	—	—	
phase 11								
242	stake	49	—	2.57	140 x 110	AD23-71	4.2	
244	stake	48	—	2.35	120 x 110	—	—	
247	drain plank	111	—	1.28	fragments	—	—	
248	drain plank	57	—	1.14	70 x 40	16BC-AD41	5.3	
269	stake	53	—	2.07	120 x 90	—	—	
298	drain post	51	—	2.58	130 x 70	AD20-70	4.2	
15-35 Copthall Avenue, watching-brief (KEY 83)								
Period II								
1382	drain plank	131	—	?	?	72BC-AD59	6.2	

Fig 128 Summary of measured tree-ring samples from 15-35 Copthall Avenue. Samples listed in site, period and phase order with sketch cross-sections. CS88 is a composite Roman chronology, see text for details

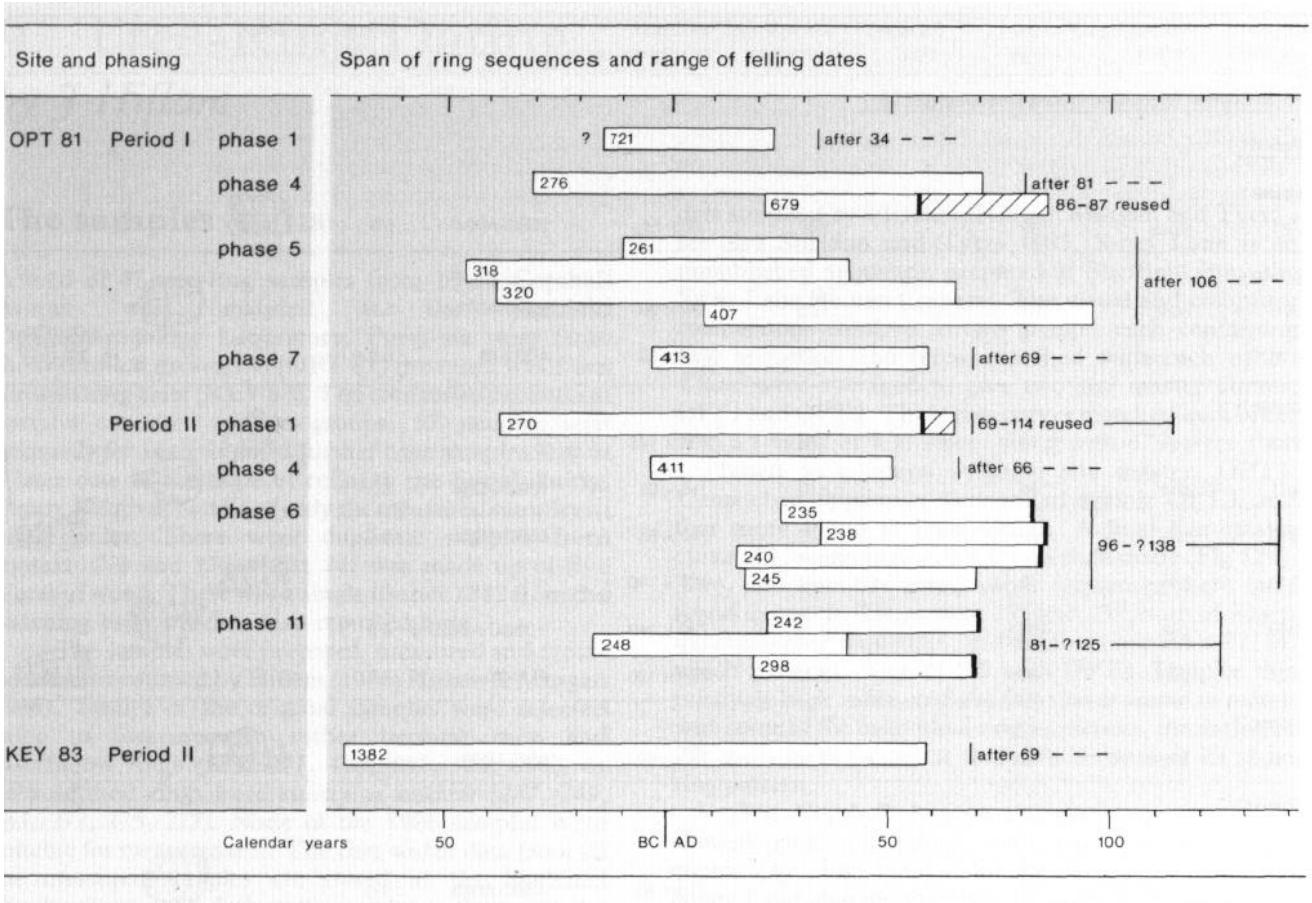


Fig 129 Bar diagram showing relative positions of all dated tree-ring samples from 15-35 Copthall Avenue, plus felling ranges for each phase. Note that 721 is not firmly dated. White bar: heartwood; hatching: sapwood

24. This would give it a *terminus post quem* for felling of AD 34. Period I Phase 4 is represented by 679 and 276/276B, which were felled in AD 86/87 and AD 81 respectively, but 679 was probably reused. Four timbers were dated from Period I Phase 5; they were felled after AD 106. The stray timber 413 assigned to Period I Phase 7 was felled some time after AD 69.

The timber from Period II Phase 1 270 was felled between AD 69 and AD 114, but was probably reused, whilst the sill-beam from Period II Phase 4 (411) was felled after AD 66. The four dated timbers from the drain (Period II Phase 6) have outer rings dating between AD 70 and AD 86. This suggests that only the sapwood has been removed when the timber was converted into planks or post (see also Baillie 1982), which would give a felling date after AD 96 and probably before AD 138. Similarly the Period II Phase 11 timbers were felled after AD 81 and probably before AD 125.

The watching brief timber dates to 72 BC-AD 59 and was also felled after AD 69.

Conclusion

Although only 26 samples from Copthall Avenue were suitable for measurement, 18 of these (19 if 721 is included) have been dated, despite the fact that most of them have less than 100 rings. Estimation of felling and construction dates has proved difficult because of the absence of sapwood. A *terminus post quem* for felling has been calculated for each of the groups, and at least one timber was felled in AD 86/87, although this was probably reused.

10. Conclusions

Natural topography

A study of the prehistoric Walbrook is crucial to an understanding of the stream in the Roman period. In the past the valleys of the stream and its tributaries have been mistaken for streambeds and very little differentiation has been made between the prehistoric, Roman and medieval streams. Recent archaeological investigations in the upper Walbrook valley have made possible for the first time a study of the natural topography and the prehistoric stream.

Within the valley of the upper Walbrook the ground surface inclined gently down to the south and from the west side of the valley towards the centre. Its east side was comparatively steep. The terrace gravels were dissected by the main Walbrook stream (Stream 3) and at least two major tributaries (Streams 1 and 4), Stream 4 also seems to have cut through brickearth. These were fed by numerous streamlets (Fig 25). Stream 2 may be considered either as a third tributary or as part of either Streams 1 or 3. These major streams had eroded their own shallow, wide depressions or valleys through the terrace gravels and into London Clay approximately from Blomfield Street southwards: Stream 1, 44m+, Stream 2, 22m+ and Stream 3, 36m+, but about 50m wide at Broadgate,

Fine gravels were deposited on the bed of Stream 1 and subsequently, silty sands. During the period of gravel deposition the stream appears to have been fairly fast-flowing. The channels shifted over the course of time: at Copthall Avenue a wide bend gradually moved eastwards, its former channel becoming a backwater. The width of the running stream at a particular time is thus difficult to establish, though there is some evidence that the the western tributary (Stream 1) could have been 9m+, and the eastern tributary (Stream 4) 3m immediately prior to the Roman period. Some flooding occurred at the edges of the western tributary's depression but otherwise the ground surface beyond the depression seems to have been dry. Stream 1 at 15-35 Copthall Avenue appears to have been fairly slow-flowing but clean, and supported aquatic plants and animals. Damp-loving plants, hygrophilous land snails and outdoor and aquatic insects demonstrate that it flowed through a marshy landscape which was on the whole wet.

This study modifies the courses of the tributaries as put forward by Merrifield (Fig 27) and casts doubt on the use of medieval ward boundaries as indicators of the course of a prehistoric or Roman stream. It is suggested here that the westernmost tributary stream, rather than flowing southwards from 1-6 Finsbury Circus (Fig 2, Site 1) and crossing the site of 15-35 Copthall Avenue along the line of the ward boundary before it joined the main stream (Fig 27), may have flowed eastwards from the valley side, turned southwards at 15-35 Copthall Avenue and thence continued on this course to Tokenhouse Yard where the upper valley narrowed into the lower Walbrook valley (Fig 25). There is a possibility however that it joined Stream 2 north of Tokenhouse Yard. Evidence for the course of Stream 2 is not conclusive: it could have flowed north-south at 4-6 Copthall Avenue but there are some indications that it meandered south-west here. This may have been the main Stream 3, but it is possible that the latter flowed approximately southwards to confluence with the easternmost tributary, Stream 4, to the north or south-west of 9-19 Throgmorton Avenue (Site 36).

Period I - late 1st early 2nd century

The development of the upper Walbrook valley generally began in the late 1st - early 2nd centuries with an ambitious programme of reclamation and drainage. The ground level of the depressions of the streams was raised by the massive dumping of clay, mainly, but also gravel, intermixed on occasion with organic material. These dumps at the same time constricted the course of the streams into much narrower channels and formed the banks of the now canalised streams. A stretch of the western tributary (Stream 1) was entirely infilled so that a road could be constructed across it, while part of the course of the eastern tributary (Stream 4) was altered from north-east to south-west to east-west. Some tributary streamlets were completely infilled. A network - possibly a grid - of ditches was provided, not only in the partially infilled depressions, but also in the higher adjacent ground. At 15-35 Copthall Avenue the infilled stretch of Stream 1 was replaced with an interconnecting system of ditches which, on the east side of the road, drained south and east, presumably into the retained stretch of canalised stream; drainage on the west side of the road was directed southwards. Both canalised streams and ditches were revetted with timber, though not always: Stream 3 at Broadgate (Site 5) was simply embanked with the dumps (Malt 1987) but a little to the south in Blomfield Street it was revetted.

This development took place in *c* AD 90-120 at 15-35 Copthall Avenue (Site 27), 43 London Wall (Site 17) and Telegraph Street (Site 22). At 4-6 Copthall Avenue (Site 33) this stage is dated *c* AD 120 but no pottery was recovered from the initial dumps or the earliest channels and surfaces. The pottery sequence from the Angel Court site to the south (Site 34) (Blurton 1977) starts in the late 1st-early 2nd century and it is therefore suggested that dumping at 4-6 Copthall Avenue is likely to have been contemporary with that on nearby sites. This conclusion is supported by the late 1st-mid 2nd century dates for the infilling of the valley and construction of buildings at the adjacent site 10-12 Copthall Avenue (Site 31). At 55-61 Moorgate (Site 15) drains which preceded the construction of a building are provisionally dated to *c* AD 100-120 (but a building on the site pre-dated this). North of the city at Broadgate (Site 5) the main Walbrook stream was similarly canalised, though it apparently remained unrevetted; this took place possibly sometime before the end of the 2nd century (Malt 1987). Evidence from an excavation at Dowgate Hill House, 14-16 Dowgate Hill, seems to

indicate that drainage works were also undertaken at the mouth of the Walbrook in the early-mid Roman period. A sequence, very familiar in the upper Walbrook, of a clay bank and associated drainage channel (east-west), successively repaired and replaced, was found here (Shea 1987).

Throughout the early part of the 2nd century this reclamation and drainage system would appear to have been largely inadequate for three reasons. Clay, in particular, and gravel were introduced in massive quantities into the upper Walbrook, which must ultimately have forced the water level to rise. Secondly, the streams were restricted to very much smaller channels and, finally, the provision of additional drainage channels was underestimated. These three factors triggered off a frequently repeated cycle: erosion of the dumped material that made up the banks, leading to rapid silting up of the channels and their overflowing, followed by more dumps to raise the banks beside the recut ditches. An additional factor in the impedance of drainage would have been domestic rubbish which found its way into the channels and is indicated by the condition and mixed nature of the finds and possibly reflected by the charred remains and decomposer insects found in the channels at 15-35 Copthall Avenue,

This silting, recutting and rebuilding continued at 15-35 Copthall Avenue and 4-6 Copthall Avenue, (Sites 27 and 33) until *c* AD 120-140. Silting of the channels at 43 London Wall (Site 17) is also likely to have occurred at this time though there is only a broad date range of *c* AD 120-200. Thus later timber-lined drains dated *c* AD 140-200 were contemporary with the period of building activity at Site 27 during which drainage was still necessary though not so extensive as previously.

The plant and pollen evidence from the channel samples of Period I at 15-35 Copthall Avenue reflect a damp, even wet grassy landscape, much more disturbed and urban in character than in the prehistoric period. This last characteristic is especially emphasised by the insect evidence. The environment may then have been altered, not only by the cutting of drainage ditches but also by the dumping of rubbish and by either a form of market gardening or the transportation of goods into town.

At the beginning of the period of reclamation two metalled roads were constructed, both on a north-east to south-west alignment. The one discovered at 15-35 Copthall Avenue (Road 1, Site 27) was a major road at the west side of the valley. This road was constructed in two phases where it crossed the infilled western tributary of the Walbrook, the first consisting of rammed gravel on a foundation of clay and leather waste. After continual flooding of the road in the former valley of the stream, it was rebuilt on a causeway of turves and silty sands, carried on a raft of brushwood. Botanical evidence indicates that the turves were probably not derived from the immediate area but transported thither from a wetter environment.

The rebuilt road was laid slightly further west and on a more north-northeast/ south-southwest alignment than that of the earlier road. Lying parallel with the Cripplegate fort to the west, this and Road 2 were probably an extension of the *Flavian* street grid on the city's western hill, linked with the Cheapside and Ironmonger Lane streets to the south and north respectively (Ordnance Survey, 1983). It seems likely that these roads were the main routes through the middle and upper Walbrook valley, possibly serving a cemetery to the north of the city. Cremations have been noted at Site 4 and, more recently, burials dating to the early 2nd century were found at 7-11 Finsbury Circus (Site 2) (Askew 1988), and one burial predating an early 2nd century road was recorded at 12-15 Finsbury Circus (Site 3) (Askew 1989). 2nd century burials have also been recorded at 35-45 New Broad Street (Site 9) (Woodger 1988). Road 1 may also have provided access to the city from areas of cultivation where market gardening and cereal production could have been carried out. A third road, aligned either north-east to south-west or north-west to south-east was located at the north end of Throgmorton Avenue in 1880 (Site 35) (Merrifield 1965, gazetteer no 143).

It is likely that the pathways of gravel which bordered drainage channels, as at 10-12 and 4-6 Copthall Avenue, and Angel Court (Sites 31, 33 and 34), or of timber, as at 15-35 Copthall Avenue and 9-19 Throgmorton Avenue (Sites 27 and 36), were part of a network, linked with the roads, that provided access to all parts of the valley.

The construction of roads and pathways and the scale of reclamation in the upper Walbrook valley are indicative of a public works programme which aimed to both control the stream and to utilise as much land as possible within the city, in this case probably to create an industrial zone as well as space for domestic habitation. Evidence of the utilisation of rivers and of land reclamation by the Romans is well known. A recent study of eight sites in the Severn Estuary has demonstrated that systematic drainage of the wetlands was undertaken in the Romano-British period (Allen & Fulford 1987, 237-84). Pottery dates from three of these sites suggest that drainage could have commenced in the 2nd century and continued to the 4th or 5th centuries (ibid, 278). Evidence of primitive ironmaking occurred on all sites and one (Ley Pill) provided evidence for a glass industry (ibid, 275-7).

