

# RECENT ARCHAEOLOGICAL WORK AT THE TOWER OF LONDON

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## SUMMARY

*The Historic Royal Palaces Agency (HRPA) appointed the Oxford Archaeological Unit (OAU) as term archaeology consultants in 1993 for a five-year period. The two organisations have worked together since on several projects of various sizes at the Tower of London. This report summarises the results of several related projects completed by the end of 1995. The principal discoveries comprised: a section of the Roman city wall incorporated as a foundation to the Bowyer Tower; fragments of several medieval storehouses and one wall of the late medieval Wardrobe building, also various post-medieval structures. The most important post-medieval structure was undoubtedly the Grand Storehouse. This once-imposing building was gutted by fire in 1841, and was subsequently demolished to make way for the Waterloo Barracks which now house the Crown Jewels. Much of the post-medieval masonry survives just below the surface, however, and was exposed in several places. Other projects which are still in progress will be described in future reports.*

## INTRODUCTION

### A brief history of the Tower

The historical background to the Tower of London has been summarised admirably in recent years (see especially Charlton 1978; Allen Brown & Curnow 1984; Parnell 1993), and there is little point in rehearsing that history in any detail in this brief report. The most salient facts, however, do require restatement. The Tower lies on the N bank of the river Thames, in the SE angle of the Roman urban and riverside defensive walls of *Londinium*. The marshy riverside area later occupied by the Inmost Ward of the Tower had been reclaimed by the end of the 1st century

AD, and excavations have revealed the presence of at least one substantial masonry building under the White Tower. The defences were first built in c.AD 200, and were remodelled in the late 4th century (Parnell 1993, 12–16).

Medieval construction at the Tower started very soon after the Norman Conquest. The White Tower is traditionally ascribed to 1078; the *Textus Roffensis* certainly suggests that it was being built in 1077 (Allen Brown & Curnow 1984, 9). The White Tower lay in the SE angle of the Roman defences, and the initial Norman work comprised a ditched enclosure corresponding to the Inmost Ward. Expansion took place during the 13th century under Richard I and Henry III, with a two-phase enlargement of the defended area (Inner Ward). Edward I added the Outer Ward in the late 13th century, while the Wharf was built during the 14th century (Allen Brown & Curnow 1984, 12–31; Parnell 1993, 17–40). Thereafter the three wards (Inmost, Inner and Outer) had a long and complex structural history. Various buildings were built, rebuilt and demolished over the centuries, and the configuration of the site varied considerably during the medieval and post-medieval periods. Much of the site suffered extensive damage during Victorian redevelopment and refurbishment (Parnell 1993, 90–108), while several buildings took direct hits from bombs during the Second World War (Parnell 1993, 114–7).

### Archaeology at the Tower

The historical significance of the Tower of London is reflected in the extent of archaeological investigation at the site. It has been studied as a

historic monument since the 18th century at least, and major advances in understanding the site occurred in the 19th century. Much of this work involved the examination of the standing buildings in the Tower, including some which have since been demolished. Advances in the archaeology of the Tower have mostly been made in the 20th century, especially in the last 50 years (see Parnell 1993). Much of the work has been on a small scale, but several substantial excavations have also been undertaken (see especially Parnell 1982 and 1985).

### **The Historic Royal Palaces Agency**

The HRP was established in 1989 to manage the Tower of London, Hampton Court, Kensington and Kew Palaces (the latter with Queen Charlotte's Cottage), and the Banqueting House Whitehall. HRP therefore has the responsibility of care for some of England's most important historical and archaeological sites. The Tower of London is a World Heritage Site and a Scheduled Ancient Monument (Greater London No 10). The Historic Royal Palaces are covered by Crown exemption, however, and applications for works are therefore treated as non-statutory applications for Scheduled Monument Clearance, rather than the more familiar Consent. Since 1993 OAU has been involved in excavation, watching brief and building survey projects for HRP at Kensington and Hampton Court Palaces and the Tower.

## **THE PROJECTS**

### **Reasons and methods**

Several of OAU's projects at the Tower during 1993–5 comprised watching briefs and small excavations associated with the new Crown Jewels display and the related programme of upgrading the Tower's electricity supply. The existing electrical cables were becoming increasingly unreliable and in some cases dangerous, while the power requirement of the new Crown Jewels display was equal to the total existing supply for the entire site. Work had already taken place on laying new cables across the moat and into the buildings of the Outer Ward before OAU began working for HRP. OAU's work therefore covered the cabling in the Inner and Inmost Wards (Figs 1 and 2).

The first project (June–July 1993) involved several small excavations and a watching brief on cabling work behind (north) of the Waterloo Barracks which houses the Crown Jewels display. Further small excavations and an intensive watching brief were carried out from December 1993 to August 1994 on the extension of this cabling to provide a continuous loop or ring around the Inner Ward, extending into Water Lane. HRP asked OAU to be involved in the design of the latter cable route (the Inner Ring Main) from an early stage so that the predictable impact of excavation on archaeological levels could be minimised, and a desk-top study of past archaeological work in the Inner and Inmost Wards formed an important part of this process (OAU 1993). An equivalent desk-based study was undertaken in July 1995 when proposals were put forward to renew the White Tower's electrical supply by laying new cables to connect with the Inner Ring Main. A watching brief on this trench took place during October 1995 (OAU 1995).

The cable trenches were planned to follow existing service runs and other recently disturbed ground as far as possible, making use of a Property Services Agency survey of services and other technical and engineering data (see Pl 1). In some areas an initial surface strip of 1.6m width was made so that deposits lying immediately below the modern tarmac *etc* could be assessed for the best route (*ie* that which provided the least or no disturbance to *in situ* pre-Victorian stratigraphy). The small area excavations were also used to guide the cable excavations past likely pinch-points. The cable trench itself was 0.8m wide and typically 0.8m deep.

Other projects relating to the Crown Jewels display comprised a series of watching briefs on minor works such as the digging of pits for railing posts. These generally had little impact on significant archaeology, but a few pits did reveal important deposits and features; this proved the value of an intensive watching brief even on apparently low-risk work. OAU was also asked to maintain a watching brief during construction work on the approach to Tower Pier. This work was commissioned by Alan Baxter & Associates, not HRP, but it is included here because Tower structures were revealed.

### **Projects and codes**

HRP already operated a coding system for collections management and other purposes. This

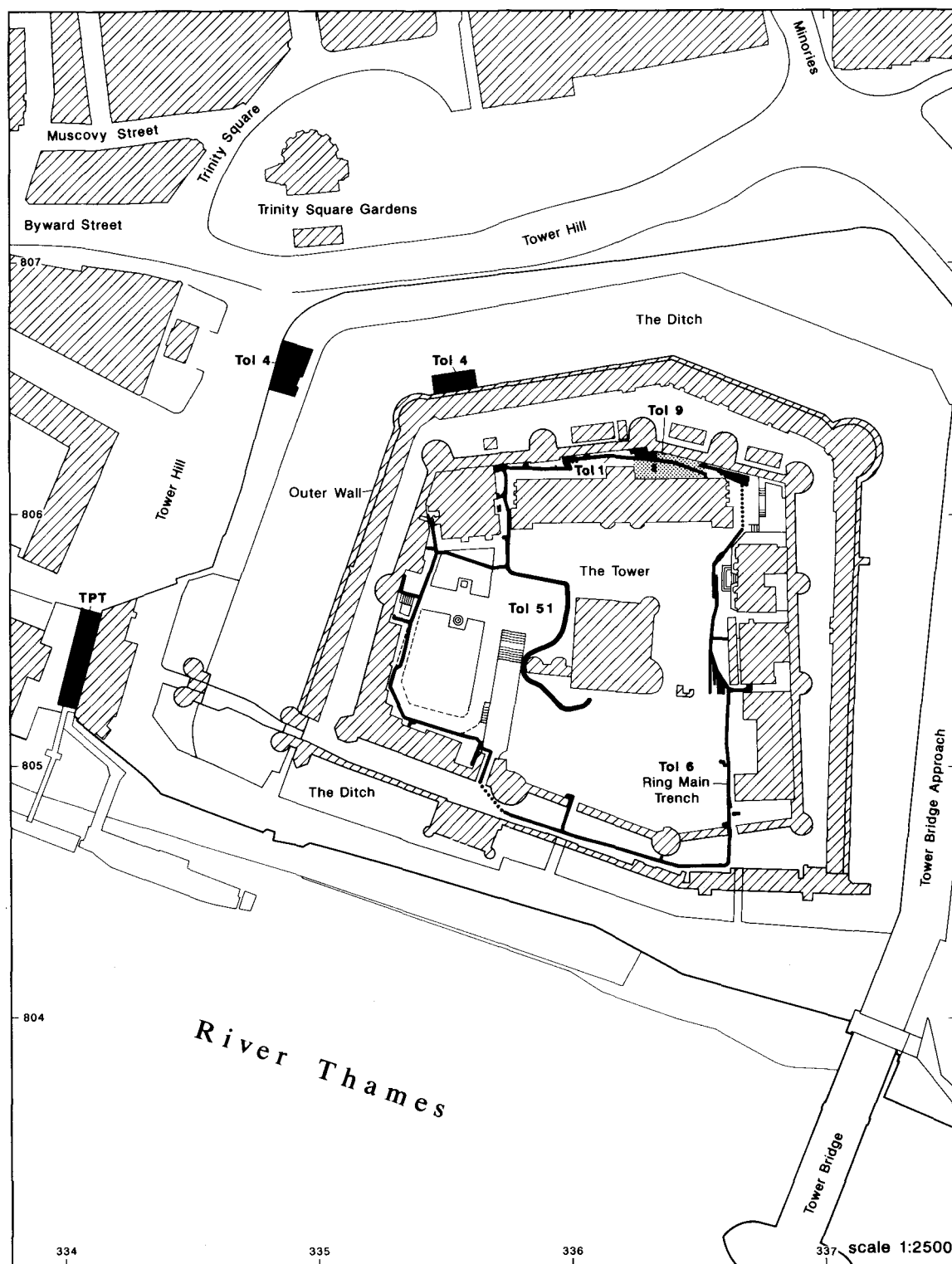


Fig 1. Tower of London: location of the excavations; TOL is the prefix of the site codes assigned by the Historic Royal Palaces Agency; the code TPT was issued by the Museum of London

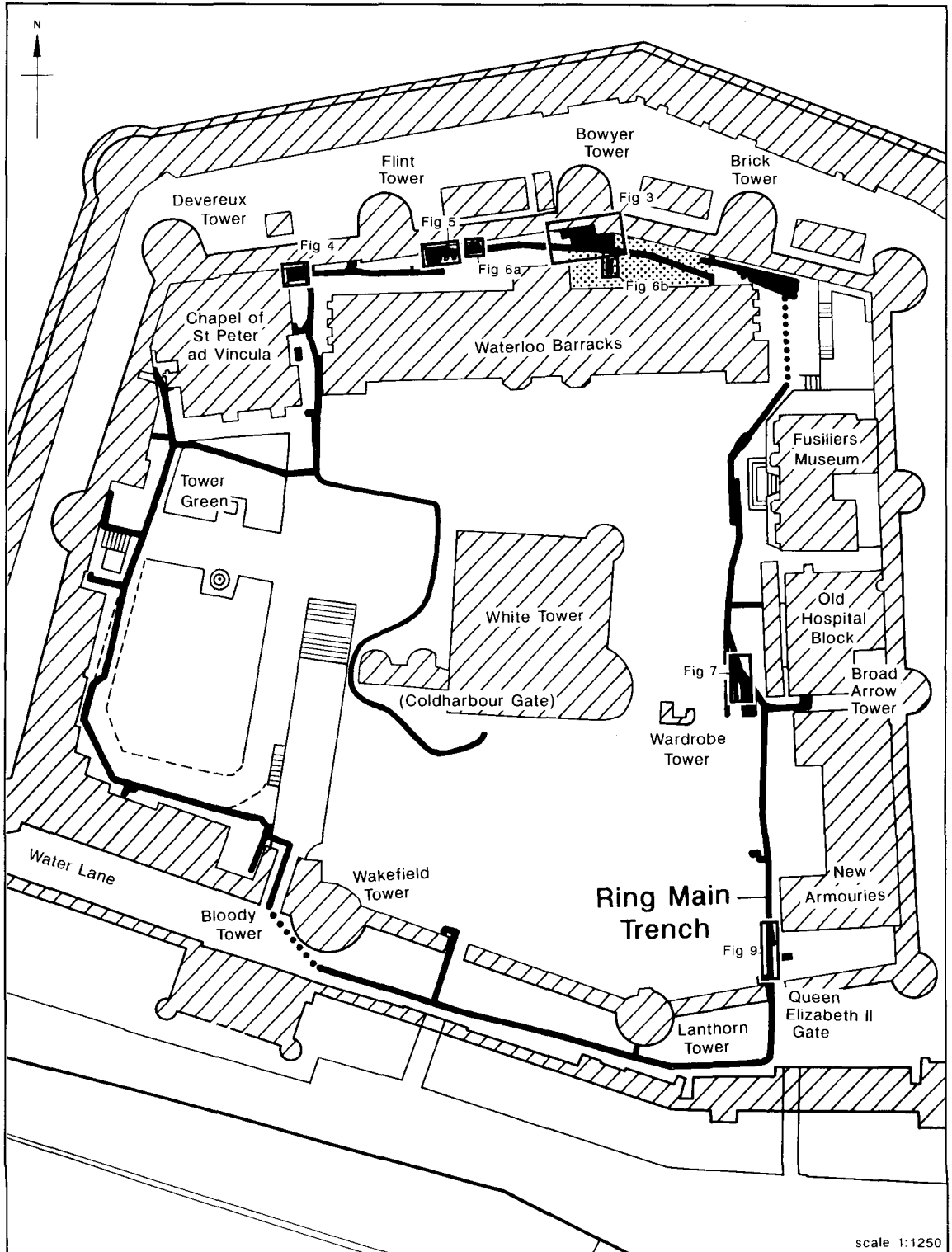


Fig 2. Tower of London: detailed location of the Crown Jewels Project, Inner Ring Main and White Tower cabling excavations



Plate 1. Tower of London: modern services exposed during the TOL 6 watching brief, with the White Tower behind

uses a three-letter code based on the site name, so that the Tower of London code is TOL. HRP A issues instructions and work orders to OAU using this code and a numerical suffix so that every project has a unique identification code. The work behind the Waterloo Barracks, for instance, has the code TOL 1 while the Inner Ring Main project is TOL 6. The work at Tower Pier Approach fell outside the HRP A contract and was assigned a Museum of London code, TPT 94. Individual project codes are noted in the following text as relevant. Every project has an archive, currently (January 1996) stored at the OAU's Oxford offices but to be deposited with HRP A at the Tower of London in late 1996 or 1997. Each archive contains all the primary documentation, including project designs and site records, as well as post-fieldwork documentation as appropriate. The final report is also included, and full data for the projects described here are therefore in the archives.

