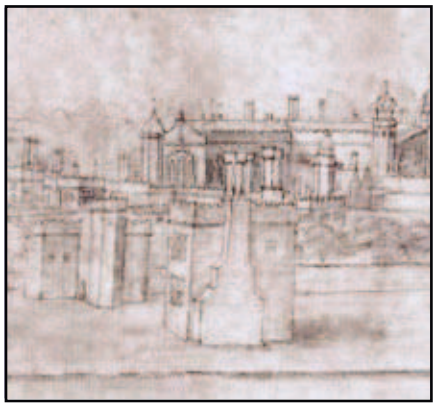
Hampton Court Palace Tiltyard and Bowling Alley (Time Team Palaces Special)



Archaeological Evaluation Report

oxfordarchaeology south

April 2010

Client: Videotext Ltd, Time Team

Issue No: V1
OA Job No: 4243
NGR: TQ 156 687

Archaeological Evaluation Report

Client Name:	Videotext Ltd, Time Team
Client Ref No:	N/A
Document Title:	Hampton Court Palace,Tiltyard and Bowling Alley (Time Team Palaces Special)
Document Type:	Evaluation Report
Issue/Version Number:	V1
Grid Reference:	TQ 156 687
Planning Reference:	n/a
OA Job Number:	4243
Site Code:	HCP66
Invoice Code:	HCP66EX
Receiving Museum:	Historic Royal Palaces Agency
Museum Accession No:	TBC
Event No:	-

Issue	Prepared by	Checked by	Approved by	Signature
1	Dan Sykes Project Officer and Ben Ford Senior Project Manager	Ben Ford Senior Project Manager	Ben Ford Senior Project Manager	

Document File Location	Projects on Server 1:\HCP66CO1_Tiltyard\Report\Final Report
Graphics File Location	Servergo:/oaupubs1_AthuH*HCP66*HCP66EX*Hampton Court, Tiltyard*GS*11.01.10
Illustrated by	Georgina Slater

Janus House
Osney Mead
Oxford OX2 0ES
t: +44 (0) 1865 263800 e: oasouth@thehumanjourney.net
f: +44 (0) 1865 793496 w: oasouth.thehumanjourney.net
Oxford Archaeological Unit Limited is a Registered Charity No: 285627

Hampton Court Palace, Tiltyard and Bowling Alley

(Time Team Palaces Special)

Archaeological Evaluation Report

Written by Dan Sykes and Ben Ford

with contributions from Leigh Allen, John Cotter, Alison Kelly, David Mullin, Rachel Scales and Ian Scott and illustrated by Georgina Slater, Anne Kilgour-Cooper and Jane Smallridge

Table of Contents

List of Figures

List of Plates

Summary

In March 2009,Oxford Archaeology (OA), in conjunction with Time Team, excavated a series of Archaeological Trenches within the grounds of Hampton Court Palace. The work was commissioned by Videotext in advance of the production of a Time Team Special concerning Henry VIII's Palaces.

A total of eight trenches were excavated. These were located through a combination of documentary research and the results of geophysical survey. The first three trenches were targeted on the assumed site of Henry VIII's northern bowling alley. The subsequent five trenches investigated the likely positions of four 'lost' towers within the area of Henry's Tiltyard.

The eastern foundation wall of Henry's bowling alley was revealed running through Trenches 1, 2 and 3 with later, additional buttress foundations uncovered in both Trenches 1 and 3. In Trench 1 a possible western wall to the structure was also identified beneath the existing garden wall. Evidence for the demolition and robbing of material from the bowling alley structure prior to re-landscaping of the area was found throughout the three trenches.

In the Tiltyard area, the remains of two of the historic Tiltyard Towers were identified. In Trench 4, A north-south aligned foundation wall was recorded on the postulated site of the North-East Tower, the twin to the sole surviving South-East Tower. The foundation had been re-used for the extant garden wall. Trench 6 yielded the north-south alignment of a further Tower foundation, possibly that of the South-West Tower. The facing of this foundation had been removed in a robbing episode and the area re-landscaped..