Modifications and improvements to the drainage system in the upper Walbrook appear to have been successful so that around AD 120-160 the number of channels could be greatly reduced and the ground within the depressions of the streams further levelled up. Material from these contexts was highly organic and contained the largest groups of finds. These seem to consist of the rubbish from households and workshops. It is these dumps which characterise so much of the sequence of deposits in the Walbrook and probably account for some at least of the great depth of peat noted by Lane-Fox at Site 28. For a time the upper Walbrook valley must have become an area designated for the disposal of rubbish in order to infill the drainage channels and level up the ground surface.

Period II - early 2nd century - mid/late 3rd century

The drainage and reclamation of Period I seems partly to have been in preparation for building construction in the wet areas of the upper Walbrook valley. At 10-12 Copthall Avenue (Site 31) the two may have been

simultaneous. Most of the buildings were erected in the first half of the 2nd century though at 55-61 Moorgate (Site 15) a building has a date range of AD 70-120 (Drummond-Murray 1988), one of the two buildings situated outside the 2nd century defensive wall at 85-86 London Wall (Site 10) has a *terminus post quem* of AD 50 (Sankey 1989) and one at 13-14a Austin Friars (Site 37) is provisionally dated to sometime after the first half of the 1st century (Dyson 1988). Presumably building construction could take place in the lst- early 2nd century whenever the ground was high enough and dry enough, generally towards the edges of the valley. Initial building construction is dated to *c* AD 120-140 at 15-35 Copthall Avenue (Site 27), and *c* AD 120-l50/160 at 8 Telegraph Street (Site 22). The building located at 43 London Wall (Site 17) was rather later in date, AD 180-230. Buildings found on the recently excavated site of 10-12 Copthall Avenue (Site 31) have been provisionally dated to the 2nd century and may have been occupied into the 3rd century (Lees 1989). A second period of construction beside Stream 2 took place at 4-6 Copthall Avenue (Site 33) in *c* AD 250-300/350, after this site had apparently been abandoned in the mid-late 2nd century, but there may not have been much of a time lapse and this was an exception. There was no close dating evidence for the final phases of the buildings at 43 London Wall, 8 Telegraph Street and 15-35 Copthall Avenue (Sites 17, 22 and 27) but those at 43 London Wall and 15-35 Copthall Avenue were occupied in the 3rd century while the stone building at 8 Telegraph Street was robbed in the mid-late 3rd century. It is worth noting, however, that at 55-61 Moorgate (Site 15) the latest building was abandoned in *c* AD 180 and dumped deposits above are provisionally dated to *c* AD 200-250 (Drummond-Murray 1988). Modern basementing had truncated these dumped deposits so that it is not known whether buildings were subsequently erected as at 4-6 Copthall Avenue.

Buildings were constructed both on the drier ground adjacent to the streams as at 8 Telegraph Street and 43 London Wall (Sites 22 and 17) or on reclaimed land as at 15-35 Copthall Avenue, 10-12 Copthall Avenue (Sites 27 and 31) and, later in the 3rd/4th centuries, at 4-6 Copthall Avenue (Site 33). The foundation of the building at 8 Telegraph Street was initially constructed of part stone and part timber, becoming entirely stone-founded when it was rebuilt some time after *c* AD 140-160. One of the buildings excavated at 55-61 Moorgate *(ibid)* appears to have had a masonry foundation at least while substantial masonry buildings with tessellated floors are currently being excavated at 22-25 Austin Friars (D Dunlop and D Shotliff AST 87, pers comm). Masonry buildings, therefore, tended to be located on the higher, more stable ground adjacent to the streams. Elsewhere the buildings were of timber or timber-framed and, where they were situated above the uncompacted fills of the channels at 15-35 Copthall Avenue and probably 4-6 Copthall Avenue, the external walls were supported on piles. The buildings nevertheless eventually sank as the fills compressed. Floors were composed of beaten clay or brickearth; at 8 Telegraph Street some were of mortar.

The samples of Period II came from Building A at 15-35 Copthall Avenue: occupation surfaces, hearths and pits. These contexts contained most of the charred remains for the site. Some of the botanical remains have been interpreted as evidence for straw floor covering.

A building with *opus signinum* floors was recorded at Angel Court (Site 34) and Roman buildings were uncovered during the re-investigation of 55-61 Moorgate (Site 15). It is likely that some of the 'platforms' at Blomfield Street (Site 6) and piles at the site to the rear of London Wall (Site 28) also supported buildings. At 15-35 Copthall Avenue a vast gravelled surface extended back from the road and the buildings to the north and east; gravelled surfaces were also laid on the west side of the road.

During this period Road 1, having shifted a little to the west at the end of Period I, continued to be regularly maintained, its drainage probably provided by the property owners. In AD 190-220 the defensive wall which enclosed the city on its landward side (Maloney J 1983, 104) must have curtailed this and Road 2 at the northern limits of the city if, as proposed (Part 3), it had originally continued northwards. There is no record of a gateway in this stretch of the defensive circuit until the medieval period so that the main upper Walbrook roads, while they may have been linked with a postulated intra-mural road, must have become in the main access roads *(ibid* 97, 98). North of the wall, evidence from Broadgate suggests that further embankment of the main Walbrook Stream (3) in *c* AD 180-300 took place as part of a rationalisation of the drainage system when the city wall was erected (Malt 1987).

Drainage and probably a water-supply were ensured by the digging of new ditches, timber revetted drains and a major land drain, though these were much fewer in number than had previously been the case. At 15-35 Copthall Avenue the scale of the surfacing and the size of the land drain imply planning and execution by the city's authorities. It would follow therefore that the development of the upper Walbrook during this period was a planned development and not a peripheral, piecemeal growth.

The evidence from seeds and insects for this period at 15-35 Copthall Avenue indicated a typically urban environment where the ground was fairly disturbed but still damp.

Just to the south-east of Angel Court, at Kings Arms Yard, the tributaries of the upper valley had united with the main stream, the course of which was now approximately southwards to the Thames. The width of the prehistoric stream here is not known but at Bucklersbury House (Site 23) (Grimes 1968, 93) it was reduced to 4.26m by means of timber revetments and dumped material. A succession of timber buildings and surfaces was then constructed above the banks of the canalised stream. The timing for reclamation and building seems to have been dissimilar however in the upper and lower valley: finds from the lowest deposits at Bucklersbury were dated AD 43-96 (Wilmott forthcoming). This early date for initial occupation of the lower Walbrook has been confirmed by a recent excavation on the west pavement of Bucklersbury street (P Rowsome and J Hill BUC 87, pers comm). With the already simplified stream system of the lower Walbrook, reclamation of the valley floor was easily achieved through dumping and building could begin immediately. Layers of black silt within the building

and dumping sequence at Bucklersbury suggest that the ground level had to be raised as flooding occurred. The stream itself had silted up by the mid-late 2nd century. It is possible that the stream here was too severely restricted, and by the late 1st-early 2nd century the inadequacy of the drainage system in the upper valley must have accounted for much of the rapid silting downstream.

At Bucklersbury the revetment collapsed and the site was abandoned until *c* mid 3rd century. By contrast, in the upper valley, occupation continued into the 3rd century although the maintenance of public services at 15-35 Copthall Avenue may have ceased sometime after the middle of the 2nd century and there was a break in occupation beside the Stream 2 from the 3rd century to the mid-late 3rd century. It may be that drainage was a problem but there was no direct evidence of this.

Comparable with those upstream, controlled excavations in the lower valley are likely to produce evidence of a continuity of occupation, albeit reduced, from the mid 2nd-3rd centuries. A decrease of activity in the Walbrook valley in the second half of the 2nd century may have been a reflection of the general decline of Roman London and other towns at this time (Merrifield 1983, 140-8).

Methods of construction for 1st-2nd century buildings in the lower Walbrook compare with those upstream, some being typical for wet, unconsolidated ground. A site on the east bank of the lower Walbrook, St Swithins House (Site 24), was investigated in 1949-50 by Ivor Noel Hume and a number of buildings were recorded (Wilmott forthcoming). Both timber and stone buildings were present. As with the structures at Bucklersbury House, those of timber were generally 1st-2nd century in date, while a stone building was dated to the later 2nd century. Three timber structures were supported on piles; onto the piles timber floors were laid (features 27, 82/83), the floors in turn carrying a beam which probably supported a wall (feature 72/73). These timber 'platforms' recall that recorded by Reader at Blomfield Street, (Site 5) (1903, 181-3). At St Swithins House a stone-founded building, considered by the excavator to have been destroyed by a fire in the Hadrianic period, seems to have had a timber-framed superstructure (building A). Another building with stone and tile superstructure post-dated the Antonine period (building E). Both these last two buildings and one of those on a piled foundation had floors of *opus signinum.* Painted wall plaster associated with many of the structures suggests that they were residential in character. Buildings at 15-35 Copthall Avenue (Site 27), perhaps at 4-6 Copthall Avenue (Site 33) and 55-61 Moorgate (Site 15) were founded on piles, but not erected on timber platforms.

The buildings at 8 Telegraph Street and Angel Court (Sites 22 and 34) bear comparison to those at St Swithins' House and may also have been residential.

Evidence from the detailed excavation of a building at 15-35 Copthall Avenue indicated scorched floors, hearths, ovens, key-hole shaped pits and sunken hearths, and internal fixtures. These suggest an industrial function, such an interpretation being supported by the siting of the buildings, not on the dry stable ground adjacent to the former stream but within the valley, implying that proximity to a water supply was more important than comfort. There were some industrial residues from the building, notably iron and glass slag; a possible awl for leatherworking was also recovered. None, however, occurred in any numbers that could provide a definite connection with activities carried out in the building. Finds and environmental evidence suggest a domestic function and it is possible that the buildings were both residences and workshops. A building in use in the mid 2nd century (provisional) at 55-61 Moorgate contained a glassworking kiln but was also associated painted plaster, implying a dual function (Drummond-Murray 1988).

It seems, therefore, that once the drainage of the upper Walbrook was sufficiently regulated in the early 2nd century buildings began to be erected, though this seems to have occurred somewhat earlier at the sides of the valley. This is later than the expansion of London in the Flavian period but the development of what was probably regarded as a marginal area began with its drainage around the beginning of the century. In some areas it seems that building construction quickly followed reclamation, in others it had to wait about twenty years. Thus it may be that the development of the upper Walbrook was a consequence of the Flavian expansion of the city. When the occupation of many sites in London, especially the peripheral areas, ceased in the mid-late 2nd century, it continued, though probably on a reduced scale, in the upper Walbrook, well into the 3rd century. It is suggested that the apparently total abandonment of the lower Walbrook in the mid 2nd century (Grimes 1968) is probably due to the limitations of the site.

Period III - mid/late 3rd century - end of 4th century

Demolition of buildings in the upper Walbrook was succeeded by a resumption of ground raising dumps and the digging of ditches. Flooding does not seem to have occurred and therefore it is inferred that the ground had become saturated with water. This period is dated to mid-late 3rd/mid-late 4th centuries at 43 and 44 London Wall and 4-6 Copthall Avenue, and possibly 8 Telegraph Street; at 15-35 Copthall Avenue it is dated to early/mid-late 4th century. The major road (1) was maintained and on its east side provided with a deep drainage ditch which was semi-permanently filled with fresh though almost still water. Large, distinctive pits, some at least associated with an external surface, suggest that at 15-35 Copthall Avenue an industrial activity continued in the 4th century, though different in character to that of the earlier period. This may have been the reason for the considerable and persistent efforts taken to counter the increasing wetness of an area that would surely have been easier to abandon. In particular, Road 1 was maintained even though, since the construction of the landward defensive wall in *c* AD 200, it no longer provided access beyond the city. Presumably it now gave access to the wall and an intramural road.

The abandonment of the upper Walbrook valley is not precisely dated. Only broad 4th or mid-late 4th century dates are provided for Period III though at

Angel Court the canalised stream flooded in the late 4th century, with no further attempts to contain it thereafter.

The environment was still very damp in Period III at 15-35 Copthall Avenue, but perhaps muddy and disturbed in contrast to the damp grassland of Period I. Human or animal disturbance was also indicated by a high proportion of nitrophilous plants and a number of synanthropic insects.

Site	Period I	Period II	Period III
15–35 Copthall Avenue: controlled excavation	early 2nd c	early/mid 2nd c –mid/late 3rd c or later	mid/late 4th c
15–35 Copthall Avenue: watching brief	early 2nd c	2nd c	
44 London Wall	–	mid/late 2nd c	late 3rd c or later
43 London Wall	early 2nd c	early 3rd–late 3rd c	early 4th c or later
4–6 Copthall Avenue	early 2nd c	mid/late 3rd c or later	early 4th c or later
8 Telegraph Street	early 2nd c	?early 2nd c–late 3rd c	

Fig 130 The overall dating framework

Period IV - post Roman

With the abandonment of the upper Walbrook valley at the end of the Roman period, natural peaty deposits began to form south of the wall and eventually blanketted the area of the former tributary and beyond at 15-35 Copthall Avenue (Site 27). These represent the marsh that developed unchecked until the 11th-mid 12th centuries. The valley was radically different from that of the pre-Roman valley, which had been dissected by well-defined wet or marshy depressions through which the streams flowed. Now, by contrast, there were no well-defined streams, the ground level within the valley having been raised up by well over 2m in some areas, and much of the upper Walbrook had become swampy. It is at this stage that the actual streams are likely to have been small, muddy rills; evidence from Broadgate indicates that even the main Walbrook stream was no longer flowing, its water dispersed.

Environmental evidence from 15-35 Copthall Avenue, such as the absence of synanthropic and decomposer insects, suggests that by the medieval period more natural conditions prevailed: the marsh had developed as the degree of wetness increased, and typical marshland vegetation was abundant. Within an early medieval ditch, water was sluggish but fresh, as indicated by the mollusc and ostracod evidence. This marsh or 'Mora' is well documented from medieval sources and gave its name to Moorfields and Moorgate.

Causes of the marsh

There is not enough evidence to allow a firm conclusion to be drawn as to the cause of the marsh but there are two main factors which could have been relevant, though a distinction should be made between the marsh within and without the city.

The evidence from Broadgate (Site 5) and London Wall (Site 12) supports the suggestion that the construction of the defensive wall resulted in the creation of the marsh on the north side of the city (Norman & Reader 1906, 184). Provision should have been, and was, made to direct the stream and its tributaries through the wall. Two culverts have been located. One of these (Merrifield 1965, W30) (Site 11) carried the main Stream 3, that to the east (W29) (Site 40) probably carried Stream 4. The true position of a third culvert (W33) just to the north of 15-35 Copthall Avenue is now considered to have been some way to the south (C Harding, pers comm). It is possible that there was an insufficient number or that the culverts were not large enough to cope with the quantity of material being carried downstream and hence silted up quickly. The introduction of drainage ditches will often lead to an increase in the velocity of water movement (Weyman 1975, 32) and hence erosive powers. At Broadgate the embankment of the stream - which could have been contemporary with the construction of the wall - caused rapid erosion (Malt 1987). Other activities affecting the main stream outside the city, as far north as its source, may also have contributed to the amount of material being carried by this stream.

Inside the city the lack of maintenance of a largely artificial drainage system is also suspected as the cause of the marsh. Natural drainage was replaced with a system imposed on the reclaimed ground, a system that seems to have been simplified and perhaps minimised during the period of building activity (Period II). The material used for reclamation was generally impermeable clay and organic refuse and the ground level continued to rise throughout the occupation of the site. Such a system, if not regularly maintained, would have disastrous results with water infiltrating into the permeable ground. The land-drain at 15-35 Copthall Avenue provides support for this suggestion; the drain had silted up after a timber element had collapsed. There may have been other contributory factors; a blockage downstream for instance would have caused the stream to back up and flood the upper valley. On the Bucklersbury House site it was observed that the width of the canalised stream was reduced from 4.0m to 2.4m; Marsden suggests that this may have been because a watermill was located there (1980, 72). At the mouth of the Walbrook Merrifield considers that preparation for the construction of a new waterfront towards the end of the 2nd century may have impeded the outflow of the stream into the Thames (1983, 147, 149). He also favours a rise in the sea level relative to the land as a cause of flooding in the Walbrook *(ibid).* It is not appropriate in this study to discuss the complex subject of sea level changes and which has been summarised recently by Milne (1985, 79-86). A rise in sea level can be suggested from the Iron Age and the Thames, which was tidal in London in the Roman period, seems to have been expected to regularly rise to a

level of *c* 1.8-2.0m OD *(ibid,* 84-6; fig 50). It is not clear how much the upper Walbrook would have been affected; investigation near the mouth of the stream may clarify this point. Recent research, however, is providing clear evidence of a fall in sea level which probably commenced during the early part of the 2nd century and was reversed towards the end of the 4th century (Brigham forthcoming). A fall in sea level would have caused down-cutting in rivers and streams: there is, so far, no evidence for this in the upper Walbrook and indeed, in the relatively short period when the change occurred, it need not have affected the upper reaches of the stream.