Some of the projects undertaken by OAU so

far are either ongoing (and will therefore be reported on at a later date; this applies to work in the moat and on 4–5 Tower Green), or are too minor to deserve more than a passing mention. A watching brief (TOL 2) on the Wharf, for instance, revealed modern make-up below the existing cobble sets. An evaluation (TOL 4) of the gardens on the NW side of the Tower moat in advance of building an underground gas meter chamber only found evidence for thick layers of fill, a finding confirmed by a subsequent watching brief. Recording work during insertion of a stair in the White Tower (TOL 5) revealed evidence for earlier timber floors. Further recording took place in the White Tower in 1995 (TOL 49), and during 1996 (TOL 60); consideration of the TOL 5 results has therefore been reserved until more data are available for interpretation. OAU has also been assisting HRP A in the establishment of an archaeological archive store at the Tower, and numerous TOL codes (TOL 18, TOL 20–48, and TOL 55–6) have been assigned retrospectively to projects undertaken at the site by various individuals and organisations from the 1950s to the early 1990s.

## TOWER PIER APPROACH (TPT, Fig 1 and Pls 2–3)

### Introduction

Tower Pier Approach consists of an alleyway leading on to the timber decking of the pier itself. A proposal to provide a canopy along the Approach necessitated stripping out the existing concrete surface and the excavation of 14 foundation pits for concrete stanchion bases (Pl 2). The site lies on the E side of the Tower Dock and W of the former Lion Tower. The latter had been protected by a brick-built Bulwark from c.1480. Parts of the Bulwark, which was swept away after the Great Fire of 1666, were recorded during excavations N of the Approach on Tower Hill West in 1985 (Hutchinson forthcoming).

### Results

The foundation pits were excavated mechanically during March and April 1994; half of the pits had already been excavated before OAU was



Plate 2. Tower of London: Tower Pier Approach seen from the N

asked to monitor the work, but records of the pits were made after excavation. Most pits were shallow (typically 0.5m deep) in line with the original design, but several had to be dug to considerable depth because of soft, unconsolidated ground which would not bear the weight of the structure. These patches of soft ground represented infill layers within below-ground structures. At least one of these appeared to be a cellar, perhaps associated with the Ram's Head inn shown on Haiward and Gascoyne's *Survey of the Tower and its Liberties* of 1597 (see Parnell 1993, fig 36). A brick wall noted in most of the pits along the west side of the Approach represented the E side of the Tower Dock; the wall continued below the maximum excavated depth of 1.8m below the stripped surface and had rubble packed against it. Two offsets were present, the first (0.23m wide) 0.8m down from the surface and the second (0.18m wide) 1.4m down (*ie* 0.6m below the first offset).

The most important structure was found in the northernmost pit on the E side of the Approach, where loose soil in the E face of the pit fell away to expose brick masonry (contexts [18],[22]) lying obliquely to the N-S axis of the pit and the E boundary wall of the Approach (Pl 3). At least 14 courses of soft, dark reddish orange bricks were present, bonded with pale grey to buff, fairly hard sand/lime mortar. The bricks were laid in a simple but irregular stretcher pattern. The most notable features of the wall were a probable return to the E at its S end and an opening at its N end. As with the dock wall, the masonry continued beyond the maximum depth (2m) of excavation.

### Discussion

Interpretation of structure [18/22] is difficult because of the very limited exposure. The 1985

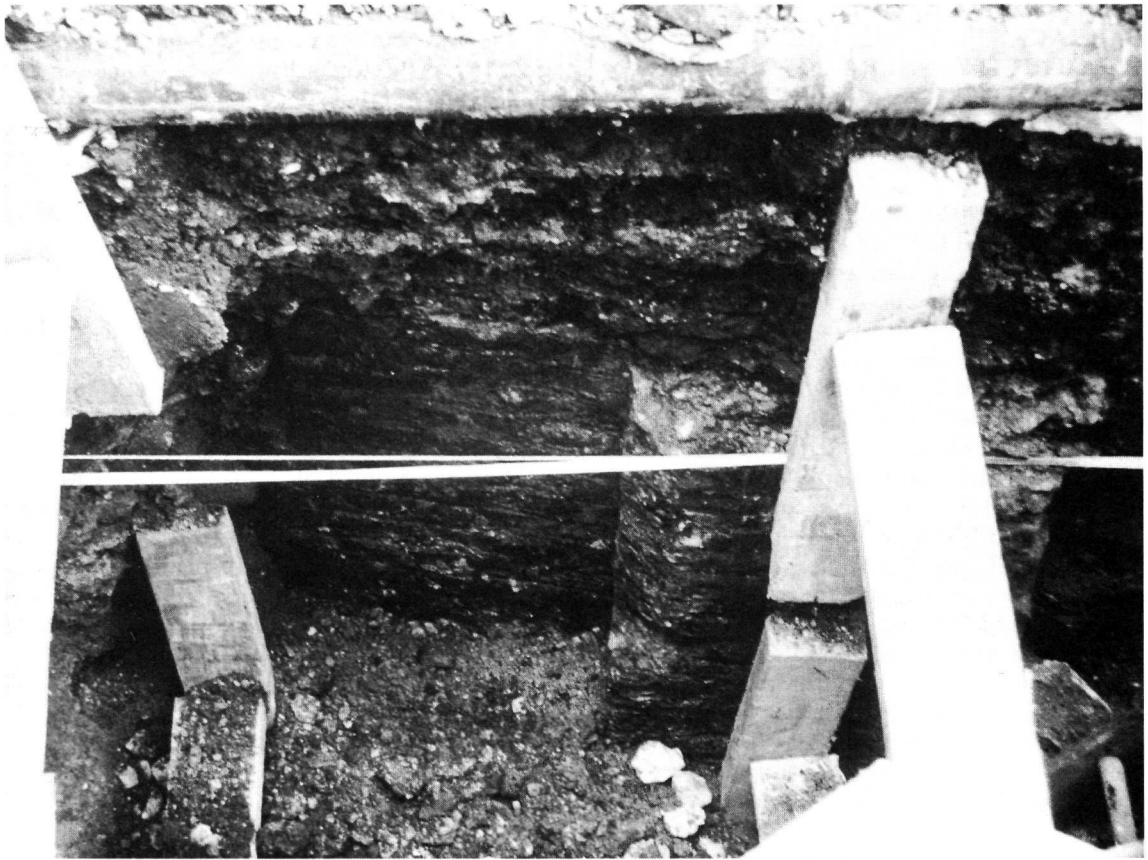


Plate 3. *Tower of London: Tower Pier Approach, detail of masonry [18/22]*

excavations on Tower Hill West revealed what appeared to be bastions at the N end of the Bulwark, parallel walls representing its W defences, and cellared structures built against the W wall (Hutchinson forthcoming). The masonry survived in good condition immediately below the modern make-up. The W wall was exposed in two places, approximately 14m apart. The alignment provided by these exposures joins up with the N end of the Tower Dock's E side. This means that [18/22] could not be part of the defensive wall as such, unless there was a drastic change of alignment immediately N of the Approach which seems unlikely, especially given the orientation of [18/22].

There is little doubt that the wall found in 1994 is at least broadly contemporary with the Bulwark. The bricks certainly appear to be of the same type. It is conceivable that the masonry is equivalent to the cellared buildings against the west wall recorded in 1985. The opening in the

wall, and the apparent return (door jamb?) may be significant in this respect. It must be admitted, however, that the alignment of the walls appears to be incorrect. If the W defence did join with the E side of the dock, cellared buildings within the Approach should perhaps be aligned parallel to the dock. Wall [18/22], however, is some 12° askew. Poor laying-out of the building during construction could explain this, but alternatively [18/22] could be associated with the moat around the W side of the Lion Tower. This was built in the late 13th century during the expansion of the Tower which saw the construction of the Outer Ward and moat. The Lion Tower had its own stone-lined moat to the W (Parnell 1993, 40–1). Wall [18/22] lies approximately 2.5m behind the presumed face of the Lion Tower moat. It seems unlikely that the wall forms the rear face of the moat lining, but it could belong to a (cellared?) building cut back into the infill between the moat and Tower Dock.

## THE CROWN JEWELS/WATERLOO BARRACKS PROJECT, THE ELECTRICITY INNER RING MAIN AND THE WHITE TOWER CABLE (Fig 2)

### Introduction

OAU excavated four small areas (1–4; see also Figs 3, 5, 6a and 6b) behind (N of) the Waterloo Barracks (TOL 1), and a further ten (unnumbered) areas during the Inner Ring Main works (TOL 6). The smallest of these excavations was little more than 1m square, while the largest measured 10m × 4m. All four of the TOL 1 areas contained significant archaeology, but services and other truncation had removed the archaeology within the 0.8m depth of excavation in three of the TOL 6 areas (NE corner of Waterloo Barracks, E of Wardrobe Tower, and N of Queen Elizabeth II Gate). Excavation was also undertaken as necessary during the watching briefs on the cable trenches and associated minor works (TOL 1, 6 and 51; and TOL 9, 11 and 12 respectively) to ensure that the digging did not damage any significant deposits, structures or features. Contexts were assigned in blocks of numbers from a continuous sequence to avoid duplication across the related projects. Contexts [1–129] were used during the TOL 1 excavation, while [150–170] were assigned to the TOL 1 watching brief. Numbers [250–289, 293–330, 333–547, 600–676 and 700–807] were used during the TOL 6 excavations and watching brief. The remaining watching briefs used numbers [201–214] (TOL 9), [290–292 and 331–332] (TOL 12), and [1000–1072] (TOL 51). A series of letter codes was used to identify some 55 individual railing post-pits in TOL 11.

The limited exposures, especially in the trench but also in the small excavations, makes detailed interpretation of the results difficult and in several cases effectively impossible. Nevertheless an attempt has been made to place the various structures *etc* into their historical context, using primary and secondary historical, cartographic, pictorial and photographic sources for assistance. The descriptions below provide brief summaries of the main findings during these projects, followed by discussion of their context.

The extent of Victorian and modern truncation of archaeological deposits deserves some mention. Service runs of various kinds and associated manholes were found in extraordinary profusion, and about half of the 700 or so recorded contexts

were services. Some of these mains were recorded by the PSA, but more were not: these principally consisted of Victorian features, but some services had been inserted since the PSA survey was drawn up in the early 1980s. Regrettably these most recent services had truncated important structures in at least two places N of the Waterloo Barracks, and possibly also E of the Wardrobe Tower. There appears to have been no archaeological record of these works.

Many of the service trenches were relatively superficial (though some were very deep, and storm drains in particular lay well beyond the limit of excavations; their fills were obvious even so). Unfortunately so was some of the most significant archaeology. A time:depth trade-off cannot be assumed at a site like the Tower of London: Roman levels sometimes lie quite close to the surface (see below; also *cf* Parnell 1982, 101–5), and medieval to post-medieval structures also survive only at shallow depths, as was graphically demonstrated on several occasions during the watching briefs described here.

### Description: stratigraphy

#### *Roman wall (Fig 3)*

A N-S wall [107] was found under the Bowyer Tower (Pl 4) in Area 3. The wall consisted of three courses of ragstone above an offset triple string course in tile, projecting 0.06m. A further course of ragstone underlay the offset (Pl 5). The masonry was bonded with a fairly hard, very pale orange-brown mortar. The exposed masonry was up to 1.37m long and 0.72m high, continuing below the maximum depth of excavation. Only 0.4m was visible in width, as the Bowyer Tower stair turret had been built over the masonry on a slightly different alignment (see Fig 3). The S end of the wall [107] had been crudely truncated. The 13th-century Inner Curtain wall butted the W face of [107] with a carefully-built vertical joint.

#### *The Inner Curtain wall, Coldharbour Gate and late medieval storehouses*

The defensive circuits of the Tower have been refaced or rebuilt in several places. Much of this work occurred during the 19th century because of redevelopment (see Parnell 1980), dilapidation

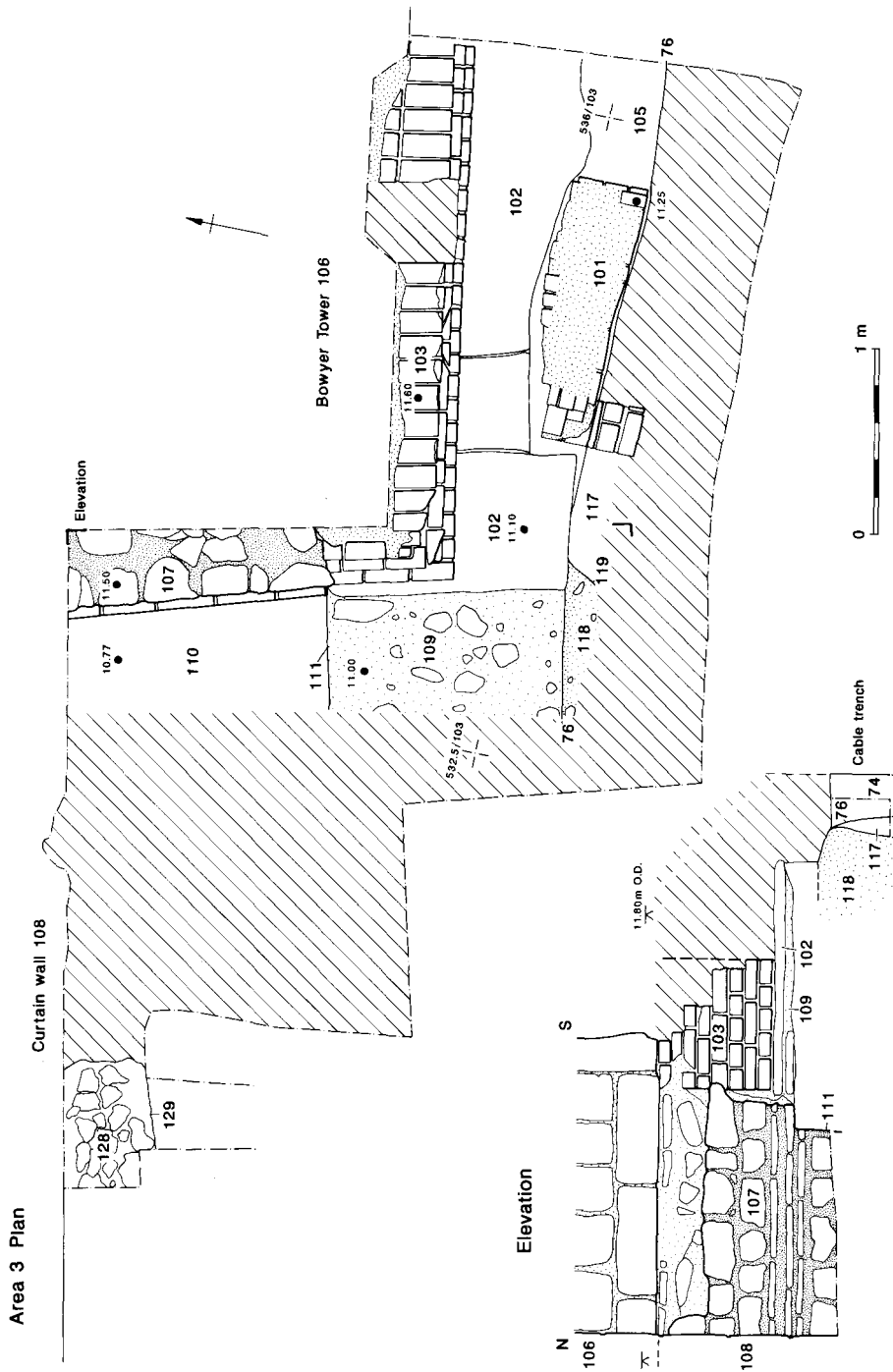


Fig 3. Tower of London: plan of Area 3, the Bowyer Tower, with elevation of the Roman wall (TOL 1)



*Plate 4. Tower of London: the Bowyer Tower area seen from the S during excavation (TOL 1 Area 3), with the Roman city wall under the stair turret and Grand Storehouse masonry and paving at front right*

or catastrophic damage (eg during the destruction of the Grand Storehouse by fire in 1841: see below). The original masonry of the Inner Curtain wall was found surviving below Victorian rebuilds in several places: E of the Brick Tower, W of the Flint Tower ([613], Fig 4), and possibly under the modern gateway E of the Wakefield Tower; the latter exposure may in fact have been the foundations of the Victorian rebuild, as the alignment did not conform to the known original line (Parnell 1980; 1985, 23–5). The Victorian masonry was always offset over the original build.