From a study of the upper Walbrook, however, it is evident that there were two distinct periods when drainage was a problem. The first, in the early 2nd century, immediately followed the radical re-organisation of the stream and, it is suggested, caused rapid erosion and silting, leading to flooding. The second period occurred south of the wall around the latter half of the 3rd century-4th century when the 'managed' stream system, already neglected, became choked up; north of the wall the re-organisation of the stream and the construction of the defensive wall could have been contemporary in *c* AD 200 (Part 4, p69), the former causing rapid erosion, the latter restricting the stream, resulting in silting, flooding and formation of a marsh.

Activities in the upper Walbrook

There is much evidence for industrial processes from the Walbrook valley but less that positively locates a particular industry in the valley. Glassworking is one of the industries for which there is definite evidence. Glassworking waste has been identified as early as Period I and was also present in Period II. Recently, at 55-61 Moorgate (Site 15) a glassworking kiln, provisionally dated to AD 140-160, has been found within a building (Drummond-Murray 1988). Fragments of glass waste, dated to the 2nd century were also found - though in a much less significant quantity - on the adjacent site of 53 Moorgate (Site 16) (Spence 1988). 'Portions of a glass blowers floor', identified as Roman because of its colour, were found in 1912 in Black Swan Alley (between 43 and 44 London Wall) by William Newton (A2371 J Shepherd, pers comm), while to the north at Blomfield Street, Reader noted many pieces of 'vitreous matter and molten glass, also several burnt flints, on some of which were traces of fused material' (1903, 197). At 15-35 Copthall Avenue a large quantity of residual furnace-lining from a foundation and dump could have derived from a glassworking kiln.

Leather is present, often in great quantities, but generally in the dumped deposits; however, the great quantity of leather off-cuts from the foundation of Road 1 at 15-35 Copthall Avenue does suggest that leather workshops were situated close-by. In the lower half of the Walbrook valley, pegged out skins found at Bucklersbury House (Grimes 1968, 97) provides definite evidence for tanning. From both Periods I and II in the upper Walbrook, bone and woodworking waste was recovered and may attest to the presence of such workshops in the area. Small quantities of iron slag, furnace-lining, fragments of crucible - some associated with brass smelting, gold refining and the melting of silver - and tools have been recovered. The character of Building A at 15-35 Copthall Avenue provides good evidence for industrial activity, possibly one that involved ironworking. Some smithing slag that does not appear to have been residual was recovered from this building. Recent research by A Wilmott (forthcoming) confirms the probability that ironworking was carried out in the lower Walbrook valley.

Pottery wasters dating to the late 1st or early 2nd century were also found at 20/ 28 Moorgate in 1936 (Site 20) and may indicate the presence of a nearby kiln, though because of the close proximity of a tributary stream here, they could have formed part of the dumped material which is so typical of Walbrook sites at this time. An oven, dating broadly to the 2nd-3rd centuries, has been recovered from a recent site at 2-6 Austin Friars on the east side of the Walbrook valley (Beazley 1987).

The timber-lined channel or tank recorded at Blomfield Street, Site 7, could have been used for an industrial process while at 9-19 Throgmorton Avenue (Site 36) a number of large shallow pits are also likely to have been associated with an industrial process.

It seems clear, therefore, that the Walbrook was exploited for its industrial potential. Development of the valley may have been planned as an extension or replacement of the industrial area around Ironmonger Lane which utilised one of the western tributaries of the middle Walbrook (Perring & Roskams forthcoming).

Analysis of the finds assemblages from the upper Walbrook sites in the study (Part 7) confirms the conclusions of recent research in the lower half of the Walbrook, that the use of the stream as a depository for sacred offerings is unproven (Wilmott forthcoming). Finds from the upper Walbrook sites are generally domestic or industrial in character and, in the main were derived from infill or levelling deposits. In comparison, finds from waterborne deposits within the channels were few. It is further suggested that within the city, from the late 1st-early 2nd century onwards, the Walbrook would have had the appearance not of a natural stream but of a network of open drains which, together with its exploitation for industrial purposes, may have made it unsuitable for votive offerings to a water spirit. This would presumably also be the case for the human skulls which, it has been suggested, were ritually deposited in the stream (Marsh & West 1981). The greatest concentrations of skulls however, have been found to the north of the city where the stream may have remained uncontaminated for a longer period of time than was the case inside the city. Those skulls further south, from the drainage channels at 15-35 Copthall Avenue for instance, may have been washed downstream. Doubts cast on the likelihood of these skulls being the result of the Boudican massacre of AD 60 *(ibid)* are now supported by the dating of the canalised stream and drainage ditches in which the skulls at 15-35 Copthall Avenue were found (and even though a certain length of time is allowed for their suggested journey downstream).

A final consideration of the Roman period in the upper Walbrook valley is the possibility of interpreting the later Roman dumps as 'Dark Earth' which occurs on

a number of other sites, especially in peripheral areas and in the western half of the city, from the 3rd century. The identifying characteristics of dark earth, namely a sequence of occupation deliberately discontinued and apparently replaced with a dark homogeneous deposit in which there are little or no signs of activity (Macphail 1981) - recently challenged (Yule forthcoming) - do not however agree with the dumps from the sites in the area of study. These were not homogeneous and there were indications of activity throughout the period of dumping. Though some deposits were dark in colour this is considered to have been a result of waterlogging. It seems clear, therefore, that post-building dumping was a positive action to counter the effects of wet ground and was pertinent to the Walbrook alone.

Appendix: 15-35 Copthall Avenue plant remains (Figs 131-6)

Fig 131 15-35 Copthall Avenue plant remains: Period I, waterlogged preservation; Natural Valley fills; channel/ditch fills

Species	Common name	Habitat	Contexts													
			Natural Valley fills			Natural Valley fills				Channel/Ditch fills						
			709	*710*	*712*	*719*	*547*	*562*	*564*	*583*	*588*	*591*	*593*	*601*	*604*	*642*	*646*
		*wgt soil g	1250	850	400	650	500	250	250	1000	250	250	250	250	250	750	650
Cereals:																	
Triticum *cf* spelta	spelt spikelet fork	FI					1										
Triticum sp	wheat spikelet fork	FI									2				4		
Triticum sp	wheat glume base	FI	2	1	5		1		8		47				600	4	9
Triticum sp	wheat rachis	FI									2						
Hordeum/Triticum sp	barley or wheat	FI											78				
Avena sp	oat	AI								1							
cf Avena sp	oat	AI											6				
Cerealia	ind cereal straw	FI															
Other plants:																	
Chara sp		E	45	2	138	27	8									6	
Pteridium aquilinum (L) Kuhn	bracken	CDGH															
Caltha palustris L	marsh marigold	CE						1									
Ranunculus acris/repens/bulbosus	buttercups	ABCDEG	23	11	10	5	10	44	70	164	40	4	10	8	69	15	4
Ranunculus sardous Crantz	hairy buttercup	ABE		14				4		11		4		1		11	
Ranunculus *cf* sardous	hairy buttercup	ABE		9							2	3				8	
Ranunculus *cf* parviflorus	small-flowered buttercup	CD								2							
Ranunculus *cf* auricomus	goldilocks	C													12		
Ranunculus flammula L	lesser spearwort	EG						10	5	16					5		
Ranunculus *cf* flammula	lesser spearwort	EG		11	1						7		1				1
Ranunculus sceleratus L	celery-leaved crowfoot	E	10	22	1	7	2	3	5	8	5	10	4	58		16	4
Ranunculus *cf* sceleratus	celery-leaved crowfoot	E		2	1											15	
Ranunculus subgen Batrachium (DC)A	crowfoots	E			1				1								
Thalictrum *cf* flavum	common meadow rue	DE								2	1						
Ranunculus sp	–	ABCDEG							1				4			2	
Papaver somniferum L	opium poppy	BGHI							5								2
Papaver *cf* somniferum	opium poppy	BGHI		1													
cf Papaver somniferum	opium poppy	BGHI									2						
Papaver sp	poppy	ABGHI						7	1				2	1			
cf Papaver sp	poppy	ABGHI														1	
Fumaria officinalis L	fumitory	A								1						1	
Fumaria sp	fumitory	A					1		1		1						
Brassica sp	wild cabbage/turnip/mustard	ABI														1	
Brassica spp	wild cabbage/turnip/mustard	ABI								2							
Raphanus raphanistrum L	wild radish/charlock	A						1									
cf Raphanus raphanistrum	wild radish/charlock	A											1				
cf Lepidium sp	–	ABDE											1				
Thlaspi arvense L	field penny-cress	AB							1								
Capsella bursa-pastoris (L) Medic	shepherd's purse	AB		4			2	14	1		1		3	8			1
Rorippa nasturtium-aquaticum (L)Ha	watercress	IE	5		1	20	1	2			2					2	
Rorippa *cf* nasturtium-aquaticum	watercress	IE										1					
Rorippa islandica (Oeder) Borbas	marsh yellow-cress	E	1	1	1			1			2	3	1	12		3	2
Rorippa *cf* islandica	marsh yellow-cress	E			1											4	
cf Camelina sativa	gold of pleasure	AHI				1											
Cruciferae	–	ABCDEGFI						1			5		1				

Fig 131 continued

Species	Common name	Habitat	Contexts														
			Natural Valley fills			Natural Valley fills				Channel/Ditch fills							
			709	*710*	*712*	*719*	*547*	*562*	*564*	*583*	*588*	*591*	*593*	*601*	*604*	*642*	*646*
		*wgt soil g	1250	850	400	650	500	250	250	1000	250	250	250	250	250	750	650
Reseda luteola L	weld-dyer's rocket	ABHI	2					6	3			3	2			7	
Viola sp	violet	ABCDG						1		1							
Silene *cf* alba	white campion	ABC						2							1		
Silene sp	campion/catchfly	ABCDF							2								1
Silene spp	campions/catchflies	ABCDF								9							
Lychnis flos-cuculi L	ragged robin	CDE	1				1	3	3	2	3	1			7	1	
cf Lychnis flos-cuculi	ragged robin	CDE															1
Agrostemma githago L	corn cockle	A			1								4				
cf Saponaria officinalis	soapwort	CEH						2									
Cerastium sp	mouse-ear chickweed	ABD	1		3	1		1			1		2	5		1	
Cerastium spp	mouse-ear chickweed	ABD								6							
cf Cerastium sp	mouse-ear chickweed	ABD											1				
Myosoton aquaticum (L) Moench	water chickweed	E	4			1					8					1	
cf Myosoton aquaticum	water chickweed	E			2		1			138							
Mysoton/Stellaria sp	chickweed/stitchwort	ABCDEG								12							
Stellaria media (L) Vill	chickweed	AB	8	20	6	13	17	40	37			6		7	59	13	6
Stellaria *cf* media	chickweed	AB										2					
Stellaria holostea L	greater stitchwort	CG		2													
cf Stellaria holostea L	greater stitchwort	CG															
Stellaria graminea L	lesser stitchwort	CD	3	6	5	1	16		36		41	4			39	6	
cf Stellaria graminea	lesser stitchwort	CD															1
Stellaria graminea/palustris	stitchwort	CDE			2	1		45		94				4			
Stellaria alsine Grimm	bog stitchwort	E						14	2								
Stellaria *cf* alsine	bog stitchwort	E		1		2		4									
Stellaria sp	chickweed/stitchwort	ABCDEG													2		
Arenaria serpyllifolia L	thyme-leaved sandwort	ABD							1								
cf Arenaria leptoclados	lesser thyme-leaved sandwort	AB											1				
Arenaria serphyllifolia/leptoclades	thyme-leaved sandwort	ABD												4			
cf Areneria sp	sandwort	ABD															1
Arenaria/Cerastium sp	sandwort/chickweed	ABCD			2												
Caryophyllaceae indet	–	–												3		4	
Montia fontana ssp chondrosperma L	blinks	AE	5	4	6	3	17	4	12	10	3	1	3	1	4	8	5
cf Montia fontana ssp chondrosperma	blinks	AE		2													
Chenopodium *cf* polyspermum	all-seed	AB	3	36												2	
Chenopodium album L	fat hen	ABFH	1		4			6	4	12				2			2
Chenopodium *cf* album	fat hen	ABFH		49	2		1		6		7	95			12	5	
Chenopodium album type	fat hen	ABFH					5						5			18	
Chenopodium murale L	nettle-leaved goosefoot	BD						1		2							
Chenopodium rubrum/glaucum	red/glaucous goosefoot	AB		5			7	97	94	110	225	102	38	34		16	6
Chenopodium *cf* rubrum/glaucum	red/glaucous goosefoot	AB													66	4	
Chenopodium sp	goosefoot *etc*	ABFH			1						3						
Chenopodium spp	goosefoot *etc*	ABFH				3											
cf Chenopodium sp	goosefoot *etc*	ABFH				1											
Chenopodium/Atriplex sp	goosefoots/oraches	ABFGH	1														
Atriplex hastata/patula	orache	ABFGH	4	2	1	2	5		24		17	35				3	6
Atriplex *cf* hastata/patula	orache	ABFGH	1														
Atriplex sp	orache	ABFGH				1											
Atriplex spp	oraches	ABFGH						11		23							
Chenopodiaceae indet	–	–						2									

Fig 131 continued

Species	Common name	Habitat	Contexts														
			Natural Valley fills			Natural Valley fills						Channel/Ditch fills					
			709	*710*	*712*	*719*	*547*	*562*	*564*	*583*	*588*	*591*	*593*	*601*	*604*	*642*	*646*
		*wgt soil g	1250	850	400	650	500	250	250	1000	250	250	250	250	250	750	650
Caryophyllaceae/Chenopodiaceae/Port	–	ABCDE								38							
cf Caryophyllaceae/Chenopodiaceae	–	ABCDE									2						
Malva sp	mallow	BCDF				1		2		2							
Linum usitatissimum L	cultivated flax	I						7	7	18	2		1				
Linum catharticum L	purging flax	D					1	6	2	6					1	1	1
Trifolium sp	clover	ABDI						5						4			
Ornithopus perpusillus L	birdsfoot	D				1		15	4	5			2	3	14		
Rubus fruticosus agg	blackberry	CFGH					2		36			3				4	2
Rubus *cf* fruticosus agg	blackberry	CFGH						2		34							
Rubus fruticosus/idaeus	blackberry/raspberry	CFGH									7				7	1	
Potentilla *cf* argentea	hoary cinquefoil	D						5	1	4				4			
Potentilla erecta (L) Rausch	tormentil	CDEGH					4		10		5		1		13	1	
Potentilla *cf* erecta	tormentil	CDEGH						7		40				2			
Potentilla argentea/erecta type	hoary cinquefoil/tormentil	CDEGH														1	2
Potentilla reptans L	creeping cinquefoil	BC(D)		1			5										2
Potentilla *cf* reptans	creeping cinquefoil	BC(D)						25		2							
Potentilla sp	cinquefoil/tormentil	BCDEFGH		1										1		1	
cf Potentilla sp	cinquefoil/tormentil	BCDEFGH										1					
Potentilla/Fragaria sp	–	BCDEFGH											1				
Fragaria vesca L	wild strawberry	CDF							15	10		2			11		
cf Fragaria vesca	wild strawberry	CDF									4						
Alchemilla *cf* vulgaris agg	lady's mantle	CDE									1						
Aphanes arvensis agg	parsley piert	ABD	1		1			5	3	5	4			1		3	1
Prunus spinosa L	sloe/blackthorn	CFG								1							
Prunus avium/cerasus	sloe/cherry	CFGI														1	
Prunus domestica L	plum/bullace	CI										1					
Prunus *cf* cerasus	sour cherry	CI								3							
Malus sylvestris	crab apple	CFH															
Pyrus/Malus sp	pear/apple	CFI								8							
Rosaceae indet	–	–									1				5		
cf Callitriche sp	–	E							1								
Torilis arvensis (Huds) Link	spreading hedge-parsley	A									1						
Torilis *cf* arvensis	spreading hedge-parsley	A						5									
Torilis japonica/nodosa	hedge-parsley	ACD									1				3	1	
Conium maculatum L	hemlock	CEG					3	7	38	13	3	4	1	15	3	1	
cf Conium maculatum	hemlock	CEG															1
Buplerum *cf* rotundifolium	hare's-ear	A											1				
Apium graveolens L	celery	EI						19	11	14			2	1		3	3
Apium nodiflorum (L) Lag	fool's watercress	E		64	1	5	1	6		11						3	2
Apium *cf* nodiflorum	fool's watercress	E														1	
cf Apium nodiflorum	fool's watercress	E		1													
Apium graveolens/nodiflorum	wild celery/fool's watercress	E													14		
Apium sp	–	EFI	4								8						
Seseli libanotis (L) Koch	–	CD															1
Berula erecta (Huds) Coville	narrow-leaved water-parsnip	E									2						
cf Berula erecta	narrow-leaved water-parsnip	E						10									
Oenanthe pimpinelloides L	dropwort	DE								1							
Oenanthe *cf* pimpinelloides	dropwort	DE													3		
Oenanthe crocata	hemlock water dropwort	E														1	

Fig 131 continued

Species	Common name	Habitat	Contexts													
			Natural Valley fills			Natural Valley fills							Channel/Ditch fills			
			709	*710*	*712*	*719*	*547*	*562*	*564*	*583*	*588*	*591*	*593*	*601*	*604*	*642*	*646*
		*wgt soil g	1250	850	400	650	500	250	250	1000	250	250	250	250	250	750	650
Oenanthe sp	dropwort	DE											1				
cf Oenanthe sp	dropwort	DE							1								
Anethum graveolens L	dill	BFI	1					19	1	8	2	8	2	2			
cf Anethum graveolens	dill	BFI					1		3						5	1	
Foeniculum vulgare Mill	fennel	BDFIG									4						
Coriandrum sativum L	coriander	I						3		2							
cf Coriandrum sativum	coriander	I									1						
Daucus carota L	wild carrot	ACDGI							1						5	2	2
cf Daucus carota	wild carrot	ACDGI						1									1
Umbelliferae indet	–	–			1	1				3	3			1		3	3
Bryonia dioica Jacq	bryony	CG	1						1	1							
Bryonia *cf* dioica	bryony	CG													1		
Polygonum aviculare L	knotgrass	ABG	4	4	6	1	18	32	57	94	30	9	17	5	22	25	10
Polygonum *cf* aviculare	knotgrass	ABG											3				
Polygonum bistorta L	bistort	DF													1		
Polygonum persicaria L	persicaria	ABEH	4		1	2	1	22	29	46	15			11			2
Polygonum *cf* persicaria	persicaria	ABEH						8						5			
Polygonum lapathifolium L	pale persicaria	ABE				2	4	1			13			9			
Polygonum *cf* lapathifolium	pale persicaria	ABE															
cf Polygonum lapathifolium	pale persicaria	ABE					1										
Polygonum persicaria/lapathifolium	persicaria	ABEH		1		1				9		42			10	11	4
Polygonum *cf* persicaria/lapathifolium	persicaria	ABEH	5									2					
Polygonum *cf* hydropiper	water pepper	E					3				5	6	6				
Polygonum convolvulus L	black bindweed	ABF								4							
Polygonum sp	–	ABCDEFG												2			
Polygonum spp	–	ABCDEFG		2													
Rumex acetosella L	sheep's sorrel	AD	22	2	25	9	38	79	148	153	127	11	18	11		7	13
Rumex obtusifolius L	broad-leaved dock	BC		1													
Rumex obtusifolius type	broad-leaved dock	BC															
Rumex *cf* obtusifolius	broad-leaved dock	BC		2													
Rumex acetosa/crispus/obtusifolius	dock	ABCD	2	69	4	3	24	57		181	32	11	5	6	26	14	6
Rumex sanguineus/conglomeratus	dock	BC			4												
Rumex sanguineus L	red-veined dock	BCD													142		
Rumex maritimus L	golden dock	EJ															6
Rumex sp	dock	ABCDEFGI	1	2	1	3	1					4	3		4	5	8
Rumex spp	docks	ABCDEFGI				6			47							9	5
Polygonaceae indet	–	–				4	2										
Urtica urens L	small nettle	AB		2			1	12	74	15	3	1		1	7	5	
Urtica dioica L	stinging nettle	BCDEFGH	18	16	4	7	29	424	189	386		67		88	99	114	49
cf Urtica dioica	stinging nettle	BCDEFGH			1												
Ficus carica L	fig	I	1				8	24	50	81	6		1		18	7	6
cf Ficus carica	fig	I										1					
Morus nigra	mulberry	FHI							1								
Corylus avellana L	hazel	CF															1
Anagallis arvensis L	scarlet pimpernel	AG		7	1		1		1							1	
cf Myosotis	forget-me-not	BCDE	1														
Hyoscyamus niger L	henbane	BDG							1	2					1		
Solanum nigrum L	black nightshade	BF						2	1	2							
cf Solanum nigrum	black nightshade	BF					1										

Fig 131 continued

Species	Common name	Habitat	Contexts													
			Natural Valley fills			Natural Valley fills						Channel/Ditch fills				
			709	*710*	*712*	*719*	*547*	*562*	*564*	*583*	*588*	*591*	*593*	*601*	*604*	*642*	*646*
		*wgt soil g	1250	850	400	650	500	250	250	1000	250	250	250	250	250	750	650
Veronica *cf* anagallis-aquatica L	water-speedwell	CE				3		9						78			
Veronica officinalis L	common speedwell	CD	1														
cf Veronica spp	speedwell	ACDE						5									
Limosella aquatica L	mudwort	E									2						
cf Limosella aquatica	mudwort	E				1							1		1	1	
cf Rhinanthus minor	yellow rattle	D										1					
Rhinanthus sp	yellow rattle	ABDGH						2		2							
Mentha sp	mint	ABCEFGI		2	1					1			1				
Lycopus europaeus L	gipsy-wort	EH						1			2			1			
cf Lycopus europeaus	gipsy-wort	EH							1								
Satureja hortensis	summer savory	FGI						7									
Satureja hortensis type	summer savory	FGI					1										
cf Satureja hortensis	summer savory	FGI														1	
Calamintha sp	calamint	D						1									
Prunella vulgaris L	self-heal	BCDG	3	1			5		38	88	25	1	8	6	49	8	8
cf Prunella vulgaris	self-heal	BCDG					2										
Ballota nigra	black horehound	CG									1					1	
Lamium sp	dead-nettle	ABC													1	2	
cf Lamium sp	dead-nettle	ABC					1	1									
Nepeta cataria L	cat-mint	C							1								
Labiatae indet	–	ABCFEFI			1						3						
Plantago major L	great plantain	ABC	15	70	5	7		17					1		7	17	2
cf Plantago major	great plantain	ABC			2												
Plantago media L	hoary plantain	D									6	35					4
cf Plantago lanceolata	ribwort	D													10		
Sambucus nigra L	elder	BCFGH					1	4	11	6	3				5		1
Sambucus *cf* nigra	elder	BCFGH											1				
Sambucus nigra/ebulus	elder/danewort	BCFGH		1												3	
Bidens cernua L	nodding bur-marigold	E		1		1		7	1		3		3				
Bidens *cf* cernua	nodding bur-marigold	E										4					
Bidens tripartita L	tripartite bur-marigold	E						1	2		2	5	2	9	1		
Bidens *cf* tripartita	tripartite bur-marigold	E										4					
Bidens sp	bur-marigold	E		1												1	
Senecio sp	ragwort	ABCDEG													2		
cf Senecio sp	ragwort	ABCDEG						8									
Chrysanthemum *cf* segetum	corn marigold	AH											1				
Chrysanthemum *cf* leucanthemum	ox-eye daisy	D														1	
Chrysanthemum sp	–	ABCD													1		
Anthemis/Chrysanthemum sp	–	ABD												1			
Arctium lappa L	great burdock	B(D)										1					
cf Arctium lappa	great burdock	B(D)							1								
Cirsium arvense (L) Scop	creeping thistle	AB	2														
Cirsium sp	thistle	ABCDEFG				2	1				2						
cf Cirsium sp	thistle	ABCDEFG											1	1			
Carduus/Cirsium sp	thistles	ABDEG		1	1	1			2	4						3	1
cf Carduus/Cirsium	thistles	ABDEG														1	
Centaurea *cf* nigra	lesser knapweed	BDG													7		
Centaurea sp	knapweed/thistle	ABDGH				1				2							
cf Centaurea sp	knapweed/thistle	ABDGH						8		3					1		

Fig 131 continued

Species	Common name	Habitat	Contexts														
			Natural Valley fills			Natural Valley fills				Channel/Ditch fills							
			709	*710*	*712*	*719*	*547*	*562*	*564*	*583*	*588*	*591*	*593*	*601*	*604*	*642*	*646*
		*wgt soil g	1250	850	400	650	500	250	250	1000	250	250	250	250	250	750	650
Lapsana communis L	nipplewort	BCF								2					3		
cf Lapsana communis	nipplewort	BCF												1			
Hypochoeris radicata L	cat's ear	CD							3							1	1
Hypochoeris *cf* radicata	cat's ear	CD									2				4		
Leontodon *cf* autumnalis	autumnal hawkbit	BD									5	1					1
cf Leontodon autumnalis	autumnal hawkbit	BD															1
Leontodon *cf* hispidus	rough hawkbit	D													4		
Leontodon sp	hawkbit	BDF				4		42	9	12				6		1	1
cf Leontodon sp	hawkbit	BDF															1
Picris sp	ox-tongue	BCD													3		
Picris echioides L	bristly ox-tongue	BC									1						
Sonchus arvensis L	field milk-thistle	ADE														1	
Sonchus oleraceus L	milk-/sow-thistle	AB							2		1						
Sonchus asper (L) Hill	spiny milk-/sow-thistle	AB	1						1	4	7						1
Sonchus asper/oleraceus	milk-/sow-thistle	AB						18									
Sonchus sp	milk-/sow-thistle	ABE													2		
Crepis sp	hawk's beard	BCE								2							
cf Crepis sp	hawk's beard	BCE						1									
Taraxacum sp	dandelion	BCDEFGH						2									
Compositae indet	–	–						4		1	2		1	2			1
Alisma sp	water-plantain	E	1		1	3		3	2								
Triglochin maritima L	sea arrow-head	E		1					1	5	4				3		
cf Triglochin maritima	sea arrow-head	E			2			21				1		2			
Zannichellia palustris L	horned pond-weed	E	1		18											3	
Juncus sp	rush	DE		18			112						32				130
Juncus spp	rush	DE	69		229	132		2064	380	54	240	25		339		107	
Luzula sp DC	woodrush	CDE		3	3											3	1
cf Luzula sp	woodrush	CDE					1								1		
Typha sp	bulrush/reedmace	E														1	
Eleocharis palustris/uniglumis	spike-rush	E	12	11	4	7	12	16	38	113	25	3	7	8	35	15	5
Eleocharis sp	spike-rush	E														5	2
cf Scirpus sp	club-rushes	EH		1													
Schoenoplectus lacustris (L) Palla	bulrush	E	1														
Schoenoplectus *cf* lacustris	bulrush	E	1														
Carex sp	sedge	CDEH	7			2	4									10	1
Carex spp	sedges	CDEH		3	5		7	33	31	102	24		9	5	39	6	4
cf Carex sp	sedge	CDEH	1			1					3						
Cyperaceae indet	–	ABCDEFI		1	1							2				2	2
cf Cyperaceae indet	–	ABCDEFI							1	2							
Glyceria sp	flote/reed grass	EH	14			6											
cf Glyceria sp	flote/reed grass	EH		18		28			1							2	
cf Lolium/Festuca	rye-grass/festue	BCD											29				
Gramineae indet	–	ABCDEHIF	14	56	17	100	10	2803	52	178	310	36	216	2000	338	94	25
Indeterminate	–	–			3	11	3	6	2	3		1	1	9		7	

Fig 131 continued

Species	Common name	Habitat	Contexts													
			Natural Valley fills			Natural Valley fills							Channel/Ditch fills			
			709	*710*	*712*	*719*	*547*	*562*	*564*	*583*	*588*	*591*	*593*	*601*	*604*	*642*	*646*
		*wgt soil g	1250	850	400												
Charred remains:																	
Cereals:																	
Triticum sp	wheat	FI					1				3				1		
Triticum sp	wheat spikelet fork	FI					1										
Triticum sp	wheat glume base	FI														1	
Cerealia	ind cereal straw	FI													2		
Other plants:																	
Ranunculus acris/repens/bulbosus	buttercups	ABCDEG								1						1	
Brassica sp	wild cabbage/turnip/mustard	ABI													1		
Caryophyllaceae indet	–	–							1								
Vitis vinifera L	vine	I						1									
cf Vicia/Lathyrus sp	vetch/tare/vetchling	CD								1							
Leguminosae indet	–	–														1	
Potentilla *cf* erecta	tormentil	CDEGH													1		
Berula erecta (Huds) Coville	narrow-leaved water-parsnip	E													1		
Rumex acetosa/crispus/obtusifolius	dock	ABCD								1				1			
Ficus carica L	fig	I													2		
Plantago sp	plantain/ribwort	ABCD							1								
Festuca sp	Fescue	CDEF													1		
Lolium/Festuca	rye-grass/festue	BCD					1		1		1						
Gramineae indet	–	ABCDEHIF						82	5		5				1	3	
Indeterminate	–	–					1										

Key to habitat codes:
A Weeds of cultivated land
B Ruderals. Weeds of waste places and disturbed ground
C Plants of woods, scrub, hedgerows
D Open environment (fairly undisturbed)
E Plants of damp/wet environment
F Edible plants
G Medicinal and poisonous plants
H Commercial/industrial use
I Cultivated plants
*Wgt soil g = Weight of soil processed in grams

Fig 132 15-35 Copthall Avenue plant remains: waterlogged preservation; Period I, turf; Period II, hearths