The medieval build of the Inner Curtain wall survives largely intact E of the Flint Tower. The wall was traced downwards to a maximum depth of 1.75m below the modern paving in exposures for a new manhole in Area 1, immediately E of the Flint Tower (Fig 5). The masonry was roughly coursed and quite crudely faced, with a variety of stone types (eg Kentish ragstone, sandstone, and flint) and tile used. A damaged uncoursed

layer of limestone [40] was found at a depth of 1.55m; it extended up to 0.32m from the wall face, but an intact S edge could not be identified because of later truncation.

The White Tower electricity cable trench (TOL 51) skirted the W side of Coldharbour Gate, exposing part of the buried courses of its W tower. A length of 2.55m of the masonry was uncovered, forming the E side of the trench. Three courses of limestone blocks were revealed, each offset from the one below, and the offsets were between 0.04m and 0.1m wide. The lowest projected 0.22m from the face of the tower. The stonework comprised very closely set courses of large and medium-sized limestone blocks. No medieval soil horizons remained against the masonry because excavation of the previous electricity trench had truncated the archaeology here.

Several medieval walls were found abutting the Inner Curtain Wall in Areas 1 and 2: walls



Plate 5. Tower of London: detail of the Roman city wall under the Bowyer Tower stair turret, seen from the W

[7, 26, 27, 33 and 37] were in Area 1 (Fig 5 and Pl 6), and wall [113] was in Area 2 (Fig 6a). None of the walls had consistently coursed masonry, but they did have carefully dressed, flat faces where these survived. Structures [27 and 33] (and possibly [113]) butted against and were built approximately at right-angles to the Inner Curtain wall. Structure [27] contained an even mixture of chalk blocks and Reigate sandstone with a bonding matrix of fairly crumbly pale creamy-brown mortar incorporating c.20% crushed chalk. The structure was traced for 1.2m to the S, but excavation could not continue beyond this because of live services. The S end had been truncated but not completely removed by a Victorian or later service trench. The maximum height was 1.4m, and the width was up to 0.48m. The W face had been mostly robbed out, but a few facing stones did survive *in situ*.

Structure [33] lay 2.1m to the W of and slightly out of parallel with [27], and was built of chalk (80%) and limestone (18%) with occasional flint and brick/tile fragments. The masonry was bonded with a very hard, pale creamy-brown

mortar. A length of 1.5m was exposed within the available area; the S end of the structure was truncated by the same service which cut [27]. The E face of [33] was vertical in its upper part, but bulged out slightly in its lower levels; this gives the impression of an offset in Figure 5. The W face was completely robbed away, but the minimum width was 0.6m. The structure survived to a height of 1.4m. Structure [33] overlay the stonework [40] associated with the Inner Curtain wall.

Both [27] and [33] were abutted by other masonry features. The former was abutted by a chalk (75%) and limestone (20%) structure [26] with occasional inclusions of flint and brick/tile. The bonding matrix was a fairly hard, light orange sandy mortar. The structure had been truncated along its S face, and its E limit lay beyond the edge of Area 1. The original dimensions, therefore, could not be determined, but the visible portion was 1.5m long (E-W), 0.7m wide, and 0.56m high.

Structure [7] abutted [33], and was bonded with a chalk surface [37] which abutted wall [27]. The surface lay at a depth of 1.7m below

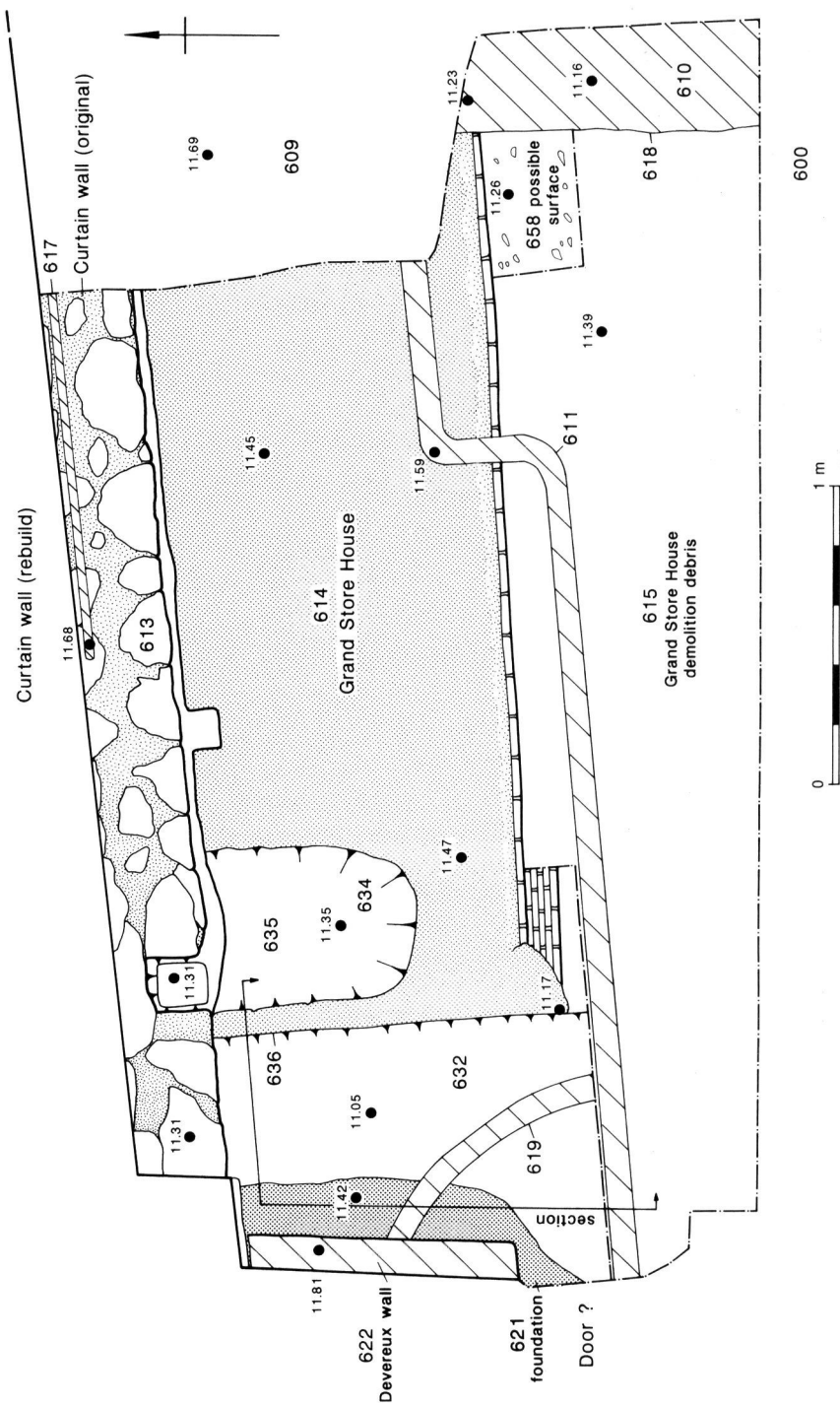


Fig 4. Tower of London: plan W of the Flint Tower (TOL 6)



Fig 5. Tower of London: plan of Area 1, E of the Flint Tower (TOL 1)



Plate 6. Tower of London: the medieval walls exposed in TOL 1 Area 1 seen from the W; note the modern service trenches cutting the masonry

the modern paving. Structure [7] consisted of a large rectangular area of masonry, virtually all of chalk blocks, with occasional use of limestone and inclusions of brick/tile. The bonding matrix was a fairly hard light orange sandy mortar. The structure was largely intact, except that a Victorian or later drain had cut away the upper part of the S face. The service trench which cut [27] and [33] ran along the S face of [7], but fortunately did not cut into it. The E face featured a 0.1m-wide offset approximately 0.35m down the surviving masonry. This was not carried around the S face. Maximum dimensions were 1.46m E-W (including the offset)  $\times$  0.84m  $\times$  1.4m.

Structure [113] (Fig. 6a), only seen in plan, had slightly irregular faces (although this may be the result of post-medieval activity—see structures [112] and [114], below). It projected at a right-angle for 1m from and abutted the Inner Curtain wall. The feature was virtually all of chalk, with

occasional use of flint, bonded with a hard pale yellow-brown mortar. The structure was up to 0.38m wide.

A number of medieval or possibly medieval deposits were noted during the TOL 1 and 6 excavations and watching briefs. These deposits were mostly seen in the sides of existing service runs followed by the cable trench, but they were occasionally revealed in plan during the excavations. The deposits were mostly layers, although one or two could have been feature fills. They were left unexcavated in most cases, and no significant artefact assemblages were recovered.

#### *The Wardrobe (Figs 7–8 and Pl 7)*

Excavation in the Wardrobe Tower area uncovered perhaps the most important archaeology on the Inner Ring Main route. Wall [382] was aligned E-W and consisted of coursed chalk, flint and limestone pieces bonded with a yellowish-brown sandy mortar. The S side was faced with bricks [389] bonded with a yellowish-brown sandy mortar including chalk flecks. The masonry survived to a height of 0.87m and was 1.16m wide. Wall [382] was set in a construction trench [414] which cut a clay layer to the N. Pottery from the fill [413] of the construction cut dates to the late medieval period and cross-joins with a sherd from a layer [412] abutting the S face of the wall. The construction trench cut through the fill of an (unexcavated) feature [416], fill [415] to the south, which in turn cut a deposit of mortar, [417]. Fortunately, and after considerable efforts by OAU and the contractor, an alternative trench route was found so that the masonry could be left *in situ*.

Deposits to either side of the wall differed considerably. A series of loam layers, superimposed on each other to the S, were placed or accumulated against the brick face. These layers contained late medieval and post-medieval pottery and probably represent garden soils or similar material. A possible construction layer of mortar [387] abutted the N face of [382] and was overlain by a thick layer of broken bricks [386], which in turn was sealed by layers of soil.

#### *Possible medieval building N of Queen Elizabeth II Gate (Fig 9)*

An E-W aligned masonry structure [450] was found 2.5m to the N of the Queen Elizabeth II

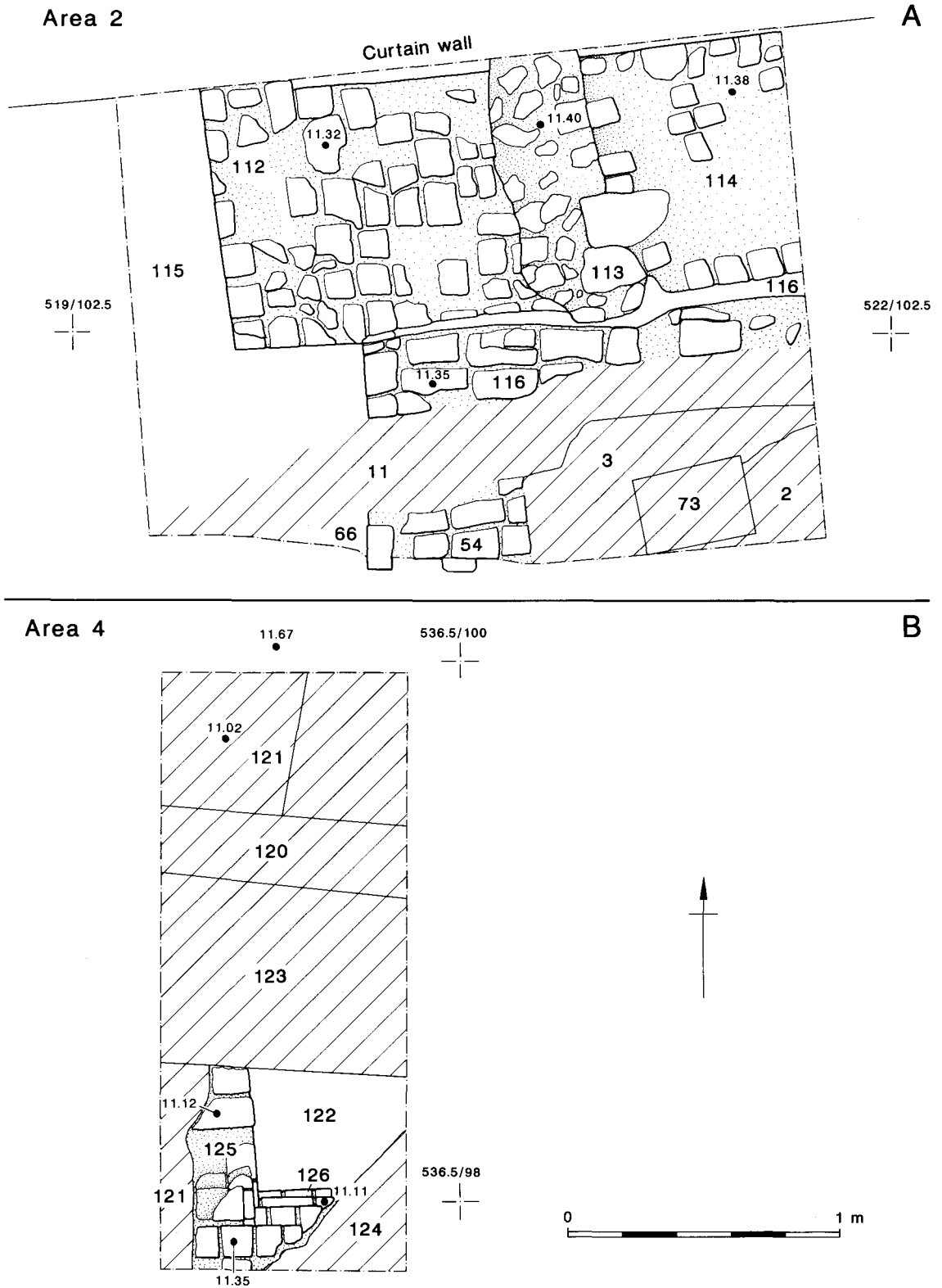


Fig 6. Tower of London: a) plan of Area 2 (TOL 1); b) plan of Area 4 (TOL 1)

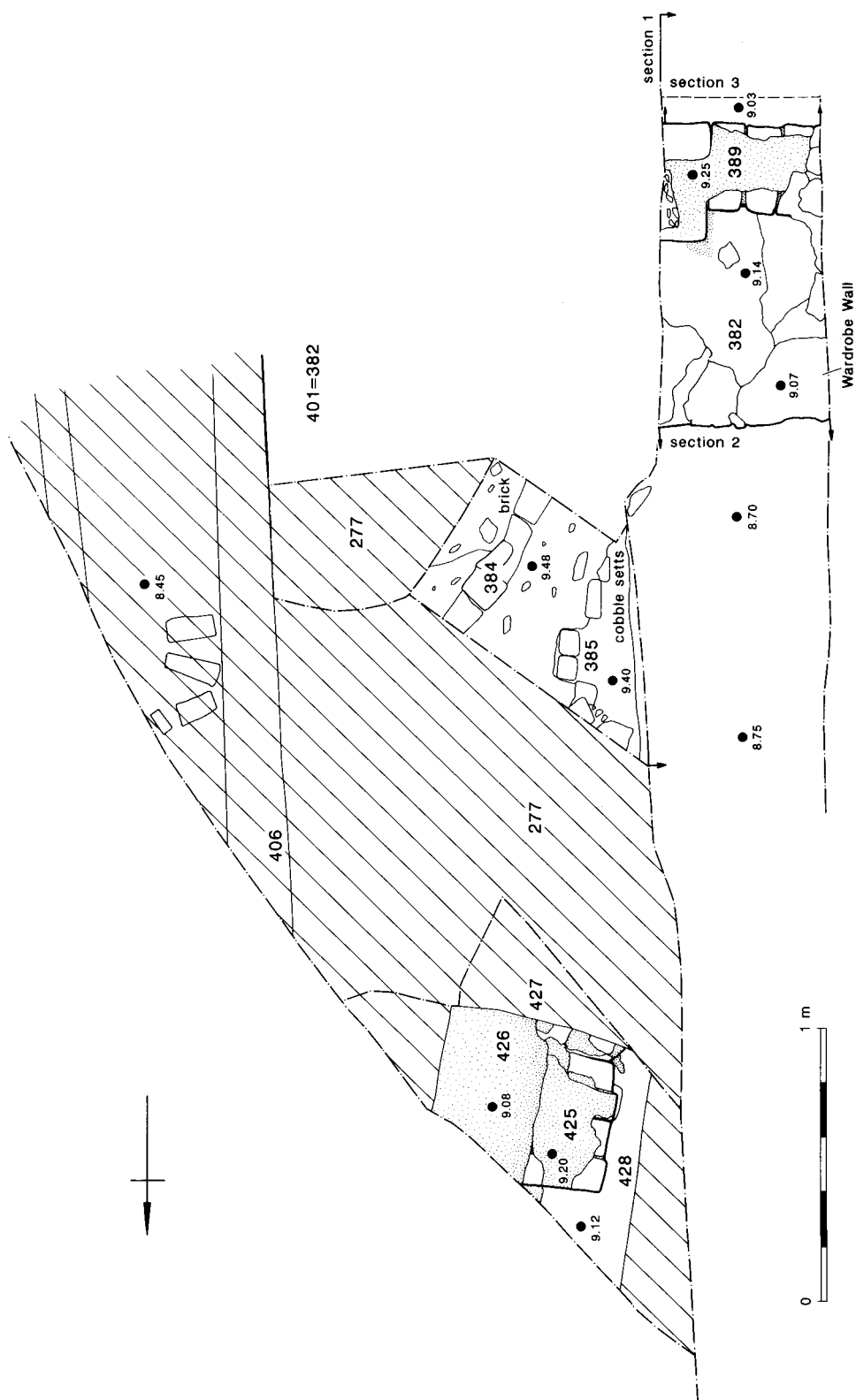


Fig 7. Tower of London: plan of the Wardrobe area (TOL 6)

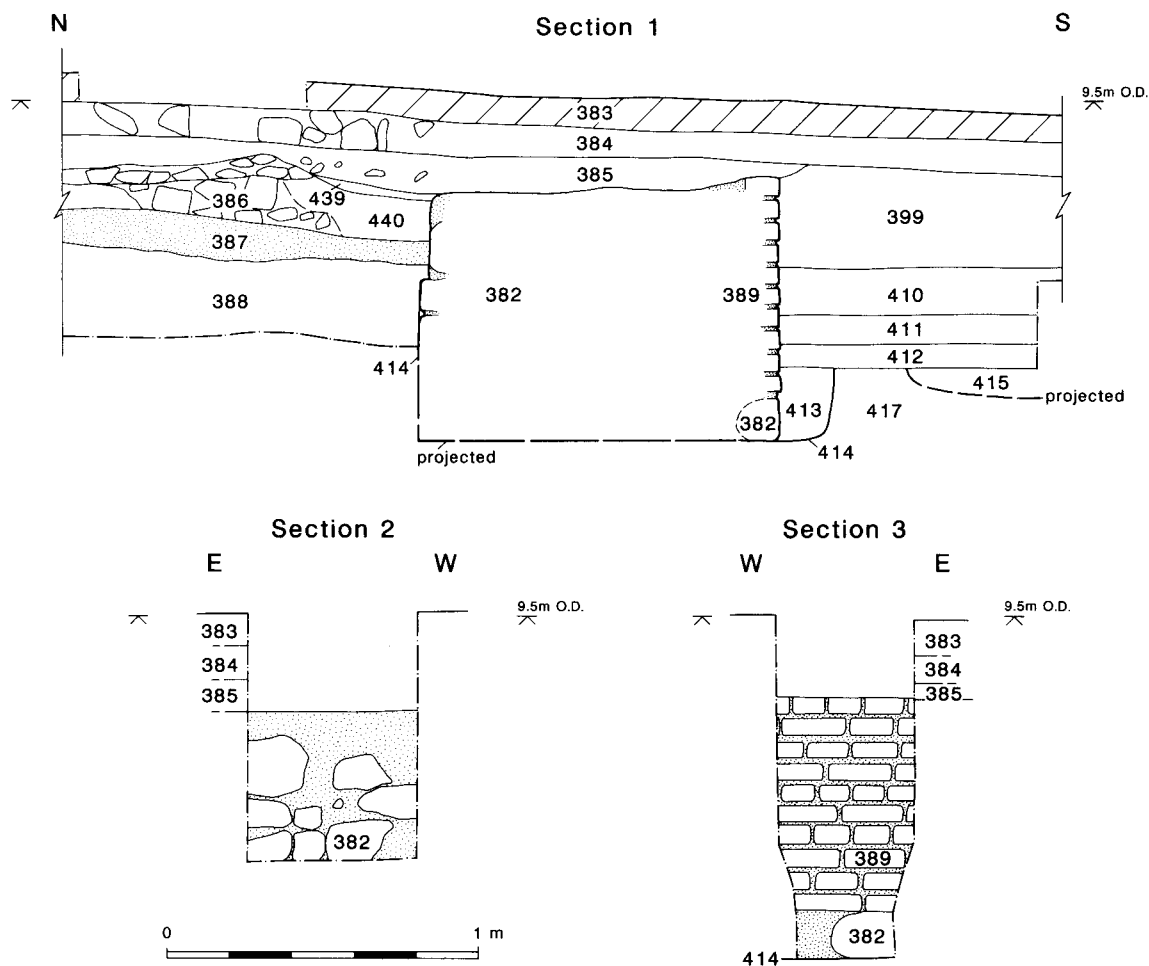


Fig 8. Tower of London: sections of the Wardrobe area (TOL 6)

gate. The masonry comprised limestone and sandstone blocks bonded with yellow-brown sandy mortar. A portion of stonework at least 1m wide lay *in situ*, but the true width could not be established owing to the presence of overlying pipes. A deposit of dark grey loam [448] abutted the north side of [450] and was overlaid by a portion of red brickwork [449]. Five courses bonded with white mortar were visible. The structure lay flat at the base of the trench, presumably where it had fallen after being demolished.

#### *The late 17th-century Grand Storehouse*

Several features associated with the Grand Storehouse were found. These included fragments

of the rear (N) wall and the rear stair turret. A small area of intact paving was also found. In all cases, however, the features had suffered extensive damage in the Victorian and modern periods.

Brickwork [54] was first exposed in the cable trench, and was subsequently recorded in plan in Area 2 as context [116] (see Fig 6a). The masonry had been truncated by a modern manhole and an electricity cable trench, so that only the W face and core survived. Brickwork [116] extended for 1.65m eastwards within Area 2, and appeared to continue beyond the E limit of excavation. The N face of [116] abutted a pair of brickwork features [112 and 114] which flanked the earlier chalk masonry [113] to its W and E respectively. Only the top course of these features was revealed. [112] measured 1.2m

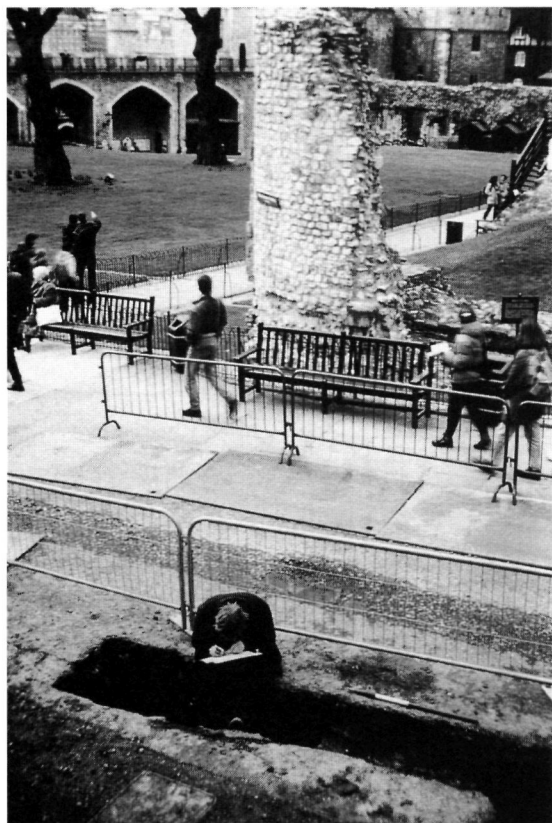


Plate 7. Tower of London: the Wardrobe wall seen from the E, with the Wardrobe Tower behind



Plate 8. Tower of London: Grand Storehouse walls [125 and 126] seen from the N in TOL 1 Area 4, showing the destructiveness of modern services

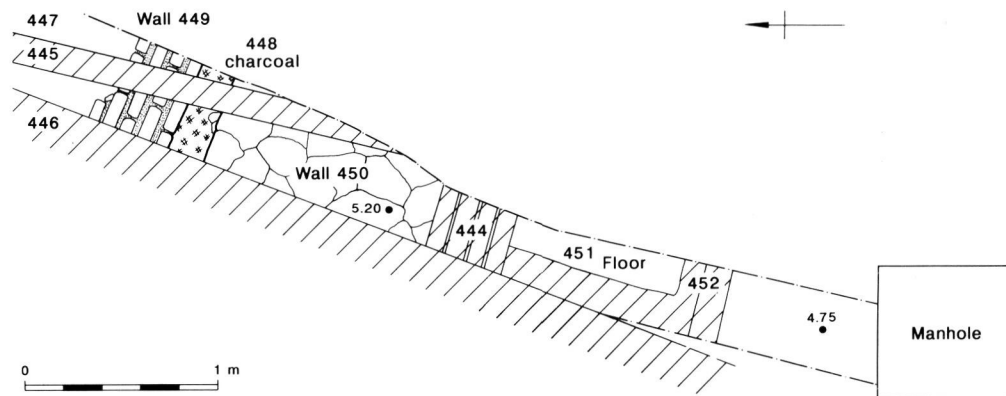


Fig 9. Tower of London: plan of possible medieval building N of the Queen Elizabeth Gate (TOL 6)

(E-W)  $\times$  1m; [114] was 0.9m long (N-S) and extended E beyond the edge of Area 2.

Brickwork features [101] (Fig 3), [55 and 125] (Fig 6b, Pl 8) were part of the same N-S structure. [101], at the N end, was 1.4m wide; three courses

at least of bricks stood above ground. The N edge of the feature had been damaged by a later service trench, but the bricks and pointing survived sufficiently to show that the edge was original rather than being the result of truncation.

The masonry had been cut to the S by a service trench which also cut away the N side of [55]. The latter consisted entirely of foundations in a wide trench [86]. Twelve courses of brick were present, apparently in English bond.

Structure [125], in Area 4 (Fig 6b), lay 2.8m S of the cable trench. Five courses were exposed in the E face of the area; the fourth and fifth courses from the bottom were offset. The core and N extension of the structure had been removed by later service trenches. Structure [125] abutted E-W structure [126]. Five courses were revealed, with offsets in the second, third, and fourth courses from the bottom; these offsets were more pronounced than in feature [125] (0.04m-0.06m compared to 0.02m). A later service had removed the E extension of the structure; the S face lay beyond the limit of excavation, but will also have been truncated by the service. Not enough survived of either wall to determine the bond type.

Structure [93] lay 19.6m E of [126]. The N face had been removed by, and the S face had been scoured but not destroyed by, later services. The wall was later observed during the TOL 1 and 9 watching briefs, where it survived immediately below the make-up for the existing tarmac level. Structure [203] was 8.40m long with the S face intact, and a maximum width of 0.7m and depth of 0.34m were observed (Pl 9). Structure [203] was constructed of red bricks, formed by alternate layers of headers and stretchers. The N face had been removed by a modern service trench and an E-W line of sandstone blocks, but the N face was recorded in a further exposure immediately to the W [170]. Extrapolation of the two faces shows that the N wall was approximately 1.4m wide.

The bonding material was lime mortar. This was usually fairly soft, although the mortar for structures [112 and 114] was hard. The colour was usually grey-white, although [114] had yellow-brown mortar.

Three stone paving slabs [102] survived around the N side of structure [101] (Fig 3, Pl 4). They underlay brickwork underpinning the Bowyer Tower and had therefore survived later robbing. The slabs were 0.07m thick, and lay on a layer of hard, greyish white mortar which could have been laid as a bedding, but it was compact enough to have acted as a floor in its own right. It appeared that the mortar had been laid against a solid structure, but only a layer of silty sand [110] was found to the N.