Species	Common name	Habitat	Contexts									
			Turf			Hearths						
			306	*350*	*215*	*222*	*255*	*257*	*258*	*340*	*344*	*355*	*388*
		*wgt soil g	1000	500	900	3000	850	1750	750	250	750	250	750
Triticum sp	wheat glume base	FI						9	1		3		3
Chara sp	–	E	27										
Ranunculus acris/repens/bulbosus	buttercups	ABCDEG	80	48	31	853	7	13	30		83		49
Ranunculus *cf* acris/repens/bulbosus	buttercups	ABCDEG						1					
cf Ranunculus acris/repens/bulbosus	buttercups	ABCDEG						4					
Ranunculus sardous Crantz	hairy buttercup	ABE				1							1
Ranunculus flammula L	lesser spearwort	EG		3		2					3		
Ranunculus *cf* flammula	lesser spearwort	EG		3			3	2			1		10
cf Ranunculus flammula	lesser spearwort	EG						1					
Ranunculus sceleratus L	celery-leaved crowfoot	E	15	12	1		21	6	2		5		
Ranunculus subgen Batrachium (DC)A	crowfoots	E		1									
Thalictrum flavum L	common meadow rue	DE		1									
Ranunculus sp	–	ABCDEG					1						
Papaver rhoeas L	field poppy	ABGH					3						
cf Papaver somniferum	opium poppy	BGHI								1			
Papaver sp	poppy	ABGHI		1									
Fumaria officinalis L	fumitory	A			1								
Capsella bursa-pastoris (L) Medic	shepherd's purse	AB		10	1								
cf Capsella bursa-pastoris	shepherd's purse	AB		2									
Rorippa islandica (Oeder) Borbas	marsh yellow-cress	E		5									
Reseda luteola L	weld-dyer's rocket	ABHI			23				1		1		4
cf Reseda luteola	weld-dyer's rocket	ABHI		1									
Viola sp	violet	ABCDG									1		
cf Viola sp	violet	ABCDG				1							
Silene *cf* alba	white campion	ABC									1		
Silene sp	campion/catchfly	ABCDF							1				
Lychnis flos-cuculi L	ragged robin	CDE			1		1	1					
cf Lychnis flos-cuculi	ragged robin	CDE									1		
Agrostemma githago L	corn cockle	A											
cf Agrostemma githago	corn cockle	A											
Cerastium spp	mouse-ear chickweed	ABD				68							
cf Cerastium sp	mouse-ear chickweed	ABD											1
Myosoton aquaticum (L) Moench	water chickweed	E	2			1							
cf Myosoton aquaticum	water chickweed	E									1		
Stellaria media (L) Vill	chickweed	AB	1	64	1	5	9	3	3		1		
Stellaria holostea L	greater stitchwort	CG											
Stelloria graminea L	lesser stitchwort	CD	1	31	10		18		32	1	8		17
Stellaria graminea/palustris	stitchwort	CDE			3	32							
Stellaria sp	chickweed/stitchwort	ABCDEG			1	1							
cf Areneria sp	sandwort	ABD											1
Caryophyllaceae indet	–	–		2	1								
Montia fontana ssp chondrosperma L	blinks	AE	2	7		3	1				4		
Chenopodium *cf* polyspermum	all-seed	AB					1						
Chenopodium album L	fat hen	ABFH		6		3		1					
Chenopodium *cf* album	fat hen	ABFH					1						
Chenopodium album type	fat hen	ABFH	1	2		1							
Chenopodium *cf* murale	nettle-leaved goosefoot	BD									2		
Chenopodium rubrum/glaucum	red-glaucous goosefoot	AB		40	1		5	2			1		
Chenopodium *cf* rubrum/glaucum	red/glaucous goosefoot	AB		21			2						

Fig 132 continued

Species	Common name	Habitat	Contexts									
			Turf		Hearths							
			306	*350*	*215*	*222*	*255*	*257*	*258*	*340*	*344*	*355*	*388*
		*wgt soil g	1000	500	900	3000	850	1750	750	250	750	250	750
Chenopodium sp	goosefoot etc	ABFH		3	1		1	2	2		2		
Chenopodium/Atriplex sp	goosefoots/oraches	ABFGH			1								
Atriplex hastata/patula	orache	ABFGH		3				3	1				
Atriplex sp	orache	ABFGH				3							
Chenopodiaceae indet	–	–			2								
Malva sp	mallow	BCDF									1		
Linum catharticum L	purging flax	D				3						1	2
cf Ornithopus perpusillus	birdsfoot	D			1								
Vicia sp	vetch	CD											3
Rubus fruticosus agg	blackberry	CFGH		2	2				1	1			1
Rubus fruticosus/idaeus	blackberry/raspberry	CFGH		1							1		
Potentilla argentea type	hoary cinquefoil	D			14								
Potentilla *cf* argentea	hoary cinquefoil	D			32	1	4						
Potentilla erecta (L) Rausch	tormentil	CDEGH		4			2	1	2		17	1	
Potentilla *cf* erecta	tormentil	CDEGH				18							
cf Potentilla erecta	tormentil	CDEGH					1						
Potentilla argentea/erecta type	hoary cinquefoil/tormentil	CDEGH						6					3
Potentilla *cf* argentea/erecta type	hoary cinquefoil/tormentil	CDEGH							1				
cf Potentilla argentea/erecta	hoary cinquefoil/tormentil	CDEGH						1					
Potentilla reptans L	creeping cinquefoil	BC(D)			5				24				4
Potentilla *cf* reptans	creeping cinquefoil	BC(D)							24		18		
Potentilla sp	cinquefoil/tormentil	BCDEFGH						1		1		4	8
Potentilla spp	cinquefoil/tormentil	BCDEFGH			5								
Fragaria vesca L	wild strawberry	CDF							1				
cf Fragaria vesca	wild strawberry	CDF					2	5					
Aphanes arvensis agg	parsley piert	ABD		1					1				2
cf Aphanes arvensis agg	parsley piert	ABD		1									
Prunus sp	–	CFGI				1							
Rosaceae indet	–	–		2					2				
cf Torilis nodosa (L) Gaertn	knotted hedge-parsley	AD											1
cf Torilis sp	hedge-parsley	ACD					1						
Conium maculatum L	hemlock	CEG					1	1					1
cf Conium maculatum	hemlock	CEG											1
Apium graveolens L	celery	EI			1	8			2		1		3
cf Apium graveolens	celery	EI										1	
Apium nodiflorum (L) Lag	fool's watercress	E	13										
cf Apium inundatum	–	E					1						
Apium sp	–	EFI									4		
cf Apium sp	–	EFI		1									
cf Apium spp	–	EFI					3						
Oenanthe *cf* fistulosa	water dropwort	E							1				
Aethusa cynapium L	fool's parsley	A									1		
cf Anethum graveolens	dill	BFI					1		1		1		1
cf Coriandrum sativum	coriander	I											2
Umbelliferae indet	–	–			1	1	1				1		2
Bryonia dioica Jacq	bryony	CG											1
Polygonum aviculare L	knotgrass	ABG	1	1	1	5							1
Polygonum persicaria L	persicaria	ABEH		11		4							
Polygonum lapathifolium L	pale persicaria	ABE	4			2							

Fig 132 continued

Species	Common name	Habitat	Contexts										
			Turf			Hearths							
			306	*350*	*215*	*222*	*255*	*257*	*258*	*340*	*344*	*355*	*388*
		*wgt soil g	1000	500	900	3000	850	1750	750	250	750	250	750
Polygonum *cf* lapathifolium	pale persicaria	ABE		4									
Polygonum persicaria/lapathifolium	persicaria	ABEH		8							2		
Polygonum sp	–	ABCDEFG											
cf Polygonum sp	–	ABCDEFG				1							
Rumex acetosella L	sheep's sorrel	AD	61	64	140	17	88	20	28		62	5	16
cf Rumex acetosella	sheep's sorrel	AD						1					
Rumex acetosa/crispus/obtusifolius	dock	ABCD	135	65	1	106		6	5	1	3	1	7
Rumex sanguineus/conglomeratus	dock	BC					1						
Rumex sp	dock	ABCDEFGI			1		1		4	2	3	1	6
Rumex spp	docks	ABCDEFGI		8	3			4			9		
Polygonaceae indet	–	–									1		
Urtica urens L	small nettle	AB		4		1	13	9	6	3	1		1
Urtica dioica L	stinging nettle	BCDEFGH	2	56	10	6	33	17	14		11	1	13
cf Urtica sp	nettle	BCDEFGH							2				
Ficus carica L	fig	I					3		1				7
Corylus avellana L	hazel	CF				1							
Menyanthes trifoliata L	bogbean	EFG					1						
Hyoscyamus niger L	henbane	BDG				1	3						16
Solanum nigrum L	black nightshade	BF		1									
Veronica officinalis L	common speedwell	CD			1								
cf Rhinanthus minor	yellow rattle	D											1
Rhinanthus sp	yellow rattle	ABDGH				224							
cf Mentha sp	mint	ABCEFGI				1							
Mentha sp	mint	ABCEFGI			1		2						1
Lycopus europaeus L	gipsy-wort	EH	68	13							1		
Prunella vulgaris L	self-heal	BCDG	3	5	6	379		1	2		10		18
cf Prunella vulgaris	self-heal	BDCG							1				
Nepeta cataria L	cat-mint	C				2							
Plantago major L	great plantain	ABC			2		2		2				1
Plantago media L	hoary plantain	D				1		1					
cf Plantago media	hoary plantain	D		1									
Plantago lanceolata L	ribwort	D				1							
Plantago *cf* lanceolata	ribwort	D				3							
Sambucus nigra L	elder	BCFGH					2				1		
Sambucus *cf* nigra	elder	BCFGH						1					1
Sambucus nigra/ebulus	elder/danewort	BCFGH					1						
Senecio *cf* jacobea	ragwort	BG											1
Cirsium arvense (L) Scop	creeping thistle	AB									1		
cf Cirsium sp	thistle	ABCDEFG				1	1						
Carduus/Cirsium	thistles	ABDEG		2									1
Carduus/Cirsium/Centaurea	thistle/knapweed	ABCD											1
Hypochoeris radicata L	cat's ear	CD		1		2							1
Leontodon sp	hawkbit	BDF		1		4							
Sonchus asper (L) Hill	spiny milk-/sow-thistle	AB		1		2	1				2		
Compositae indet	–	–				2							
Alisma sp	water-plantain	E	76		1								
Potamogeton sp L	pondweed	E	1										
Juncus sp	rush	DE			30		44	82	88		8		508
Juncus spp	rush	DE	60	81	666	10064	129				21		

Fig 132 continued

Species	Common name	Habitat	Contexts										
			Turf		Hearths								
			306	*350*	*215*	*222*	*255*	*257*	*258*	*340*	*344*	*355*	*388*
		*wgt soil g	1000	500	900	3000	850	1750	750	250	750	250	750
Luzula sp DC	woodrush	CDE			1	1							
cf Luzula sp	woodrush	CDE					1						
Typha sp	bulrush/reedmace	E			1								
Eleocharis palustris/uniglumis	spike-rush	E	58	10	14	13	2	2	5		23	5	19
Carex sp	sedge	CDEH							18				13
Carex spp	sedges	CDEH	6	19	47	581	23	10			48	5	33
Cyperaceae indet	–	ABCDEFI											2
cf Glyceria sp	flote/reed grass	EH							1				
Lolium/Festuca	rye-grass/festue	BCD		1				4					
Bromus sp	brome	ABD						82					
Gramineae indet	–	ABCDEHIF	18	37	81	6998	5	53	22		34	18	207
Indeterminate	–	–		5	7	4			2	1	2		1
Charred remains													
Cereals:													
Triticum spelta	spelt	glume base FI			5								
Triticum *cf* spelta	spelt	glume base FI			2			7					
Triticum dicoccum/spelta	emmer/spelt	FI			12								
Triticum dicoccum/spelta	emmer/spelt	glume base FI			12								
Triticum sp	wheat	FI								2			
Triticum sp	wheat	glume base FI			30		5	9	10				1
cf Triticum sp	wheat	FI			1								
Hordeum sativum	barley	FI			6								
Hordeum sativum	barley	rachis FI			1								
cf Hordeum sativum	barley	FI			1								
Hordeum/Triticum sp	barley or wheat	FI											
Hordeum/Secale/Triticum sp	barley/rye/wheat	FI			1								
Avena sp	oat	AI			1	3							
cf Avena sp	oat	AI									1		
Other plants:													
Ranunculus acris/repens/bulbosus	buttercups	ABCDEG				9	2	2			1		
Ranunculus flammula L	lesser spearwort	EG				1							
cf Brassica sp	wild cabbage/turnip/mustard	ABI							1				
Cruciferae	–	ABCDEGFI									1		
Agrostemma githago L	corn cockle	A			1								
Myosoton/Stellaria sp	chickweed/stitchwort	ABCDEG				1							
Caryophyllaceae indet	–	–			1								
Chenopodium sp	goosefoot etc	ABFH							1				
Malva sylvestris L	mallow	BF				1							
Trifolium sp	clover	ABDI			1								
cf Vicia sp	vetch	CD					1				1		
Vicia/Lathyrus sp	vetch/tare/vetchling	CD							2				1
Potentilla *cf* erecta	tormentil	CDEGH											1
Potentilla sp	cinquefoil/tormentil	BCDEFGH							1				
Aphanes arvensis agg	parsley piert	ABD					1						
Polygonum lapathifolium L	pale persicaria	ABE				1							

Fig 132 continued

Species	Common name	Habitat	Contexts									
			Turf		Hearths							
			306	*350*	*215*	*222*	*255*	*257*	*258*	*340*	*344*	*355*	*388*
		*wgt soil g	1000	500									
Rumex acetosella L	sheep's sorrel	AD				1	1	5	1				
Rumex acetosa/crispus/obtusifolius	dock	ABCD				4							
Rumex sp	dock	ABCDEFGI			1		1	1					
Veronica hederifolia L	ivy speedwell	A				1							
Prunella vulgaris L	self-heal	BCDG				1							
cf Prunella vulgaris	self-heal	BDCG					1						
Plantago lanceolata L	ribwort	D				2							
Galium sp	bedstraw	ABCDE				1							
Sambucus nigra L	elder	BCFGH				1							
Anthemis cotula L	stinking mayweed	ABGH			1								
cf Lapsana communis	nipplewort	BCF			1								
Eleocharis palustris/uniglumis	spike-rush	E			1	1							
Carex sp	sedge	CDEH			1		1						
Carex spp	sedges	CDEH				2							
Cyperaceae indet	–	ABCDEFI									1		
cf Avena/Bromus sp	oat/brome grass	ABCDFI				1							
Hordeum sp	barley	BDFI			3	1							
Lolium/Festuca	rye-grass/festue	BCD			1				4		8		1
Poa spp	poa	ABDE											4
Poa spp type	poa	ABDE							11				
Bromus sp	brome	ABD				2							
cf Agrostis sp type	bent-grass	ABCD											12
Gramineae indet	–	ABCDEHIF			33	131	5	6	7		15	110	11
cf Gramineae indet	–	ABCDEHIF					1						
Indeterminate	–	–			2							2	

Key to habitat codes:
A Weeds of cultivated land
B Ruderals. Weeds of waste places and disturbed ground
C Plants of woods, scrub, hedgerows
D Open environment (fairly undisturbed)
E Plants of damp/wet environment
F Edible plants
G Medicinal and poisonous plants
H Commercial/industrial use
I Cultivated plants
*Wgt soil g = Weight of soil processed in grams

Fig 133 15-35 Copthall Avenue plant remains: Period II, drain; dumps; occupation surfaces; pits