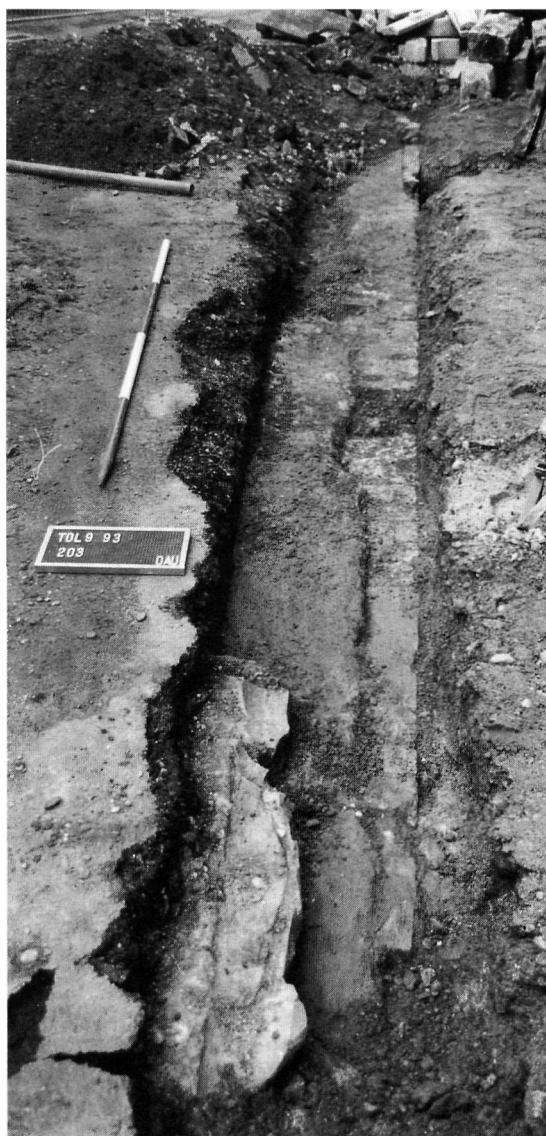


Plate 9. Tower of London: Grand Storehouse wall [203] revealed during the TOL 9 watching brief; seen from the W

Wall [614] was found in the angle between the Devereux Tower wall and the Inner Curtain wall, NW of the Waterloo Barracks (Fig 4). The wall was 1.05m wide and was traced to a depth of 0.54m. The purple-red hand-made unfrogged bricks were bonded with grey-white lime mortar. The brickwork extended E-W for 2.1m towards the Devereux Tower wall, and abutted the Curtain Wall (Pl 10). Seven courses were revealed, each one offset from the course below. The offsets were between 0.02m and 0.04m wide.



Plate 10. *Tower of London: Grand Storehouse wall [614] (TOL 6) from above*

The uppermost offset only survived as a line of mortar on the top of the wall, indicating the level at which demolition of the building stopped. A mixed deposit of silty loam and sandy gravel [615] containing brick and stones abutted the S face of [614]. A later feature [636] had removed the westward extension of the structure.

A fragment of brick masonry was exposed in the section of a feeder trench to the Flint Tower. The brick type and bonding material were identical to [614], and the masonry was felt to be part of the same structure. Here the brickwork was 1.72m wide and traced to a depth of 0.26m below services. Three offset courses survived.

Structure [668] lay 18m to the south of wall [614], and on a similar alignment to it. The bricks were purple-red and bonded with grey-white lime mortar. A length of 1.02m was revealed. Three courses of the N face were present, but the courses were not offset. The S face lay outside the excavated area.

#### *Other post-medieval structures*

A portion of N-S aligned brickwork [1044] was found at the brow of the terraced slope in front (N) of Coldharbour Gate. The masonry was 0.85m wide and at least 0.12m tall. The bricks were bonded with a hard grey-white mortar and were constructed of header build. Another section of brickwork [1045] of similar type lay to the W of [1044]. Two courses of brickwork survived, the W extent of the structure having been truncated by the excavation of the original cable trench. No original edges or faces for the brickwork were observed, but [1045] appeared to lie at a right-angle to [1044]. Several pits in the trench to the N of these walls may have been associated with them. Brick and other building rubble found in the same area probably relates to demolition of a structure.

A N-S aligned brick structure [1066] was revealed at the base of the cable trench S of the White Tower (Pl 11). The masonry comprised two courses of red bricks covered with a layer of light greyish-white lime based mortar (which obscured details of brick size and build). The structure had been truncated by the excavation of the original cable trench, so that a depth of only 0.12m survived in the trench section. The wall was 0.56m wide and extended for 0.68m across the cable trench.

A fragment of brick wall [311] was found just N of the Royal Fusiliers Museum. The 0.35m-wide masonry was aligned roughly N-S, and was built of hand-made unfrogged red bricks bonded with a yellowish-white sandy mortar. A maximum length of 0.85m of this structure was exposed within the confines of the trench. The wall was truncated by a large tree root.

Two structures were identified in a 1m-square excavation between the Royal Fusiliers Museum and the Hospital Block. Structure [421], aligned E-W, was constructed of red and yellow bricks in English Cross style and bonded with white mortar. The width of the brickwork was not seen, but it was butted by a 0.7m-wide N-S structure [420] of similar bricks but bonded with cement. Both structures were overlain by concrete.

A fragment of a red brick structure [425] was found 2.5m NE of the Wardrobe building wall (Fig 7). Wall 425 was aligned *c.* N-S, extended for a length of 0.54m, and was 0.34m wide. The structure was built in English Cross style and was bonded with light grey mortar.



Plate 11. Tower of London: the cable trench (TOL 51) S of the White Tower seen from the E, with walls [1065 and 1066] respectively in front of and behind the ranging pole, and concrete structure [1064] at the bottom right

#### *Victorian and later archaeology*

The vast majority of Victorian and later features were service trenches (electricity, gas, security cabling, water, and rain/foul drainage). Many of the pipes *etc* lay within the excavated depth of the cable trench and/or excavation areas. They had sometimes truncated earlier archaeological features, such as the chalk structures in Area 1, the Wardrobe building and the brickwork of the Grand Storehouse (see Pl 8). Some of the features were so deeply cut that the service was not reached. Many of the services (especially water and drain pipes) were clearly no longer active, but most of the electrical services were live.

Several more substantial Victorian structures were exposed in the cable trench W and S of the White Tower in 1995. They were readily distinguishable from earlier post-medieval walls by the use of yellow frogged stock bricks set in

hard cement-like mortar. A 3m-long stretch of N-S aligned structure [1051] abutted the W drum of Coldharbour Gate and overlaid its offset footing. The masonry was at least 1m wide and 0.48m tall, but an eastward return towards the White Tower had been heavily truncated so that only a 0.5m length survived at the excavated level. A floor [1053] of compacted small pebbles, mortar and loam butted [1051] in the corner between the N-S wall and the eastward return (Pl 12). No dating evidence was recovered from the exposed surface of this deposit, although clearly it was stratigraphically later than the wall itself.

Two further brick structures were observed W of [1051]. Masonry [1070] comprised a single course of several quarter and half bricks bonded with a thick layer of white mortar, and was recorded in the W face of the trench. The bricks and mortar lay on a layer of thin grey slate



Plate 12. *Tower of London: brick wall [1051] and floor [1053] seen from the E*

pieces. The structure extended for a length of 1.12m and was 0.16m tall, but it had been heavily truncated by the excavation of the old cable trench. Structure [1062] lay to the SE of [1070] and formed the corner of a building. The masonry survived just below the level of the topsoil and turf to a height of 0.55m, and consisted of yellow bricks in alternate courses of headers and stretchers. The E face of the brickwork was rendered with a 0.02m-thick layer of concreted mortar.

Structure [1065] lay 1.5m to the E of post-medieval wall [1066] (Pl 11) and was constructed of red and yellow stock bricks bonded with a hard grey cement. The structure was 0.24m wide and, like [1066], extended across the trench. Four alternate courses of headers and stretchers were present. Walls [1051, 1062, 1065 and 1070] were butted and/or overlain by a series of similar rubbly deposits, often containing high proportions

of broken and complete bricks. Some of these were still mortared together.

A large concrete structure [1064] was found under the staircase to the White Tower, 3.5m NNE of [1065] (Pl 1). The concrete was aligned E-W, and its S and upper surfaces had been rendered with hard cement. The 0.66m-tall structure filled the width of the trench.

Grand Storehouse wall [614] and layer [615] (Fig 4) were cut by a linear N-S feature [636] containing compacted sandy gravel deposits, [620 and 621], and backfilled with a dark grey brown clay loam [632]. The Devereux Tower wall [622] was constructed on fill [620] and was clearly bonded to the Victorian rebuilt Inner Curtain wall. Victorian and later modifications to the Inner Curtain consisted of either wholesale rebuilding or irregular patching using a mixture of building materials such as ragstone, sandstone, tile and flint. Other evidence for Victorian

activity included minor walls possibly for garden borders, and brickwork underpinning the W entrance to the Chapel of St Peter ad Vincula.

### Description: artefacts

Very small quantities of artefacts and ecofacts were recovered during these projects. Most of the material is not worthy of publication, but specialist reports are held in the relevant project archives (principally TOL 1 and 6). Summaries of the only two categories (pot and clay pipes) of any significance from the excavations and watching briefs on the cabling works are provided here, and again more details are available in the TOL 1 and TOL 6 archives.

#### Pottery

*Lucy Wittingham and Catherine Underwood-Keevil*

The pottery from the Waterloo Barracks (TOL 1), Inner Ring Main (TOL 6) and White Tower cable trench (TOL 51) projects was counted and weighed by context groups and recorded with reference to published fabric type series (Redknap 1983, Vince 1991 and Pearce and Vince 1988). Museum of London fabric codes were used wherever possible. All assemblages were small, and individual groups were often mixed in date. A total of 240 sherds (3.45kg) was recovered: TOL 1 produced 112 sherds (1.5kg) from 15 contexts, TOL 6 113 sherds (1.8kg) from 29 contexts, and TOL 51 15 sherds (0.15kg) from six contexts. Roman and medieval material was commonly residual in late 18th to 19th-century contexts. Average sherd size tends to be small, and few diagnostic vessel forms are present.

The three assemblages contain a range of fabrics typical of a domestic site in London, occurring in different proportions in each assemblage. The majority (76%) of the TOL 1 assemblage is post-medieval with the Roman (8%) and medieval pottery (13%) occurring as small and predominantly residual components. Similar proportions are evident in TOL 51 (6.7% Roman, 26.6% medieval and 66.7% post-medieval, although the numbers involved are very small). In contrast the majority (60%) of the TOL 6 assemblage is medieval, again mostly residual, with the post-medieval pottery (30%)

mostly found *in situ*. The earliest material is Roman, found in the TOL 1 and TOL 51 assemblages as residual sherds. Greywares, Black Burnished ware and mortaria dated from the 2nd and 3rd centuries AD are present in TOL 1, while the single occurrence from TOL 51 is an amphora sherd, possibly imported. The post-Roman material is of similar character in each assemblage. A small number of 11th to 12th-century wares (EMSS, EMCH, EMFL, EMSH, EMIS, LOGR) are present including one typical cooking pot rim form (see Redknap 1983 fig 7 no 5 and Vince 1991 fig 2.38 nos 67–74).

Local wares made in or near to London dominate the 12th to 14th-century pottery. They include undiagnostic sherds of South Hertfordshire Greyware (SHER), Coarse London-type ware (LCOAR), London-type ware (LOND) jugs with North French and Rouen styles of decoration, Late London-type ware jugs (LLOND) and various products of the Surrey/Hampshire whiteware industries. These include jugs in Cheam (CHEA), Kingston upon Thames (KING) and Tudor Green ware (TUDG), and cooking pots and bowls in Coarse Border ware (CBW) (Pearce and Vince 1988, fig 114 no 465 and fig 118 no 501).

The early post-medieval assemblage is again dominated by wares produced in the vicinity of London. These include fragments from 16th-century cooking pots, tripod pipkins and short rounded jugs in Tudor Red/Brown ware (TUDR/TUDB), and a shallow dish, porringer and chamber pot in Surrey/Hampshire Borderware (BORDY/BORDG). 17th- to 18th-century utilitarian vessels are represented by fragments of cooking pots, tripod pipkins, flanged dishes, storage jars/cisterns, deep bowls and collar-rimmed shallow bowls in a coarse and fine red earthenware (PMR/PMFR), and tankards in Post-Medieval Black glazed ware (PMBL). Undiagnostic sherds of Tin-Glazed ware (TGW) are likely to be of 17th-century date.

A small number of imported medieval and early post-medieval wares are present. These consist of: a small decorated jug sherd in Rouen Ware (ROUL) of mid 13th to mid 14th-century date; a strap handle in a red micaceous sandy ware (possibly Spanish Red Micaceous ware, SPAM) of 14th to 17th-century date; Siegburg stoneware (SIEG) of 14th to mid 16th-century date; Rhenish Stoneware drinking jugs from Raeren (RAER) and Cologne/Frechen (KOLS); and Dutch Red Earthenware cooking pot/pipkin

sherds (DUTR). The Rouen, Spanish Micaceous and Siegburg products are less common imported wares in the City of London. The late 18th to 19th-century wares which dominate the TOL 1 assemblage include Creamware, Pearlware, Transfer-Printed wares and English Stonewares.

#### *Clay tobacco pipes*

*Dr David Higgins*

A total of 43 fragments of pipe from nine contexts were recovered from TOL 1, comprising 14 bowl fragments, 28 stem fragments and one mouthpiece. With the exception of three 17th-century stem fragments all of this material dates from the late 18th or 19th century. Twenty-six fragments of pipe were recovered from nine contexts in TOL 6, comprising 10 bowl and 16 stem fragments. Nine of the bowls and seven stems came from late 17th-century layer [547], and the size of some of the pieces (*eg* a bowl with 85mm of surviving stem) suggests that the material had been little disturbed since deposition. The TOL 6 pipes include a higher proportion of post-medieval types. Full details of all the pipes are contained in the archive.

The pipe groups from this work are too small and dispersed to draw any firm conclusions about the nature of pipe use and deposition on this site as a whole, although a few general points can be made. As a high status Royal site with a marked military presence it might be expected that the pipes would show differences from general domestic assemblages from elsewhere in London. This could manifest itself in terms of the quality of the products or in the range of forms, for example, with special types being used or with duplicated forms resulting from central purchasing for the stores. From the small sample recovered this does not appear to be the case. The degree of milling around the rim and the presence of burnishing both affected the price of a pipe and so can be used as a guide to status. Two of the fragments from TOL 6 context [547] were burnished and the level of milling amongst the 1650–70 pipes was generally quite good with two being fully milled, one three quarters milled and one half milled. Despite this, these finishing techniques are not sufficiently different from domestic groups of the period to suggest that higher quality pipes were in use at the Tower. Likewise, the group of pipes from [547] as a

whole includes a typical range of London forms with an average overall quality of finish.