Species	Common name	Habitat	Contexts													
			Drain	Dumps		Occupation surfaces							Pits			
			184	*518*	*523*	*191*	*214*	*338*	*406*	*433*	*181*	*226*	*363*	*367*	*477*	*544*
		*wgt soil g	1000	1300	1000	300	750	2750	250	850	1000	1050	750	750	500	1000
Cereals:																
Triticum sp	wheat	spikelet fork	FI									1				
Triticum sp	wheat	glume base	FI				8	12		1		1				
Hordeum sativum	barley		FI												1	
Other plants:																
Chara sp			E									1				
Ranunculus acris/repens/bulbosus	buttercups		ABCDEG	41	79	126	11	18	52		63	52	33	21	33	43	17
Ranunculus *cf* acris/repens/bulbosu	buttercups		ABCDEG						1								
cf Ranunculus arvensis	–		A												1	
Ranunculus sardous Crantz	hairy buttercup		ABE		8			2								
Ranunculus *cf* sardous	hairy buttercup		ABE		1	22										
Ranunculus *cf* parviflorus	small-flowered buttercup		CdDb								2					
Ranunculus *cf* lingua	great spearwort		E		3	5			1							
Ranunculus flammula L	lesser spearwort		EG	8		9		5			1		1			
Ranunculus *cf* flammula	lesser spearwort		EG											1		
cf Ranunculus flammula	lesser spearwort		EG												1	
Ranunculus sceleratus L	celery-leaved crowfoot		E	12	4		1	1	4		6	2	5	14	104		30
Ranunculus *cf* sceleratus	celery-leaved crowfoot		E						1								
cf Ranunculus sceleratus	celery-leaved crowfoot		E												1		
Thalictrum *cf* flavum	common meadow rue		DE												1		
Ranunculus sp	–		ABCDEG					1					1				
Papaver *cf* rhoeas	field poppy		ABGH										1				
Papaver somniferum L	opium poppy		BGHI	13													
Papaver sp	poppy		ABGHI					1						2			
Fumaria sp	fumitory		A										1				
Brassica spp	wild cabbage/turnip/mustard		ABI						3								
cf Capsella bursa-pastoris	shepherd's purse		AB	32										1			
Rorippa nasturtium-aquaticum (L) Ha	watercress		IE						1								
Rorippa islandica (Oeder) Borbas	marsh yellow-cress		E	13	1	1			1					1			
Cruciferae	–		ABCDEGFI					1									
Reseda luteola L	weld-dyer's rocket		ABHI	1		1	1					1	2				
Viola sp	violet		ABCDG										1				
Silene dioica (L) Clairv	red campion		CD		1												
Silene dioica/alba type	white/red campion		ABCD										2				
Silene sp	campion/catchfly		ABCDF												1		
Lychnis flos-cuculi L	ragged robin		CDE			5			1				2				
cf Lychnis flos-cuculi	ragged robin		CDE				1							1			
Agrostemma githago L.	corn cockle		A														
Cerastium sp	mouse-ear chickweed		ABD	10		2											
cf Cerastium sp	mouse-ear chickweed		ABD							2				1			
Myosoton aquaticum (L) Moench	water chickweed		E							1					2	1	
cf Myosoton aquaticum	water chickweed		E										1				
Mysoton/Stellaria sp	chickweed/stitchwort		ABCDEG			18											
Stellaria media (L) Vill	chickweed		AB	80	1			1		1	2	3	1	2	2	25	
Stellaria *cf* media	chickweed		AB				1					7					
cf Stellaria media	chickweed		AB										3				
cf Stellaria holostea L	greater stitchwort		CG											1			
Stellaria graminea L	lesser stitchwort		CD		18	9		3	14		22		18	8	10	9	28

Fig 133 continued

Species	Common name	Habitat	Contexts													
			Drain	Dumps		Occupation surfaces							Pits			
			184	*518*	*523*	*191*	*214*	*338*	*406*	*433*	*181*	*226*	*363*	*367*	*477*	*544*
		*wgt soil g	1000	1300	1000	300	750	2750	250	850	1000	1050	750	750	500	1000
Stellaria graminea type	lesser stitchwort	CD											21			
cf Stellaria graminea	lesser stitchwort	CD													3	
Stellaria *cf* alsine	bog stitchwort	E					3									
Stellaria sp	chickweed/stitchwort	ABCDEG	1													
cf Arenaria sp	sandwort	ABD													1	
Montia fontana ssp chondrosperma L	blinks	AE		1	1		9	13				15	2	1	7	
Chenopodium *cf* polyspermum	all-seed	AB												3		
Chenopodium album L	fat hen	ABFH		1							2		4	6		
Chenopodium *cf* album	fat hen	ABFH	1									54				
Chenopodium album type	fat hen	ABFH			1								11			
Chenopodium murale L	nettle-leaved goosefoot	BD				3							5	2		
Chenopodium rubrum/glaucum	red-glaucous goosefoot	AB			2			1		1			87	13	2	3
Chenopodium sp	goosefoot *etc*	ABFH	1				2			2			4			
Chenopodium spp	goosefoot *etc*	ABFH		2				4						4		
Chenopodium/Atriplex sp	goosefoots/oraches	ABFGH		1												
Chenopodium/Atriplex spp	goosefoots/oraches	ABFGH												7		
Atriplex hastata/patula	orache	ABFGH		2								1	9	2		
Atriplex *cf* hastata/patula	orache	ABFGH										1				
Atriplex sp	orache	ABFGH	1											1		
cf Atriplex sp	orache	ABFGH				1										
Chenopodiaceae indet	–	–	1			1										1
Malva sp	mallow	BCDF	1										1			3
cf Linum usitatissimum	cultivated flax	I				1										
Linum catharticum L	purging flax	D	1		4							1				
Vitis vinifera L	vine	I						1								
Ornithopus perpusillus L	birdsfoot	D	2		16											
Rubus fruticosus agg	blackberry	CFGH	21		4			3					3			2
Rubus *cf* fruticosus agg	blackberry	CFGH									12			1		
Potentilla *cf* palustris	marsh cinquefoil	E		1												
Potentilla *cf* argentea	hoary cinquefoil	D					3				3					
Potentilla erecta (L) Rausch	tormentil	CDEGH		62	8		1	2		3			8		1	3
Potentilla *cf* erecta	tormentil	CDEGH	6	2			1	2			11	1				
Potentilla argentea/erecta type	hoary cinquefoil/tormentil	CDEGH											1		11	
Potentilla reptans L	creeping cinquefoil	BC(D)		3										4		
Potentilla reptans type	creeping cinquefoil	BC(D)						19								
Potentilla *cf* reptans	creeping cinquefoil	BC(D)					3				5					
Potentilla sp	cinquefoil/tormentil	BCDEFGH	5		2			3				1	1	1		
Potentilla spp	cinquefoil/tormentil	BCDEFGH				4		25						7		
Potentilla/Fragaria sp	–	BCDEFGH											1			
Fragaria vesca L	wild strawberry	CDF		1												
cf Alchemilla sp	lady's mantle	CD					1									
Aphanes arvensis agg	parsley piert	ABD	2		3		1				3			2	1	
Rosa sp	rose	CGI									2					
Prunus spinosa L	sloe/blackthorn	CFG										1				
Rosaceae indet	–	–				1				1			1			
Conium maculatum L	hemlock	CEG	1					5		1	1			2		12
Apium graveolens L	celery	EI	10				1			2		1		14		8
Apium *cf* graveolens	celery	EI						3		4			6		6	
cf Apium graveolens	celery	EI						6								

Fig 133 continued

Species	Common name	Habitat	Contexts													
			Drain	Dumps		Occupation surfaces							Pits			
			184	*518*	*523*	*191*	*214*	*338*	*406*	*433*	*181*	*226*	*363*	*367*	*477*	*544*
		*wgt soil g	1000	1300	1000	300	750	2750	250	850	1000	1050	750	750	500	1000
Apium nodiflorum (L) Lag	fool's watercress	E		1												
Apium *cf* nodiflorum	fool's watercress	E														1
Apium graveolens/nodiflorum	wild celery/fool's watercress	E						58					30			
Apium sp	–	EFI	1							11	1					
cf Apium sp	–	EFI													1	
Oenanthe *cf* fistulosa	water dropwort	E	1													
Oenanthe *cf* pimpinelloides	dropwort	DE				1										
Oenanthe sp	dropwort	DE		1			2									
cf Oenanthe sp	dropwort	DE			1											
Anethum graveolens L	dill	BFI					1							1		
cf Anethum graveolens	dill	BFI	2							2						
Coriandrum sativum L	coriander	I	2					1								1
cf Coriandrum sativum	coriander	I								1						
Daucus carota L	wild carrot	ACDGI								1	1	1				
cf Daucus carota	wild carrot	ACDGI	2		1			1				1				
Umbelliferae indet	–	–	2	1		2		3		4		1	7	3		2
cf Umbelliferae indet	–	–				1								1		
Bryonia dioica Jacq	bryony	CG	1													
Polygonum aviculare L	knotgrass	ABG	38		9		4	1	1				6		1	
Polygonum *cf* aviculare	knotgrass	ABG				1						2	2			
Polygonum persicaria L	persicaria	ABEH		1								1		1		
Polygonum *cf* persicaria	persicaria	ABEH	5								1					
Polygonum lapathifolium L	pale persicaria	ABE		1												
Polygonum persicaria/lapathifolium	persicaria	ABEH			2											
cf Polygonum persicaria/lapathifol	persicaria	ABEH										1				
Polygonum convolvulus L	black bindweed	ABF			1											
Polygonum sp	–	ABCDEFG	1													
Polygonum spp	–	ABCDEFG														3
cf Polygonum sp	–	ABCDEFG						1								
Rumex acetosella L	sheep's sorrel	AD	38	71	143	23	81	37		3	142	32	25	141	13	
Rumex *cf* acetosella	sheep's sorrel	AD										6	25			
cf Rumex acetosella	sheep's sorrel	AD										1				2
Rumex acetosa/crispus/obtusifolius	dock	ABCD	25	7	30		3	8		33	10		1	13	7	
Rumex *cf* acetosa/crispus/obtusifolius	dock	ABCD													5	
Rumex sanguineus/conglomeratus	dock	BC			21								4			
Rumex sp	dock	ABCDEFGI			10	1	4		1			15	4		3	7
Rumex spp	docks	ABCDEFGI	7	5				2				9		20		
Polygonaceae indet	–	–			1					1					3	
Urtica urens L	small nettle	AB	10			7	1	5		1			9	17	3	
Urtica *cf* urens	small nettle	AB								3						
cf Urtica urens	small nettle	AB										1				
Urtica dioica L	stinging nettle	BCDEFGH	118	14	12	11	6	27		7	11	7	95	27	15	195
Ficus carica L	fig	I	6	2	6		1			3	11	1		1		1
cf Ficus carica	fig	I						4								
Corylus avellana L	hazel	CF								2						
cf Corylus avellana	hazel	CF														
cf Myosotis	forget-me-not	BCDE													1	
Hyoscyamus niger L	henbane	BDG	3										1	3		
Solanum dulcamara L	woody nightshade	BC											2			

Fig 133 continued

Species	Common name	Habitat	Contexts												
			Drain	Dumps		Occupation surfaces							Pits		
			184	*518*	*523*	*191*	*214*	*338*	*406*	*433*	*181*	*226*	*363*	*367*	*477*	*544*
		*wgt soil g	1000	1300	1000	300	750	2750	250	850	1000	1050	750	750	500	1000
Solanum nigrum L	black nightshade	BF								1				1		
Solanum sp	nightshade	BD												1		
Limosella aquatica L	mudwort	E										1				
Rhinanthus sp	yellow rattle	ABDGH						6								
cf Mentha sp	mint	ABCEFGI									1					
Mentha sp	mint	ABCEFGI	10	2									2	3		
Lycopus europaeus L	gipsy-wort	EH		3												1
Lycopus europaeus type	gipsy-wort	EH										2				
Satureja hortensis	summer savory	FGI			1					1	3					
cf Satureja hortensis	summer savory	FGI											2			
Prunella vulgaris L	self-heal	BCDG	106	16		2	9				12	7			10	1
cf Prunella vulgaris	self-heal	BCDG			3		1								2	
cf Lamium sp	dead-nettle	ABC											1			
Labiatae indet	–	ABCFEFI	5			1	1					1				
Plantago major L	great plantain	ABC					2	1				5	4	1		3
Plantago media L	hoary plantain	D					1									
Plantago *cf* lanceolata	ribwort	D													1	
cf Plantago lanceolata	ribwort	D								1						
Sambucus nigra L	elder	BCFGH	11								5	1	2	2	1	
Sambucus nigra/ebulus	elder/danewort	BCFGH		1											1	
Valerianella dentata (L) Poll	corn salad	A			1											
Bidens sp	bur-marigold	E	1													
Anthemis cotula L	stinking mayweed	ABGH	4					1								
cf Chrysanthemum sp	–	ABCD	2													
cf Arctium lappa	great burdock	B(D)	1													
cf Cirsium arvense	creeping thistle	AB					1									
Cirsium sp	thistle	ABCDEFG			3		1					1				
Carduus/Cirsium	thistles	ABDEG		4	1					1						1
Centaurea sp	knapweed/thistle	ABDGH	2		1		1									
cf Centaurea sp	knapweed/thistle	ABDGH					1									
Hypochoeris radicata L	cat's ear	CD			8											
Hypochoeris *cf* radicata	cat's ear	CD										2				
Leontodon *cf* autumnalis	autumnal hawkbit	BD	8				1									
Leontodon sp	hawkbit	BDF			4			1						1	1	
Sonchus arvensis L	field milk-thistle	ADE					1								1	
Sonchus asper (L) Hill	spiny milk-/sow thistle	AB	3		1	2								4		1
Sonchus *cf* asper	spiny milk-/sow thistle	AB		3								2				
Crepis *cf* capillaris	smooth hawk's-beard	BD					1									
Taraxacum officinale Weber	dandelion	BDFGH										1				
Taraxacum *cf* officinale	dandelion	BDFGH					1									
Compositae indet	–	–		3			1	1					1	1	6	
Alisma sp	water-plantain	E	1				1									
Triglochin maritima L	sea arrow-head	E			2											
cf Triglochin maritima	sea arrow-head	E										1				
Juncus sp	rush	DE	670				10	12				14	72		72	8
Juncus spp	rush	DE		89		600	96	328		41	620	12		123	160	
cf Luzula sp	woodrush	CDE						1								
Eleocharis palustris/uniglumis	spike-rush	E	8	31	71	5	13	8		11	6	15	1	7	13	2
Eleocharis sp	spike-rush	E		4	26		1									

Fig 133 continued

Species	Common name	Habitat	Contexts												
			Drain	Dumps		Occupation surfaces						Pits			
			184	*518*	*523*	*191*	*214*	*338*	*406*	*433*	*181*	*226*	*363*	*367*	*477*	*544*
		*wgt soil g	1000	1300	1000	300	750	2750	250	850	1000	1050	750	750	500	1000
cf Schoenplectus lacustris	bulrush	E	1													
Carex sp	sedge	CDEH		67			2	5		11		6	2	3	8	
Carex spp	sedges	CDEH	36	26	95	3	17	29			31	15	14	22		1
cf Carex sp	sedge	CDEH	1			1										
Cyperaceae indet	–	ABCDEFI		2												
Glyceria sp	flote/reed grass	EH													1	
Lolium/Festuca	rye-grass/festue	BCD										22				
Gramineae indet	–	ABCDEHIF	2150	26	77	47	120	1012		143	450	100	12	53	151	14
Indeterminate	–	–	13	4	1	7	7	22		3	7		3	5		2
Charred remains																
Cereals:																
Triticum sp	wheat	glume base FI						1								
Hordeum sativum	barley	FI											1			
cf Hordeum sativum	barley	FI												1		
Avena sp	oat	AI						1							1	
Other plants:																
Ranunculus acris/repens/bulbosus	buttercups	ABCDEG						5								
Reseda luteola L	weld-dyer's rocket	ABHI						1								
Cerastium spp	mouse-ear chickweed	ABD						2								
Stellaria media (L) Vill	chickweed	AB											1			
Stellaria graminea/palustris	stitchwort	CDE						1								
cf Trifolium repens type	white clover	D								1						
Trifolium spp	clover	ABDI						21								
cf Lens culinaris	lentil	I						1								
Conium maculatum L	hemlock	CEG						1								
Apium *cf* graveolens	celery	EI						1								
Rumex acetosa/crispus/obtusifolius	dock	ABCD						1								
Rumex sp	dock	ABCDEFGI													1	
Corylus avellana L	hazel	CF										1				
Prunella vulgaris L	self-heal	BCDG						1								
Labiatae indet	–	ABCFEFI									1					
Plantago *cf* lanceolata L	ribwort	D						2								
Chamaemelum nobile (L) All	chamomile	BDFG											1			
Carex sp	sedge	CDEH							2							
Carex spp	sedges	CDEH						3								
Festuca *cf* perenne	rye-grass	B										1				
Lolium/Festuca	rye-grass/festue	BCD						1					2			
Gramineae indet	–	ABCDEHIF	40					10		10		2	5	7	11	