The 19th century deposits also included standard London styles of the period, the only point to note being the large number of fragments from long-stemmed pipes in TOL 1 context [30]. This might suggest a preference for the more traditional, and expensive, 'churchwarden' type of pipe rather than the cheaper, short-stemmed 'cutty'.

## Discussion

### *The Roman city wall*

Wall [107] in Area 3 is part of the Roman city wall. The character of the masonry, and especially the use of tile string/offset courses, established this very clearly. The exposed part represents the internal (W) face of the wall. The medieval construction works in the area appear to have removed any trace of an internal rampart; at least, no such feature was present in the excavation. The bottom level of c.10.75m OD can be compared with the Roman ground level of 10.45m OD at the standing portion of the Roman Wall adjacent to Tower Hill tube station (Parnell 1982, 123–7). There is a gradient down from Tower Hill towards the Thames, so that the contemporary ground level by the Roman Wall at the Wardrobe Tower is c.9m OD (Parnell 1982, 105–118). The masonry exposed in 1993, featuring the offset of three tile courses with a course of masonry below, suggests that the wall was exposed at the first offset 1m or more above the contemporary ground surface rather than at plinth level (*cf* Merrifield 1965, 104–5, figs 12–13, plates 40–2, 47).

The location of the wall is somewhat E of the anticipated position as shown on published plans (*eg* Allen Brown & Curnow 1984, fig 1). This is partly a mapping error (Geoffrey Parnell pers comm), but it is interesting to note that part of the wall was also found under the floor of the Bowyer Tower in 1911 (Merrifield 1965, 299; Allen Brown & Curnow 1984, 78). It has not been possible to establish the position of the wall within the Bowyer Tower precisely, but there does seem to be some discrepancy with the line of the W face as exposed in 1993. This raises the intriguing possibility that the Bowyer Tower was built over an internal turret such as the one adjacent to the Wardrobe Tower (Parnell 1993, fig 3).

*The medieval storehouse buildings*

The various exposures of the original Inner Curtain wall and the Coldharbour Gate do not require further comment except to note that the Victorian rebuild of the curtain N of the Waterloo Barracks was slightly set back from the medieval masonry. This has implications for the interpretation of post-medieval plans of the area, in that the reconstruction work changed the local topography.

The chalk-built structures in Areas 1 and 2 post-date the 13th-century construction of the Inner Curtain wall, and they pre-date the 17th-century construction of the Grand Storehouse (see below); structure [113] was abutted by Grand Storehouse brick masonry and the other buildings would be crossed by it. The dating evidence from the excavations does not give any greater definition; pottery from the sandy deposits which post-date the masonry is 16th century at the earliest. A brief study of the extant structures within the Tower shows that chalk is comparatively rare, and certainly does not appear to be used in any post-medieval buildings. Chalk can be seen, however, in some 13th-15th century structures (*cf* Tatton-Brown 1991, 365-6). Examples include the main drain of Henry III's palace, exposed to the E of the Wakefield Tower, and a vice in the first floor of the Bloody Tower (Allen Brown & Curnow 1984, 52-3). Therefore the excavated structures are probably of late medieval date.

The structures were probably part of the late medieval and early post-medieval Ordnance Stores. The Stores were built end-on to the Inner Curtain, and all the excavated N-S walls would therefore be principal structural elements. There can be little doubt that [27] and [113] belonged to these buildings, but [33] is more difficult to interpret. Its W face had been robbed away, but even so the wall is substantially wider than [27] and [113]. Furthermore it was not aligned in parallel with wall [27], despite the narrow space between them. It seems unlikely that walls [33] and [27] belonged to one building. Wall [33] may have been part of a N-S store building, but equally it may have belonged to a stair turret attached to the Flint Tower. Such buildings are shown on both Haiward and Gascoyne's 1597 survey and, more clearly, on Holcroft Blood's of 1688 (Parnell 1993, fig 45). A plan of 1682 (Parnell 1993, fig 58) also shows structures on the SE and SW corners of the tower. Unfortunately

archive plans in the Public Record Office offer little help in this respect, although MPH/892 shows a kink in the curtain ('Line Wall') at approximately the position of the excavated masonry (Pl 11). The 19th-century rebuilding here may have destroyed any evidence for its original ground plan to the W.

*Other medieval evidence*

A structure was found N of the Queen Elizabeth II Gate. The four courses of collapsed brickwork found immediately to the N of the stonework presumably represented a facing from the wall. The bricks were similar to those from the Wardrobe building. Haiward and Gascoyne's 1597 survey of the Tower depicts a small block of buildings on the N side of the Queen's Gallery in the approximate position of the masonry located in the ring main trench. The stone structure may therefore be part of the late medieval royal lodgings.

*The Wardrobe wall*

The E-W stone wall with a brick S face immediately W of the Wardrobe Tower corresponds with the long, narrow building running from that Tower to the Broad Arrow Tower depicted on the 1597 survey. The timber-framed Wardrobe was built in 1532-3 (Parnell 1980, and 1993, 53-7; Allen Brown & Curnow 1984, 71) as part of a general refurbishment of the royal apartments in the Inmost Ward and the SE corner of the Inner Ward, before the coronation of Anne Boleyn as queen in May 1533. The Wardrobe was demolished in 1663 to make way for the New Armouries building (Parnell 1980, 147; 1993, 64). The limited dating evidence associated with the wall broadly confirms this sequence. The only potsherd recovered from its construction trench was of late medieval date, while the soils found against the S face contained late medieval and early post-medieval pottery. The latest garden soil contained a single sherd of probable 17th-century date.

Unfortunately only one side of the Wardrobe was located, and it is not clear which this is. The brick facing could be internal or external (though the latter seems more likely). The possible construction level to the N of the wall could be a floor layer. The build-up and character of soils

against the wall's S face, however, suggests that this represented the S side of the building. This accords well with the 1597 survey, which shows the range built against the N side (or perhaps even behind) the Wardrobe Tower and running to the N side of the Broad Arrow Tower. If the excavated wall represented the N side of the Wardrobe the S side would have to run in front (S) of the tower, and this seems unlikely on the basis of the available evidence. The reason that only one wall was found almost certainly lies in the topography of the site. The excavation clearly shows that the Wardrobe had been terraced into the S-facing slope. The N wall could quite easily lie beyond the excavated depth of the trench. It is equally possible, of course, that the extensive service runs in this area had already removed the N wall.

### *The Grand Storehouse (Fig 10)*

By 1687, the Ordnance Stores against the N side of the Inner Curtain wall were in poor condition, and it was agreed that they should be replaced by a single building occupying the same area. This was the Grand Storehouse (Pl 13). Surviving plans, sections and elevations show an elegant brick structure, two storeys high with an attic. The façade was especially impressive, with projecting bays and entrance surmounted by a magnificent pediment. The new storehouse was provided with a large stair turret centrally in its rear (N) wall; this contained the Grand Staircase, and a lesser one which gave access to the attic level (Pl 14). The first floor of the storehouse contained the Small Armoury, with extraordinary displays of weaponry (Parnell 1993, 70–5).

Plans in the Public Record Office show that the area behind (*ie* N of) the Grand Storehouse contained a number of other buildings in the post-medieval period, and that the towers and curtain as they stood then appear to be very different from their Victorian/modern configurations (see above). The area is shown as vacant space in one plan (Works 31/109); as store and survey rooms in another (MPH 892, Pl 13), which also shows the back stair of the Grand Storehouse as contiguous with the Bowyer Tower; and finally as the Iron Vault (Works 31/108, and 31/196, Pl 15), attached to the Grand Storehouse. At least two plans show the Flint Tower extending back to and conjoining with the Grand Storehouse (Works 31/108, and MPH 892).

The Grand Storehouse survived until 1841, when it was gutted by a fire started in a Small Gun Office workshop in the Bowyer Tower (Parnell 1993, 90, 95–6). The blaze also spread to and badly damaged the Brick and Flint Towers. The Flint Tower had only recently (*c.*1796) been rebuilt by the Ordnance Department. Much of the Inner Curtain wall was also damaged, especially at parapet level. The fire led to a major programme of reconstruction of the wall and all three towers.

The brickwork structures N of the Waterloo Barracks belong to the Grand Storehouse. The only element of doubt rests on structures [112] and [114] in Area 2. These clasp the chalk masonry, [113], and could conceivably belong to the documented 16th-century reconstruction of the Ordnance Stores. The bricks and mortar, however, were the same as those used in the other walls.

The excavated features represent elements of the back (N) wall of the Grand Storehouse, and its associated stair turret. The latter appears to have been built after the former, as wall [125] abutted wall [126] (see Fig 6b, Pl 8). It is likely that this represents more of a constructional device than a major gap in the construction programme. Interestingly, however, one of the PRO plans (Works 31/109) does show the stair turret walls abutting the rear wall of the main building. The staircase itself is shown as slightly off-centre to a line produced through the centre of the main entrance in the S façade. This may have been a surveying error caused by the need to place the smaller staircase to the attic level (the 'Back Stair' on PRO MPH/892, Pl 14) on the E side of the Grand Staircase itself. It also tends to confirm that the stair turret was a secondary build to the storehouse itself.

The excavated walls allow the archival plans to be compared with the existing layout of the walls and towers, although there are internal contradictions among the plans themselves. In general terms the stair turret is in its expected position, and it clearly abuts the curtain wall and the Bowyer Tower, as shown by the plans (although it does not cut into the curtain wall, at ground level at least, as is shown on PRO Works 31/109 and 31/196). The wall between the Grand and back stairs shown on the various plans (see Pl 14) was not found in the excavations. It is conceivable that the wall has been completely removed by later activity such as the digging of service trenches. The wall is shown as a minor

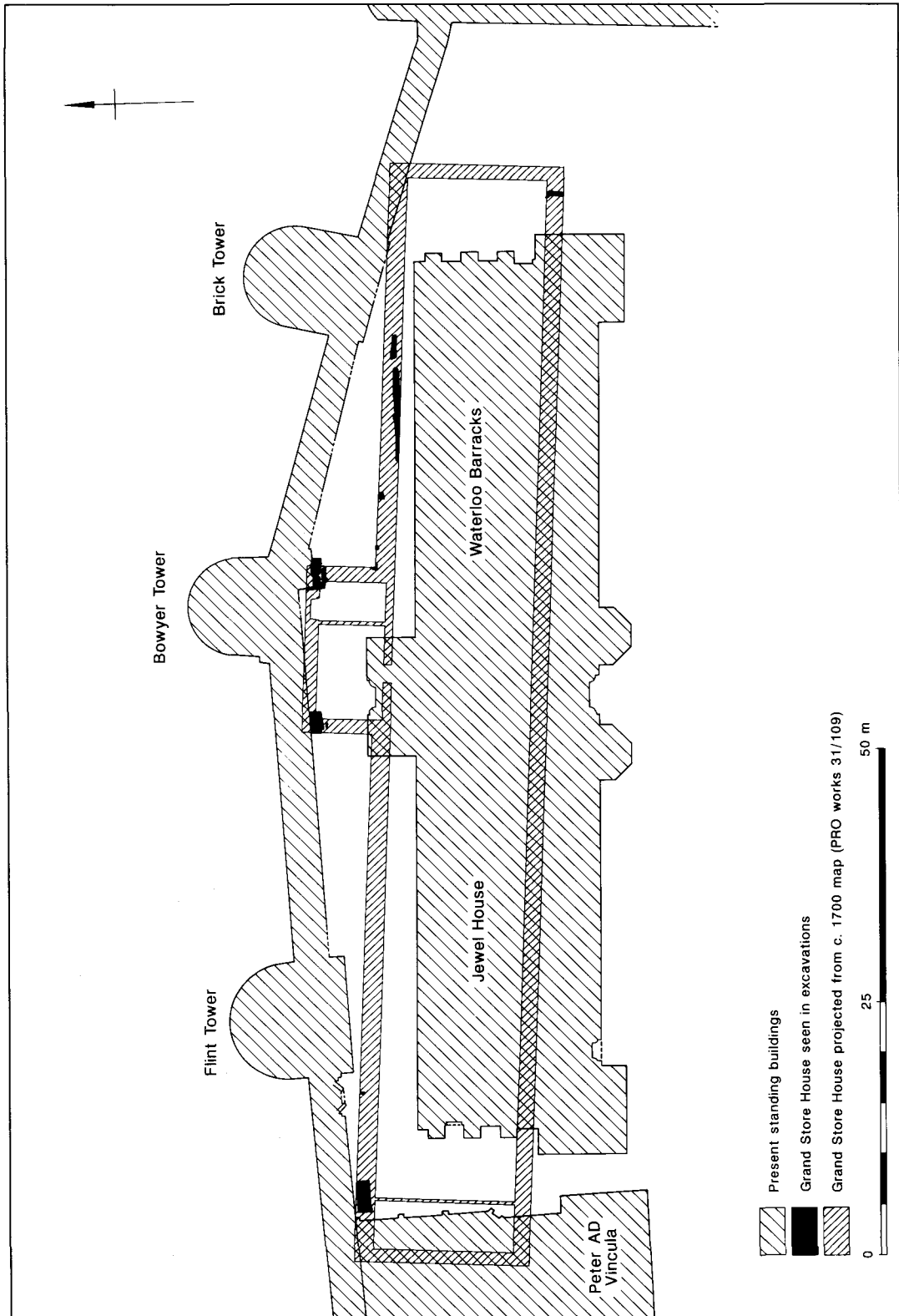


Fig 10. Tower of London: summary plan of excavated evidence for the Grand Storehouse

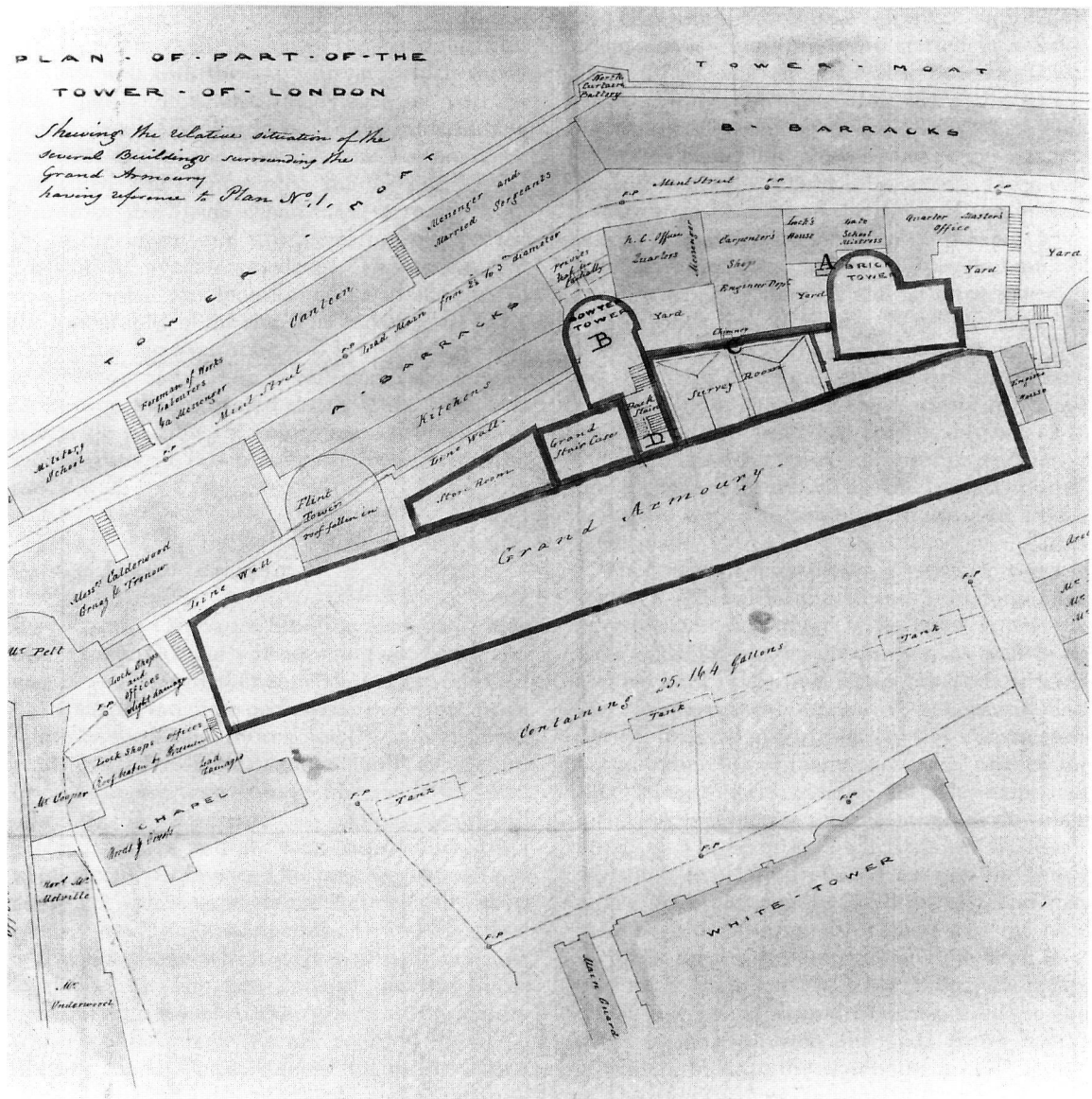


Plate 13. Tower of London: plan of part of the Tower of London drawn in 1841 with an assessment of the fire damage to buildings around the Grand Storehouse (the title Grand Armoury is probably a confusion of the main building with the Small Armoury which it contained); original in the Public Records Office, PRO MPH/892

feature compared to the scale of the load-bearing walls, however, and it may only have had shallow foundations, or even none at all.

The load-bearing walls were at least 1.4m wide. This was proved in the case of wall [101/55], which survived to its full width despite extensive truncation, and by extrapolation of the faces of walls [93, 170 and 203]. The limited exposure of wall [54/116] in Area 2 makes it

difficult to interpret the surviving, but much-truncated masonry. The 'width' of [116] (at least 1.65m E-W) is greater than one might expect. This could be for structural reasons, but it is also possible that [116] is part of a corner, returning eastwards along the Inner Curtain wall. The available evidence, however, cannot prove this. The evidence from walls [101, 125, 126 and 614] suggests that offsets were built into the brickwork

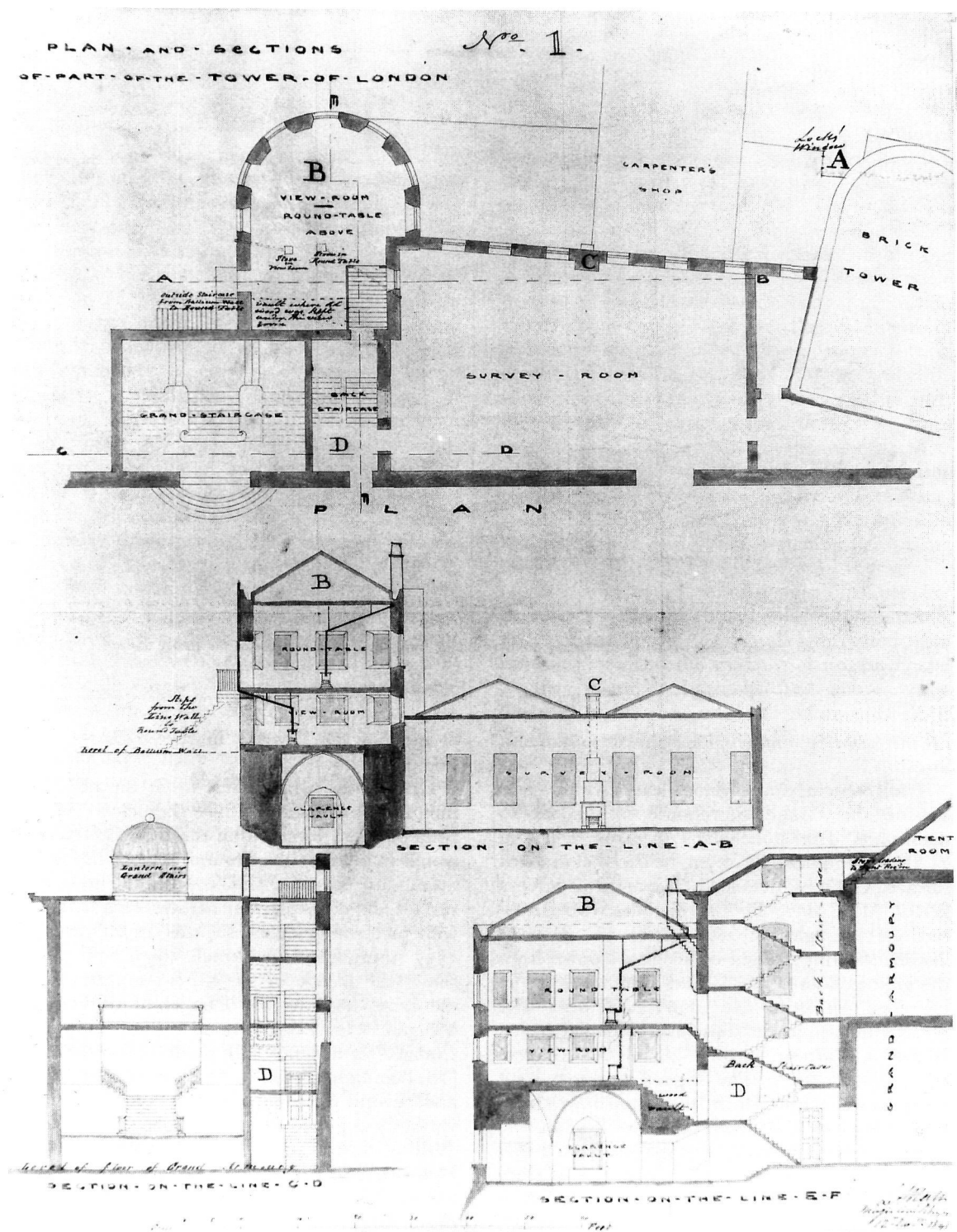


Plate 14. Tower of London: detailed plans and sections of the Grand Storehouse staircase in 1841; original in the Public Record Office, PRO MPH/892

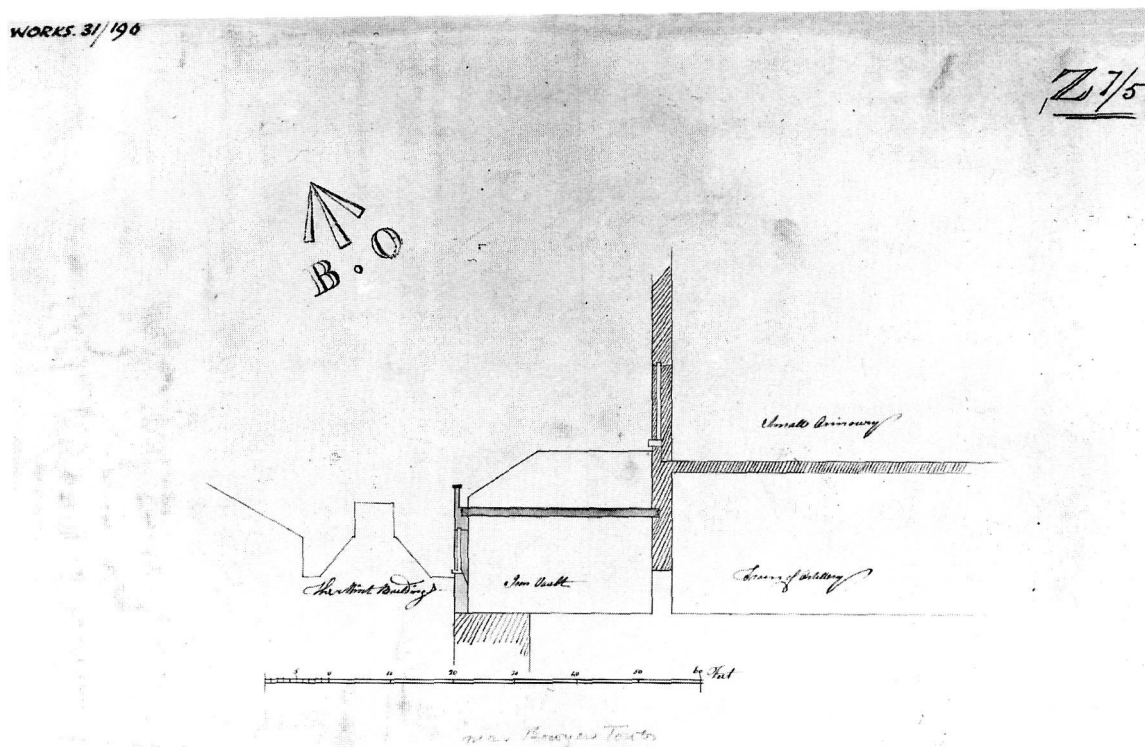


Plate 15. Tower of London: cross-section of the Grand Storehouse and Iron Vault (nd); original in the Public Record Office, PRO Works 31/196

in the courses immediately above foundation level.

The contemporary floor level within and outside the Grand Storehouse is difficult to determine. The stone slabs in Area 3 lay at 11.1m, approximately 0.7m below the modern surface. The most detailed of the archival surveys (PRO MPH/892, Pl 14) includes two cross-sections through the stair turret and Bowyer Tower, showing a flight of five stairs down from the ground floor of the Grand Storehouse to the Clarence Vault in the Bowyer Tower. The present door into this has been widened (Allen Brown & Curnow 1984, 78), and the concrete floor is also modern. The original level may have been lower, although it may not have been significantly so (*cf* the survival of the Roman wall under the current floor). It must be stressed that caution is required in interpreting the archaeology on the basis of the documentary sources. It is notable, for instance, that none of the plans referred to above includes the doorway in the E side of the stair turret defined by the N face of wall [101] (and presumably by the original build

of the Bowyer Tower stair turret for the other side of the door).

Floor [102], which must be at the bottom of the flight of stairs, may be close to the contemporary level within the Bowyer Tower. It would imply that the ground floor of the Grand Storehouse lay at a similar level to the current surface, or perhaps even higher. This correlates with pictorial evidence such as an engraving of 1737 (reproduced in Parnell 1993, fig 60). This shows the façade of the storehouse rising from the same level as the Chapel of St Peter ad Vincula, a level which does not appear to have changed significantly into modern times. Surface [102] continued outside the stair turret to the E, and beyond the limit of excavation. This area is variously depicted as a store house (PRO Works 31/109) and a survey room (PRO MPH/892, Pl 14). Unless there were stairs to a higher level, this would have had a ground floor below that of the Grand Storehouse.

The extreme disturbance caused by service runs around the NE corner of the Waterloo Barracks had removed any trace of the Grand

Storehouse within the excavated depth in this area. Observations during projects TOL 1 (excavations and watching brief) and TOL 9 (watching brief), however, showed that the N wall would pass extremely close to the E end of the Brick Tower and would then run against the Inner Curtain Wall. The original medieval build of the curtain was set forward from the Victorian rebuild, and the truncation of the medieval wall face here may well reflect construction of the storehouse. Two archival plans of the Grand Storehouse are somewhat contradictory in their depiction of the NE corner. One (PRO Works 31/109) shows the corner cutting into the curtain line immediately to the E of the Brick Tower. The other (MPH/892, Pl 13), however, shows an obtuse angle in the N wall suggesting that it had been built against the curtain rather than cutting into it. Most plans agree that this occurred at the W end, and the ring main project produced clear corroboratory evidence for this. The evidence at the E end is weak, however, because of the extensive service cutting already referred to. The damage to the medieval curtain wall face could have been caused by the storehouse cutting into it, but equally the damage could have been the result of modern service runs and the storehouse wall could have run alongside the curtain. Unfortunately the available evidence cannot prove either case.

The E end of the storehouse was not found, largely because there was no need to continue the excavations around the E end of the Waterloo Barracks. Useful evidence regarding its position (and the location of the S wall) was recorded by Derek Gadd (1993a and b) in the early stages of the Crown Jewels project in the Waterloo Barracks. Observation of excavations for a service feed and a hoarding posthole revealed brickwork identical in character to that recorded by OAU. The service trench provided a complete section of masonry, with a definite S face containing three offsets in the excavated depth (Gadd 1993b, fig 1). It is difficult to determine whether a N face was present; the photographs in the report do not make this clear (Gadd 1993b, fig 3 does not appear to include a built face). The E wall would be slightly to the W of the position anticipated on the basis of historic plans, but the difficulty in matching 17th and 18th-century cartographic sources to the Victorian/modern site probably account for the discrepancy.

The excavations at the NW corner of the Waterloo Barracks located the N wall butting up

against the medieval curtain wall, with the offset Victorian rebuild clearly post-dating the demolition of the storehouse after the 1841 fire. More offsets were noted in this exposure than in any other location, but this may simply reflect the position of the wall close to the NW corner of the building. The corner itself was not found, but the historic plan evidence would place it on the W side of the Devereux Wall. The foundation for the latter had cut the Grand Storehouse wall. Otherwise the archaeological evidence is in close accord with the plans, which show a slight angle in the N wall taking it alongside the curtain rather than cutting into it. The fragment of storehouse wall exposed in a feeder trench section immediately W of the Flint Tower is slightly wider than elsewhere. Some plans (eg MPH/892, Pl 13, PRO Works 31/108) show the tower extending to conjoin with the storehouse. The extra width of the wall W of the tower probably represented infill of a small and redundant space.