Key to habitat codes:
A Weeds of cultivated land
B Ruderals. Weeds of waste places and disturbed ground
C Plants of woods, scrub, hedgerows
D Open environment (fairly undisturbed)
E Plants of damp/wet environment
F Edible plants
G Medicinal and poisonous plants
H Commercial/industrial use
I Cultivated plants
*Wgt soil g = Weight of soil processed in grams

Fig 134 15-35 Copthall Avenue plant remains: Period III, pit; channels; 'peat'

Species	Common name	Habitat	Contexts								
			Pit	Channel/Ditch				Channel/Ditch			'Peat'
			172	*133*	*134*	*138*	*140*	*144*	*145*	*146*	*147*	*110*
		*wgt soil g	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
cf Triticum sp	wheat	FI						3				
Ranunculus acris/repens/bulbosus	buttercups	ABCDEG	6	8	6	4	17	21	2	33	9	6
Ranunculus sardous Crantz	hairy buttercup	ABE									1	1
Ranunculus *cf* sardous	hairy buttercup	ABE					1					
Ranunculus flammula L	lesser spearwort	EG	2		1			7			1	
Ranunculus *cf* flammula	lesser spearwort	EG	1							2		
Ranunculus sceleratus L	celery-leaved crowfoot	E	116	669	237	221	204	2	2	255	389	125
Ranunculus subgen Batrachium (DC)A	crowfoots	E			1							
Ranunculus sp	–	ABCDEG									1	
Papaver somniferum L	opium poppy	BGHI								3	2	
Fumaria officinalis L	fumitory	A			1						1	
Brassica *cf* nigra	black mustard	BI	1									
Brassica sp	wild cabbage/turnip/mustard	ABI								1		
Thlaspi arvense L	field penny-cress	AB		1	2		1			2	1	
Capsella bursa-pastoris (L) Medic	shepherd's purse	AB					2	3		2		
Rorippa nasturtium-aquaticum (L)Ha	watercress	IE		34	1	14		18			4	1
Rorippa islandica (Oeder) Borbas	marsh yellow-cress	E		2			1	6		3	2	
cf Rorippa islandica	marsh yellow-cress	E	3									
Cruciferae	–	ABCDEGFI		4								
Reseda luteola L	weld/mignonette	AB						3				
Viola sp	violet	ABCDG		1								
cf Viola sp	violet	ABCDG			1							
Agrostemma githago L	corn cockle	A										
Myosoton aquaticum (L) Moench	water chickweed	E	46		7		196			62	132	1
cf Myosoton aquaticum	water chickweed	E		30		9		87	18			
Mysoton/Stellaria sp	chickweed/stitchwort	ABCDEG	6								8	
Stellaria media (L) Vill	chickweed	AB	53	189	110	75	110	320	12	363	53	2
Stellaria graminea L	lesser stitchwort	CD	10			1	28	9		14		
Stellaria graminea/palustris	stitchwort	CDE		12	5						16	
Stellaria sp	chickweed/stitchwort	ABCDEG										1
Stellaria spp	chickweed/stitchwort	ABCDEG		8								
Montia fontana ssp chondrosperma L	blinks	AE								1	6	
Montia *cf* perfoliata	–	BI						14				
Chenopodium album L	fat hen	ABFH	24	82	35	62	192	6	44	35	6	
Chenopodium *cf* album	fat hen	ABFH				29		12				
Chenopodium murale L	nettle-leaved goosefoot	BD		8	5	2		12		2	1	
Chenopodium *cf* murale	nettle-leaved goosefoot	BD	1			1	13					
Chenopodium rubrum/glaucum	red-glaucous goosefoot	AB	83	341	108	212	308	870	21	1019	199	21
Chenopodium sp	goosefoot *etc*	ABFH							4			
Chenopodium spp	goosefoot *etc*	ABFH			3						9	
Atriplex hastata/patula	orache	ABFGH	23			52	104	212	8	119		
Atriplex *cf* hastata/patula	orache	ABFGH	1									
Atriplex spp	oraches	ABFGH		103	89						97	39
cf Atriplex sp	orache	ABFGH								7		
Chenopodiaceae indet	–	–		8				30				
cf Linum usitatissimum	cultivated flax	I				1						
Linum catharticum L	purging flax	D	1		1		2					
Rubus fruticosus agg	blackberry	CFGH				2	1		1	1		
Rubus *cf* fruticosus agg	blackberry	CFGH		1								1

Fig 134 continued

Species	Common name	Habitat	Contexts								
			Pit	Channel/Ditch				Channel/Ditch			'Peat'
			172	*133*	*134*	*138*	*140*	*144*	*145*	*146*	*147*	*110*
		*wgt soil g	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Rubus fruticosus/idaeus	blackberry/raspberry	CFGH			4							
Potentilla erecta (L) Rausch	tormentil	CDEGH	8			2	2	14	2	76		
Potentilla erecta type	tormentil	CDEGH			9							
Potentilla *cf* erecta	tormentil	CDEGH		16								
Potentilla sp	cinquefoil/tormentil	BCDEFGH			2		2			1	1	1
Rosa sp	rose	CGI			1							
Prunus spinosa L	sloe/blackthorn	CFG	1							1		
cf Pyrus/Malus sp	pear apple	CFI										1
cf Callitriche sp	–	E						9				
Conium maculatum L	hemlock	CEG	3	73	35	7	115	102	5	80	143	
Apium graveolens L	celery	EI	7	22		12	8			1		1
Apium nodiflorum (L) Lag	fool's watercress	E	30	354	168	78	8		1	4	11	10
Apium *cf* nodiflorum	fool's watercress	E						252				
Apium sp	–	EFI						15				
Oenanthe *cf* fistulosa	water dropwort	E										1
Oenanthe *cf* crocata	hemlock water dropwort	E								1		
Oenanthe aquatica (L) Poiret	fine-leaved water dropwort	E				1				1		40
Oenanthe *cf* aquatica	fine-leaved water dropwort	E		8						1		
Oenanthe sp	dropwort	DE				1						
Umbelliferae indet	–	–		20			4	18		1		
Umbelliferae/Compositae indet	–	–			1							
cf Bryonia dioica	bryony	CG								1		
Polygonum aviculare L	knotgrass	ABG	2	2	1	1	15	15		7	3	1
Polygonum persicaria L	persicaria	ABEH	54	10	9	6	53	30	1	18	23	
Polygonum lapathifolium L	pale persicaria	ABE	3	1		1				95	26	
Polygonum *cf* lapathifolium	pale persicaria	ABE										1
Polygonum *cf* hydropiper	water pepper	E	1									
Rumex acetosella L	sheep's sorrel	AD		1		2				15	10	1
Rumex acetosa/crispus/obtusifolius	dock	ABCD	6	12	18		32	51		2	23	6
Rumex maritimus L	golden dock	EJ		5		9		1				7
Rumex sp	dock	ABCDEFGI				8			1			
Rumex spp	docks	ABCDEFGI					18					
Polygonaceae indet	–	–	4									
Urtica urens L	small nettle	AB	12	36	26	21	24	159	4	9		1
Urtica dioica L	stinging nettle	BCDEFGH	29	850	524	532	1136	1100	74	478		7
Hyoscyamus niger L	henbane	BDG						2				
Solanum nigrum L	black nightshade	BF	1	7	1	5	12	21		1		
Veronica officinalis L	common speedwell	CD	1									1
cf Rhinanthus sp	yellow rattle	ABDGH								1		
Mentha spp	mint	ABCEFGI		10								
Lycopus europaeus L	gipsy-wort	EH	1	10		15	4	9		2	8	2
Satureja hortensis	summer savory	FGI		2								
Prunella vulgaris L	self-heal	BCDG			1			9		2	6	
Ballota nigra	black horehound	CG					2					
Lamium sp	dead-nettle	ABC		2							2	
Labiatae indet	–	ABCFEFI						1	1		2	
Plantago major L	great plantain	ABC	3	10		8	8	25		4		3
cf Plantago lanceolata	ribwort	D								1		
Plantago sp	plantain/ribwort	ABCD									2	

Fig 134 continued

Species	Common name	Habitat	Contexts								
			Pit	Channel/Ditch				Channel/Ditch			'Peat'
			172	*133*	*134*	*138*	*140*	*144*	*145*	*146*	*147*	*110*
		*wgt soil g	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Sambucus nigra L	elder	BCFGH			6		8	7	3	2		10
cf Bidens cernua	nodding bur-marigold	E										1
Bidens tripartita L	tripartite bur-marigold	E		2								
Bidens *cf* tripartita	tripartite bur-marigold	E								1		
Anthemis cotula L	stinking mayweed	ABGH								1		
Anthemis *cf* cotula	stinking mayweed	ABGH								1		
cf Chrysanthemum segetum	corn marigold	AH										1
Cirsium vulgare (Savi) Ten	spear thistle	AB								2	2	1
Cirsium sp	thistle	ABCDEFG	1									
Carduus/Cirsium	thistles	ABDEG								1		
Centaurea sp	knapweed/thistle	ABDGH		1								
cf Cichorium intybus L	chicory	CD								1		
cf Lapsana communis	nipplewort	BCF				1						
Hypochoeris radicata L	cat's ear	CD								1		
Leontodon autumnalis L	autumnal hawkbit	BD					2					
Leontodon sp	hawkbit	BDF	1									
cf Leontodon sp	hawkbit	BDF				1						
Sonchus oleraceus L	milk-/sow-thistle	AB			3		4					
Sonchus *cf* oleraceus	milk-/sow-thistle	AB		8								
Sonchus asper (L) Hill	spiny milk-/sow-thistle	AB	6	40	11	20	24	33		13		1
Compositae indet	–	–						1				1
Alisma sp	water-plantain	E	1	800	60	368	7	109	1	2		68
Triglochin maritima L	sea arrow-head	E										
Juncus sp	rush	DE				36		111		3		
Juncus spp	rush	DE	100			12			10		3	80
Luzula sp DC	woodrush	CDE		2								
Lemna spp	duckweed	E										19
Typha sp	bulrush/reedmace	E	1									
Eleocharis palustris/uniglumis	spike-rush	E	1	4				1		2	2	3
cf Scirpus sp	club-rushes	EH								2		
Carex sp	sedge	CDEH								10		
Carex spp	sedges	CDEH	30	14	16	6	19	22	2		6	18
cf Carex sp	sedge	CDEH				1						
cf Carex spp	sedges	CDEH							1			
Cyperaceae indet	–	ABCDEFI								3		
cf Cyperaceae indet	–	ABCDEFI	2									
Glyceria sp	flote/reed grass	EH						27				
cf Glyceria sp	flote/reed grass	EH								1		
Gramineae indet	–	ABCDEHIF	68			20	6	117	6	3	13	
Indeterminate	–	–		7	6	8				1		2
Charred remains												
Hordeum sativum	barley	FI						1				
Brassica *cf* nigra	black mustard	BI						14				
Rubus fruticosus agg	blackberry	CFGH						1				
cf Cladium mariscus	sedge	E						3				
Gramineae indet	–	ABCDEHIF						3				

Key to habitat codes:
A Weeds of cultivated land
B Ruderals. Weeds of waste places and disturbed ground
C Plants of woods, scrub, hedgerows
D Open environment (fairly undisturbed)
E Plants of damp/wet environment
F Edible plants
G Medicinal and poisonous plants
H Commercial/industrial use
I Cultivated plants
*wgt soil g = weight of soil processed in grams

Fig 135 15-35 Copthall Avenue plant remains: Period IV, pit; channel/ditch; 'peat'

Species	Common name	Habitat	Contexts										
			Pits		Channel/Ditch					'Peat'			
			82	*213*	*124*	*131*	*69*	*70*	*74*	*81*	*94*	*99*	*119*	*118*
		*wgt soil g	1000	500	1000	250	1000	400	1000	1000	1000	1000	1300	1000
Chara sp	–	E		17	100	28								
Caltha palustris L	marsh marigold	CE								2				
Ranunculus acris/repens/bulbosus	buttercups	ABCDEG	16	6		5		2	23	35	20	22	8	28
Ranunculus sardous Crantz	hairy buttercup	ABE	6							10	10	2		
Ranunculus *cf* lingua	great spearwort	E												2
Ranunculus flammula L	lesser spearwort	EG	2						5	1	12			1
Ranunculus sceleratus L	celery-leaved crowfoot	E		127		28	320	52	2	10			221	556
Ranunculus *cf* sceleratus	celery-leaved crowfoot	E						11						
Ranunculus subgen Batrachium (DC)A	crowfoots	E		6							3			
Ranunculus *cf* subgen Batrachium	crowfoots	E		1										
Papaver *cf* rhoeas	field poppy	ABGH	1											
Papaver *cf* argemone	long prickly-headed poppy	A							1					
Papaver somniferum L	opium poppy	BGHI	1						4					
Papaver *cf* somniferum	opium poppy	BGHI						1						
Papaver sp	poppy	ABGHI	1						1					
Papaver spp	poppy	ABGHI						3						
Brassica spp	wild cabbage/turnip/mustard	ABI					2	3	2		7			
Raphanus raphanistrum L	wild radish/charlock	A								1				
Capsella bursa-pastoris (L) Medic	shepherd's purse	AB	1					1						
Rorippa nasturtium-aquaticum (L)Ha	watercress	IE					2							
cf Rorippa nasturtium-aquaticum	watercress	IE	1											
Rorippa *cf* microphylla	one-rowed watercress	E		7								17		
Rorippa islandica (Oeder) Borbas	marsh yellow-cress	E					1							
Reseda luteola L	weld-dyer's rocket	ABHI									3		2	1
Silene *cf* dioica	red campion	CD											1	
Silene *cf* alba	white campion	ABC										3		
Silene vulgaris (Moench) Garcke	bladder campion	ABDF									3			
Silene *cf* vulgaris	bladder campion	ABDF								1				
Silene sp	campion/catchfly	ABCDF					1		2					
cf Silene sp	campion/catchfly	ABCDF		1										
Lychnis flos-cuculi L	ragged robin	CDE	2						7	2				
Agrostemma githago L	corn cockle	A	4	1			1		1	6	9			4
cf Agrostemma githago	corn cockle	A										1		
Cerastium sp	mouse-ear chickweed	ABD								4				
Myosoton aquaticum (L) Moench	water chickweed	E			22	49								
cf Myosoton aquaticum	water chickweed	E							1				12	
Myosoton/Stellaria sp	chickweed/stitchwort	ABCDEG						2						
Stellaria media (L) Vill	chickweed	AB	4	3				31	1	5	1		4	
Stellaria *cf* media	chickweed	AB		1				1						
Stelloria graminea L	lesser stitchwort	CD	1								3	1		2
Stellaria graminea/palustris	stitchtwort	CDE							11	10				
Stellaria alsine Grimm	bog stitchwort	E												2
Stellaria *cf* alsine	bog stitchwort	E											2	
Stellaria sp	chickweed/stitchwort	ABCDEG						1			1		1	
Arenaria leptoclados (Rchb) Guss	lesser thyme-leaved sandwort	AB											1	
Spergula arvensis L	corn spurrey	AF								2				
cf Spergula arvensis	corn spurrey	AF							1					
Scleranthus annus L	annual knawel	AB								4				
Caryophyllaceae indet	–	–			8	3								