The S side of the storehouse was not found in the excavations and trench watching brief along the W side of the Waterloo Barracks. A fragment of brick masonry was found against the Chapel of St Peter ad Vincula, but this lay approximately 2m S of the line of the S wall anticipated from historic plans and the evidence from the E end of the Waterloo Barracks (see above). The function of the masonry is therefore unclear. It could be associated with the Chapel or with the Furbishers Yard (see below).

The area W of the stair turret is called the Iron Vault on Works 31/108 and 31/196 (Pl 15). The latter term need not be taken as evidence for an underground vault. No evidence for such a structure was found in the excavations (indeed the survival of the ?late medieval masonry abutting the Inner Curtain Wall E of the Flint Tower argues directly against an underground structure, as such a building would certainly have removed the earlier walls). Documentary and cartographic evidence shows that the Iron Vault was a single-storeyed building (perhaps with attic space in use as well) attached to the W end of the Grand Storehouse between the latter and the Line (Inner Curtain) Wall. The vault was built from the same surface level as the storehouse, and skylights provided some illumination. The ground floor Train of Artillery room within the storehouse (Parnell 1993, 71) opened directly into the Iron Vault (see also the section on PRO Works 31/196, Pl 15). In 1732–3 the door between the buildings was enlarged (Works Office 51/132 folio 16r),

while the floor was replaced at the same time. One document (WO 51/135 folio 25v) explicitly states that this was necessary to take spare carriages, presumably from the Train of Artillery. The vault had brick arches, and WO 51/109/109v (1721) refers to 16,280 place bricks for 'turning over a brick arch on part of the Iron Vault'. Another document refers to the use of 38 tons of clay for 'covering the brick arch made over part of the Iron Vault' (WO 51/111 folio 43r, 1721-2). Repairs to the roof were necessary in 1714 (WO 51/92 folio 33r) and 1722 (replacing the old lead; WO 51/112 folio 24v).

#### *The 1717 Main Guard and Carriage Storehouse*

The Board of Ordnance cleared away a series of medieval buildings from the S side of the White Tower in 1667-1674, and immediately afterwards built a series of timber stockades ('Pallizadoes'; Parnell 1980, 154-5). Timber sheds were erected against the S and W stockades in 1685-6 (Parnell 1993, 69; see also Holcroft Blood's 1688 bird's-eye view of the Tower). These makeshift buildings were in turn cleared away in 1717 when new and much more substantial ranges were erected. The Carriage Storehouse was constructed along the S side of the White Tower, while a new Main Guard now fronted the W face. The Carriage Storehouse was demolished in its turn in 1825 to make way for the Horse Armoury (Parnell 1993, 96). The S face of the White Tower was again cleared of all buildings in 1883, when the Horse Armoury was torn down (Parnell 1993, 106 and fig 76). The Main Guard (Parnell 1993, 82 and fig 63), meanwhile, had been demolished in c.1846, after which the ground was raised and terraced (Parnell 1993, 92).

Wall [1066] S of the White Tower was probably part of the Carriage Storehouse. Plans in the PRO (Works 31/95, dated 1753, and Works 31/99, dated 1754) show that this building comprised a long, narrow range with E and W entrances. The storehouse itself was physically separate from the White Tower, although the two were joined at the W end by a substantial staircase leading up to the original medieval entrance into the tower. The narrow strip between the entrance staircase and the SE corner of the White Tower was known as the Surveyor-General's Garden in 1754 (PRO Works 31/99). The location of wall [1066] would be consistent with the W entrance into the Carriage Storehouse itself.

Walls [1044 and 1045] on the terrace edge in front of Coldharbour Gate undoubtedly belong to the 1717 Main Guard. This building was a two-storey structure with a W-facing arcade fronting onto an open paved area which had a retaining wall to the S counteracting the slope southward on the W side of the White Tower (PRO Works 31/99). The character of the masonry attests to this date, and the location of the walls corresponds either to the main structure, or to the support walls for the paved yard area; it is impossible to be certain which option is correct on the basis of the limited evidence from the watching brief. The demolition debris found to the N of the walls probably represents the demolition of the building.

#### *The Old Hospital Block*

The Old Hospital Block built in 1718-19 (Parnell 1993, 84) replaced a conglomeration of structures between the Constable and Broad Arrow Towers. It was a lodging for officials of the Ordnance Office, and appears on PRO Works plans 31/24 and 27. The building suffered severe bomb damage in 1940 (Parnell 1993, 114), when the northern quarter was destroyed. Comparison of the surviving structure with a photograph of the bomb damage (Parnell 1993 fig 91) shows that the entire N half of the block was rebuilt. The brick type is different in the N half, while the original attic dormer fenestration has been changed. There had been two dormer windows in each half of the frontage; there are still two in the S half, but there are now four to the N. Parnell 1993 fig 91 also shows that a wall originally ran parallel to and outside the N wall of the block; stairs up to the terrace in front of the building lie between the two walls. The same arrangement can be seen on the 1875 1:1760 Ordnance Survey map (London Sheet 7.77), though not on PRO Works 31/24 or 27. The E-W wall found in the small excavation between the Hospital Block and the Royal Fusiliers Museum certainly corresponds with the wall shown on the OS map and the photograph. Interestingly there is a distinct scar or edge in the existing tarmac surface running back to the Inner Curtain wall, and this corresponds to the line of the block's outer wall. The latter would appear to be a later post-medieval addition to the original early 18th-century work.

*Other post-medieval buildings*

The small fragment of brick wall found at the NW corner of the Royal Fusiliers Museum is difficult to interpret as so little was found. The 19th-century museum building itself is cellared and its construction will no doubt have destroyed most underlying archaeology. The bricks in the wall fragment appeared to be relatively early, perhaps late medieval or early post-medieval. It is extremely unlikely that they relate in any way to the museum itself (no associated structures are shown on Victorian OS or other maps). Various cartographic sources, however, show either buildings or gardens in this area from the late 16th to early 18th centuries. A range of structures is depicted against the N end of the Inner Curtain wall's E arm by Haiward and Gascoyne (1597), but these would probably be too far E for the excavated wall. Conical or pyramid-shaped stacks of unidentified function lie closer to the area, but it seems unlikely that the wall belonged to these. The 1682 Board of Ordnance survey of the Tower shows buildings in the same location, with gardens in front; these appear to be bordered by walls, and the excavated fragment could belong to one of these. Holcroft Blood's bird's eye view of 1688, however, shows substantial new buildings on the site. These are also shown on early 18th-century maps (*eg* PRO Works 31/24, c.1720, and PRO Works 31/27, 1726).

The brick wall fragment found to the NE of the Wardrobe is problematic. It cannot belong to any of the pre-18th-century structures on the Hospital Block site as these all lie further E, effectively within the footprint of the block. PRO Works 31/27 depicts a wall with squared corners extending out W of the terrace in front of the block but the excavated fragment appears to be too far S to belong to this. PRO Works 31/27 also shows a line of trees running N-S between the Hospital Block and the White Tower. It is conceivable that walls were associated with this landscaping/plantation, and the excavated wall perhaps reflects this.

*Victorian structures*

The most unusual structure that is believed to be Victorian is the Devereux Tower wall to the W of Waterloo Barracks. This wall runs from the Victorian rebuild of the Inner Curtain wall to

the NE corner of the Chapel of St Peter ad Vincula. The ashlar masonry is similar in character to the Victorian rebuild but incorporates extremely weathered apparently late medieval architectural features. Post-medieval pottery was found in the earth-filled trench below the wall, which is clearly bonded in (and therefore contemporary) with the rebuilt Inner Curtain wall. Furthermore the trench under the wall cuts the demolished N wall of the Grand Storehouse and associated demolition deposits. The Devereux wall lies on or just within the W end of the Grand Storehouse, and is clearly a secondary feature.

The area W of the wall (and above crypts associated with the original Chapel of St Peter ad Vincula) contained furbishers' workshops from the late 17th century (Parnell 1993, 95), and numerous records in 18th-century Works account books refer to this area. Some describe a passageway at the W end of the Grand Storehouse into the Furbishers' Yard (*eg* WO 51/107 folio 88, dated 1820). There appears to have been a wall into the yard, but this was of brick (WO 51/95, folio 82, dated 1716, refers to place bricks and stock bricks used 'about a doorway into the Frobushers Yard'). At least one record specifies work on the roof and 'Upper Roome' of the Furbishers' shop here (WO 51/101, folio 78, dated 1718), and this may already have been a replacement for an earlier version. WO 51/92 folio 32 (dated 1714) describes 'Taking down the old Frobushers Shop behind the Chappell at the West end of the Grand Store House, enlarging the way to get the new Timber in, making it good again, and rebuilding the said Shop'. Presumably the yard and its buildings were cleared away as part of the reconstruction of the whole area following the 1841 fire (see Pl 11), and the Devereux wall probably dates to this time as well.

The substantial concrete block [1064] found beneath the S wall of the White Tower relates to a munitions railway that ran from the Wharf into the basement of the White Tower and was in use from the 1840s; the railway still exists under the lawn S of the White Tower. The entrance into the basement is shown on archival plans (PRO Works 31/496 dated 1893) and can still be seen as a filled void in the basement's brickwork. The concrete block overlies the infilled entrance and effectively acts as a lintel. Wall [1065] lines up with the W side of the munitions railway, and the bricks and mortar used in its

construction are consistent with the date of the railway.

Structures [1051, 1062] and the traces of brickwork [1070] observed to the SW of the White Tower are likely to be part of the enlarged Main Guard building constructed between 1898–1900 to the N of the Wakefield Tower (Parnell 1993, 108). This building replaced the 1846 Main Guard (on the same site) which had been constructed around the shell of a storehouse built in 1670–1. The 1898–1900 building extended much further N and W than its predecessor, and structures [1051, 1062 and 1070] match the location of the later building; they do not correspond to any depicted element of the earlier guard. The bricks, furthermore, are characteristically late in appearance (fabric, surface colour and frogging). The 1898–1900 Main Guard was severely damaged by fire on 29/30 October 1940 (Parnell 1993, fig 87). The brick rubble deposits found in the trench across the Coldharbour lawn clearly belong to the demolition of this building.

Brick and tile culverts were noted in several places, especially in the western run from the Royal Fusiliers Museum to the Queen Elizabeth II Gate, and along Queen's Lane. There would appear to have been a complex network of such structures around the Tower. The Property Services Agency survey of 1982, for instance, identified such a culvert around much of the moat circuit and another one draining into the moat from the W half of the Inmost Ward. It seems clear that most (probably all) of these brick culverts were main drains, especially for storm water. Some may have been foul water drains, such as the one found at the S end of the Hospital Block. All appear to be of Victorian date (though an earlier origin cannot be entirely ruled out in one or two cases) and they had all been inserted from close to the top of the soil profile as exposed in the ring main trench.

## CONCLUSIONS

The archaeological projects reported here have added several important footnotes to the history of the Tower of London. The work was generally on a small scale, but the archaeological sensitivity of the Tower of London is such that the utmost care has to be taken with this fragile resource at all times. Archaeology may well be unchallenged as a source of unexpected problems for

development programmes, but it is incumbent on this generation, as with any other, to ensure that the existing resource is not damaged, diminished or removed if this is at all avoidable. Avoidance is usually possible, but a degree of prediction is essential and this requires detailed study and planning. Such work is undertaken as a matter of routine by HRP, using the skills and experience of OAU whenever necessary.

One aspect of the Waterloo Barracks, Inner Ring Main and White Tower cabling projects deserves further comment, because it is so important to all future planning for the site. It is a commonly-held belief that the upper levels of any given site will comprise modern material of little or no archaeological sensitivity. This is demonstrated all too often in the term 'made ground' in borehole logs, a description which might cover thick layers of archaeology ranging in date from Roman to post-medieval. Such an attitude appears to have applied in the past at the Tower, when service trenches have been dug with little regard for archaeological features and structures. The most recent work, however, demonstrates that important archaeology can survive very close to the modern surface. The Grand Storehouse walls, for instance, usually lay 0.3m or less below the surface, and the Wardrobe wall had an equally shallow cover of soil. Every effort must be made to ensure that unnecessary damage of the sort which has occurred in the past does not occur in the future. HRP and OAU are committed to making such efforts.

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## BIBLIOGRAPHY

- ALLEN BROWN & CURNOW (1984), R. Allen Brown & P. E. Curnow *Tower of London*
- CHARLTON (1978), J. Charlton (ed) *The Tower of London: its History and Institutions*
- COLVIN (1963), H. M. Colvin (ed) *The History of the King's Works* Vol II, the Middle Ages
- GADD (1993a), D. Gadd *Observation of Section of the Great Storehouse, Tower of London* (unpublished)
- GADD (1993b), D. Gadd *Archaeological Recording of a Wall Foundation Possibly Associated with the Great Storehouse Outside the Waterloo Block, Tower of London* (unpublished).
- HUTCHINSON (forthcoming), M. Hutchinson 'Excavation of Edward IV's Bulwark at the Tower of London' *Trans London Middlesex Archaeol Soc*
- MERRIFIELD (1965), R. Merrifield *The Roman City of London*
- OAU (1993), Oxford Archaeological Unit *Past archaeological excavations in the Inmost and Inner Wards, and Water Lane between the Queen Elizabeth II Gate and the Bloody Tower: a desktop appraisal in connection with the new Inner Ring Main electricity supply* (unpublished)
- OAU (1995), Oxford Archaeological Unit *New electricity supply to the White Tower: desktop study of design route with project design and specification for archaeological works* (unpublished)
- PARNELL (1980), G. Parnell 'The Tower of London: the reconstruction of the Inmost Ward during the reign of Charles II' *Trans London Middlesex Archaeol Soc* 31, 147-56
- PARNELL (1982), G. Parnell 'The excavation of the Roman city wall at the Tower of London and Tower Hill, 1954-76' *Trans London Middlesex Archaeol Soc* 33, 85-133
- PARNELL (1983), G. Parnell 'The western defences of the Inmost Ward, Tower of London' *Trans London Middlesex Archaeol Soc* 34, 107-150
- PARNELL (1985), G. Parnell 'The Roman and medieval defences and the later development of the Inmost Ward, Tower of London: excavations 1955-77' *Trans London Middlesex Archaeol Soc* 36, 1-79
- PARNELL (1993), G. Parnell *The Tower of London*
- PEARCE & VINCE (1988), J. Pearce & A. Vince *A Dated Type-Series of London Medieval Pottery, Part 4: Surrey Whitewares* London Middlesex Archaeol Soc Special Paper 10
- REDKNAP (1983), M. Redknap 'The Pottery', 120-149, in Parnell 1983
- TATTON-BROWN (1991), T. Tatton-Brown 'Medieval building stone at the Tower of London' *London Archaeol*, 6.13, 361-6
- VINCE (1991), A. Vince *Aspects of Saxo-Norman London: II, Finds and Environmental Evidence* London Middlesex Archaeol Soc Special Paper 12

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