Fig 135 continued

Species	Common name	Habitat	Contexts											
			Pits		Channel/Ditch					'Peat'				
			82	*213*	*124*	*131*	*69*	*70*	*74*	*81*	*94*	*99*	*119*	*118*
		*wgt soil g	1000	500	1000	250	1000	400	1000	1000	1000	1000	1300	1000
Montia fontana ssp chondrosperma L	blinks	AE							1	2				1
Chenopodium *cf* bonus-henricus	all-good	BCDF									11			
Chenopodium album L	fat hen	ABFH		1					38	37		2		7
Chenopodium *cf* album	fat hen	ABFH		1	16			11						
Chenopodium album type	fat hen	ABFH	11			1	6							
Chenopodium murale L	nettle-leaved goosefoot	BD					1			6				
Chenopodium *cf* murale	nettle-leaved goosefoot	BD						1						
Chenopodium rubrum/glaucum	red/glaucous goosefoot	AB		86	16		4	20		52			1	
Chenopodium *cf* rubrum/glaucum	red/glaucous goosefoot	AB						5					1	
Chenopodium spp	goosefoot *etc*	ABFH	4					19	4			9		
Atriplex hastata/patula	orache	ABFGH	10	1	23						15	10	1	13
Atriplex *cf* hastata/patula	orache	ABFGH		1	2									
cf Atriplex hastata/patula	orache	ABFGH									6			
Atriplex spp	oraches	ABFGH		4		3	3		32	75		1	6	
cf Atriplex spp	oraches	ABFGH											3	
Chenopodiaceae indet	–	–		1		12	3	5						3
Linum usitatissimum L	cultivated flax	I	2							6	4	5		1
Rubus fruticosus agg	blackberry	CFGH		1							2			
Rubus *cf* fruticosus agg	blackberry	CFGH		1			2			1				
Potentilla *cf* erecta	tormentil	CDEGH								2				
Potentilla *cf* reptans	creeping cinquefoil	BC(D)									3			
Potentilla sp	cinquefoil/tormentil	BCDEFGH	1											
Fragaria vesca L	wild strawberry	CDF					1							
Aphanes arvensis agg	parsley piert	ABD	1											
Prunus sp	–	CFGI								1	1			
Pyrus/Malus sp	pear/apple	CFI									1			
Lythrum salicaria L	purple loosestrife	E							7					
cf Callitriche sp	–	E			4									
Torilis japonica/nodosa	hedge-parsley	ACD							2					
Torilis sp	hedge-parsley	ACD					1							
Conium maculatum L	hemlock	CEG					1	4				1	2	1
Bupleurum sp	–	ABCD									3			
Apium graveolens L	celery	EI		3			2							
Apium *cf* graveolens	celery	EI		2										
Apium nodiflorum (L) Lag	fool's watercress	E		2		10				11		163		
Apium *cf* nodiflorum	fool's watercress	E											1	
Oenanthe aquatica (L) Poir	fine-leaved water dropwort	E		9								61	73	530
Oenanthe *cf* aquatica	fine-leaved water dropwort	E				10								
cf Oenanthe aquatica	fine-leaved water dropwort	E		1										
Oenanthe aquatica/crocata	water dropwort	E					221			14				
Oenanthe spp	dropwort	DE											13	3
cf Oenanthe sp	dropwort	DE			18									
Aethusa cynapium L	fool's parsley	A							2	1				
Anethum graveolens	dill	BFI											9	
Foeniculum vulgare Mill	fennel	BDFIG		5										
Daucus carota L	wild carrot	ACDGI	2											
Umbelliferae indet	–	–	1					2				1		2
Umbelliferae/Compositae indet	–	–									1			
Polygonum aviculare L	knotgrass	ABG					3		5	7	4	4	1	7

Fig 135 continued

Species	Common name	Habitat	Contexts										
			Pits		Channel/Ditch					'Peat'			
			82	*213*	*124*	*131*	*69*	*70*	*74*	*81*	*94*	*99*	*119*	*118*
		*wgt soil g	1000	500	1000	250	1000	400	1000	1000	1000	1000	1300	1000
Polygonum persicaria L	persicaria	ABEH				13						4	14	
Polygonum lapathifolium L	pale persicaria	ABE								5	4			2
Polygonum *cf* hydropiper	water pepper	E									1		1	
Polygonum convolvulus L	black bindweed	ABF								1	1	1		
Rumex acetosella L	sheep's sorrel	AD	4					3	25	17	8	3		4
Rumex acetosa/crispus/obtusifolius	dock	ABCD	1	2		2	1		16	48	7	7	10	17
Rumex *cf* acetosa/crispus/obtusifolius	dock	ABCD												10
Rumex maritimus L	golden dock	EJ		3		19						47	80	
Rumex spp	docks	ABCDEFGI	4									8	1	3
Polygonaceae indet	–	–		1		2		2						
Urtica urens L	small nettle	AB		1				1		6				
cf Urtica urens	small nettle	AB									2			
Urtica dioica L	stinging nettle	BCDEFGH		8		1	1	2	3				2	1
cf Urtica dioica	stinging nettle	BCDEFGH	1											
Corylus avellana L	hazel	CF								1	1			7
Anagallis arvensis L	scarlet pimpernel	AG	1											1
Hyoscyamus niger L	henbane	BDG							1					
Solanum nigrum L	black nightshade	BF	1								1		1	
Mentha sp	mint	ABCEFGI		1										
Lycopus europaeus L	gipsy-wort	EH							1					1
Origanum vulgare L	marjoram	CD						1						
Prunella vulgaris L	self-heal	BCDG								8	3			2
cf Stachys sp	woundwort	ACEG								2				
cf Ballota nigra	black horehound	CG					1							
Labiatae indet	labiate	ABCFEFI						1	1	1				
Plantago major L	great plantain	ABC	4			28		12	2		6	10		2
cf Plantago major	great plantain	ABC		1										
Sambucus nigra L	elder	BCFGH		3				11	3	81	4	3		1
Valerianella sp	lamb's lettuce/corn salad	AC	1											
Bidens tripartita L	tripartite bur-marigold	E									3			1
Bidens sp	bur-marigold	E							1					
Senecio sp	ragwort	ABCDEG	1											
Anthemis cotula L	stinking mayweed	ABGH	25				1		6	58	141	33	1	88
Anthemis arvensis L	corn chamomile	ABGH	3											
Chrysanthemum segetum L	corn marigold	AH	1							14	11		1	5
Chrysanthemum sp	–	ABCD										1		
Cirsium arvense (L) Scop	creeping thistle	AB									1			
Cirsium sp	thistle	ABCDEFG								2		7		
cf Carduus/Cirsium	thistles	ABDEG									1			
Centaurea cyanus L	cornflower	ABGH									12	1		
Centaurea *cf* cyanus	cornflower	ABGH								7				
Centaurea sp	knapweed/thistle	ABDGH	1							8				2
cf Centaurea sp	knapweed/thistle	ABDGH									3			
Lapsana communis L	nipplewort	BCF	1							7		1		
Hypochoeris radicata L	cat's ear	CD	2											
Leontodon autumnalis L	autumnal hawkbit	BD										1		
Leontodon *cf* autumnalis	autumnal hawkbit	BD								8				
Leontodon sp	hawkbit	BDF	2											1
cf Picris echioides L	bristly ox-tongue	BC								2				

Fig 135 continued

Species	Common name	Habitat	Contexts											
			Pits		Channel/Ditch					'Peat'				
			82	*213*	*124*	*131*	*69*	*70*	*74*	*81*	*94*	*99*	*119*	*118*
		*wgt soil g	1000	500										
Sonchus oleraceus L	milk-/sow-thistle	AB	1							1				
Sonchus *cf* oleraceus	milk-/sow-thistle	AB												1
Sonchus asper (L) Hill	spiny milk-/sow-thistle	AB	1			1	1			4	1	1	3	18
Alisma plantago-aquatica L	water-plantain	EG				267								
Alisma sp	water-plantain	E		2	688							35	192	21
Alismataceae indet	–	E					113							
Juncus spp	rush	DE	12	13	73	248	450	168	532	36	81	1	23	85
Lemna spp	duckweed	E		24	28	118							2	
Typha sp	bulrush/reedmace	E						1			1			
cf Typha sp	bulrush/reedmace	E						1						
Eleocharis palustris/uniglumis	spike-rush	E	16	2			2	3	15	69	9	19	3	20
Eleocharis sp	spike-rush	E									22			
Schoenoplectus lacustris (L) Palla	bulrush	E						1	3	5				
Carex spp	sedges	CDEH	2	21	41	10	13	4	21	10	7	29	12	1
Glyceria sp	flote/reed grass	EH	1											
cf Glyceria sp	flote/reed grass	EH												10
Gramineae indet	–	ABCDEHIF	56	4		18		52	133	20	55	4	23	26
Indeterminate	–	–	2			3		2	6		3		6	
Charred remains														
Cereals:														
Triticum aestivo/compactum	club wheat	IF									1			
Hordeum/Secale/Triticum sp	barley/rye/wheat	FI									1			
Avena sp	oat	AI									1			
Other plants:														
Viola sp	violet	ABCDG											1	
Urtica dioica L	stinging nettle	BCDEFGH						1						
Bromus sp	brome	ABD						1						
Avena/Bromus sp	oat/brome grass	ABCDFI						1						

Key to habitat codes:
A Weeds of cultivated land
B Ruderals. Weeds of waste places and disturbed ground
C Plants of woods, scrub, hedgerows
D Open environment (fairly undisturbed)
E Plants of damp/wet environment
F Edible plants
G Medicinal and poisonous plants
H Commercial/industrial use
I Cultivated plants
*wgt soil g = weight of soil processed in grams

Fig 136 Summary table of environmental samples. Phasing, context and preserved material

Period	Context	Feature	Pollen	Macroplant remains	Insects	Molluscs	Ostracods	Parasites
Prehistoric	*709*	natural	–	+	+	+	+	–
	710	natural	–	+	–	–	+	–
	712	natural	–	+	+	+	–	–
	719	natural	–	+	+	+	+	–
	723	natural	–	+	+	–	–	–
	726	natural	–	+	–	–	–	–
	727	natural	–	+	–	–	–	–
	730	natural	–	+	–	–	–	–
Period I	*306*	turf	–	+	–	–	–	–
	350	turf	–	+	–	–	–	–
	547	channel	–	+	–	–	–	–
	562	channel	–	+	+	–	–	–
	563	channel	–	+	–	–	–	–
	564	channel	–	+	+	+	–	–
	583	channel	–	+	+	–	–	–
	588	channel	–	+	+	–	–	–
	589	channel	+	+	+	–	–	–
	591	channel	+	+	+	–	–	–
	593	channel	–	+	+	–	–	–
	601	channel	+	+	+	–	–	–
	604	ditch	–	+	+	–	–	+
	642	ditch	–	+	–	+	–	–
	646	ditch	–	+	–	–	–	–
Period II	*181*	pit	–	+	–	–	–	–
	184	drain	–	+	+	–	–	–
	191	floor	–	+	–	–	–	–
	214	floor	–	–	+	–	–	+
	215	hearth	–	+	–	–	–	–
	222	hearth	–	+	–	–	–	–
	225	hearth	–	+	–	–	–	–
	226	pit	–	+	–	–	–	–
	255	hearth	–	+	–	–	–	–
	257	hearth	–	+	–	–	–	+
	258	hearth	–	+	–	–	–	–
	338	floor	–	+	–	–	–	–
	340	hearth	–	+	–	–	–	–
	344	hearth	–	+	–	–	–	–
	355	hearth	–	+	–	–	–	–
	363	pit	–	+	–	–	–	–
	367	pit	–	+	+	–	–	–
	382	pit	–	–	+	–	–	–
	388	hearth	–	+	–	–	–	–
	433	floor	–	+	–	–	–	–
	477	pit	–	+	–	–	–	–
	518	dump	–	+	–	–	–	–
	523	dump	+	+	+	–	–	–
	535	dump	+	–	–	–	–	–
	544	pit	–	+	–	–	–	–
Period III	*110*	pit	–	+	+	–	–	–
	133	ditch	–	+	+	–	–	–
	134	ditch	–	+	+	–	–	+
	138	ditch	–	+	–	–	–	–
	140	ditch	–	+	–	–	–	–
	144	ditch	–	+	+	+	–	–
	146	ditch	–	+	+	+	–	–
	147	ditch	–	+	–	–	–	–
	172	pit	–	+	+	–	–	–
Period IV	*64*	ditch	–	+	–	–	–	–
	69	'peat'/marsh	–	+	+	–	–	–
	70	'peat'/marsh	–	+	+	–	–	–
	74	'peat'/marsh	–	+	+	+	+	+
	81	'peat'/marsh	–	+	–	–	–	–
	82	pit	–	+	–	–	–	–
	94	'peat'/marsh	–	+	–	–		–
	99	'peat'/marsh	–	+	+	–	–	–
	118	ditch	–	+	+	+	+	–
	119	ditch	–	+	+	+	+	+
	124	ditch	–	+	–	+	+	–
	131	ditch	–	+	–	+	+	–
	213	pit	–	+	–	–	–	–

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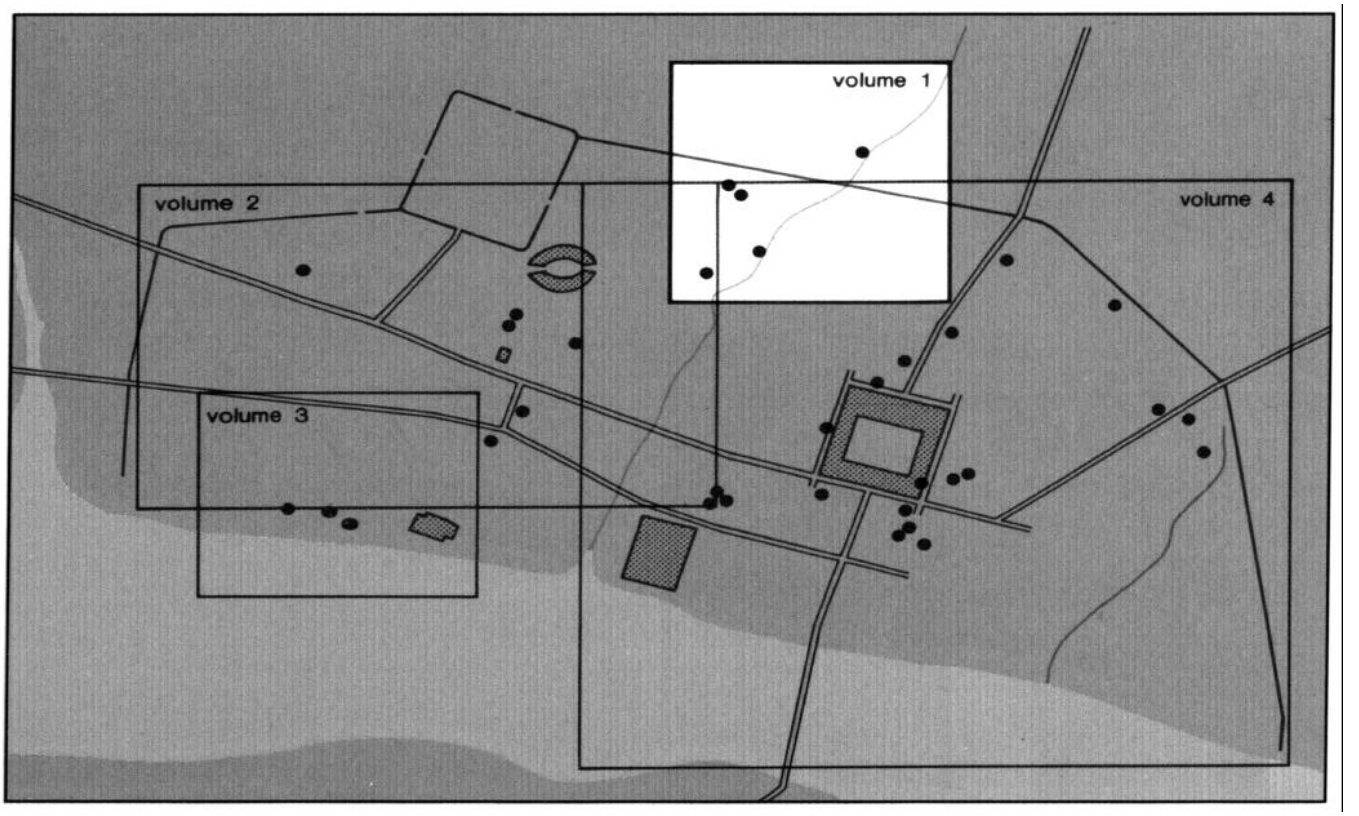

The archaeology of Roman London: map showing the individual sites discussed in each report, within their broader study areas. The sites and area covered by the present volume is shown in green.

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