Trenches 2 and 6 revealed evidence of later, possibly 17th-18th-century garden features in addition to Tudor structural features. Trenches 7 and 8 revealed only evidence of probable 17th-18th-century garden features in the form of planting beds. Trench 5 contained no significant archaeological features or deposits.

1 INTRODUCTION

Location and scope of work

1.1.1 Hampton Court Palace is located immediately north of the River Thames within the London Borough of Richmond Upon Thames, Surrey approximately 21km south west of the City of London and approximately 5km south west of Kingston Upon Thames at NGR TQ 156 687 (Fig 1). It is a Scheduled Ancient Monument (Surrey No. 83; OA, March 2008, Appendix I), which contains a number of Listed Buildings and structures, and sits within a Registered Park and Garden (Hampton Court Park). The monuments are managed by Historic Royal Palaces on behalf of the Crown.

1.1.2 To coincide with and help promote awareness of the 500th anniversary of Henry VIII's coronation, Channel 4 has commissioned Videotext Communications Ltd, 49 Goldhawk Road, London, W12 8QP to make a Time Team programme about Henry's life.

1.1.3 The fieldwork at Hampton Court took place between 22nd and 27th March 2009, and was conducted by Oxford Archaeology and Time Team archaeologists.

Geology and topography

1.1.4 The site is situated on the north bank of the River Thames to the west side of a large southern meander and within the floodplain of the river. It is set within a significant area of open ground which is formed by Hampton Court Park and Bushey Park, and which contrasts with the adjacent urban spread of Thames Ditton, Surbiton and Kingston Upon Thames, and so forth, on the opposite bank. The site is relatively flat with a slight slope down towards the river to the south and east, and lies at between *c*. 9 m to 10 m above OD, The underlying geology comprises fine alluvial deposits overlying first Terrace drift geology of the river Thames (Kempton Park Gravels), which in turn overlies London Clay.

Archaeological and historical background

Prehistoric

Ideal for habitation because of its fertile, well drained soil and proximity to the River Thames, the land on which Hampton Court Palace is situated has been settled since prehistory. Archaeological evidence for Neolithic activity has been identified in the surrounding area and by the early Bronze Age settlement and cultivation in this part of the Thames Valley appears to have been widespread.

Roman

1.1.5 During the Roman period agricultural activity along the river was intensive and extensive. It is likely that there were several prosperous Roman estates in the Hampton Court area, possibly connected to fording places.

Medieval

1.1.6 By the time of the Norman Conquest, the manor of Hampton was a rich estate held by Aelfgar, earl of Mercia, one of the most powerful men at the Saxon court.

1.1.7 The wholesale change in land ownership initiated by William the Conqueror on his accession to the English throne in 1066 brought Aelfgar's estates under the control of

the Norman lord, Walter St Valery. Nothing is known of buildings on the site during this early period and the estate seems largely to have been used as sheep pasture. By 1180, however, the Knights of the Hospital of St John of Jerusalem had established a permanent presence on the site later to be occupied by the palace. In 1338 it was recorded that the Hospitaller manor at Hampton was an important administrative centre and records mention a messuage with a chapel, garden and pigeon house. Archaeological evidence also points to a timber barn or great hall and an enclosing moat.

1.1.8 Throughout much of the later 15th century the house was leased out by the Hospitallers. A clause in the associated documentation allowed the leaseholder to make alterations to the manor buildings and, between 1495 and 1500, Lord Giles Daubeney turned the modest structure into a substantial courtier house. Typical of many of the larger medieval houses along the Thames it was ranged around a courtyard with the great hall to the north and an entrance range opposite to the south. Daubeney's house also had a substantial chamber-block, a chapel and kitchen range and is particularly significant because it created the basic footprint for the palace built by Cardinal Thomas Wolsey and Henry VIII.

Late medieval and post-medieval

1.1.9 In January 1515 Wolsey signed a ninety-nine year lease on Daubeney's former property at Hampton Court. Although the sources for Wolsey's building works are patchy we can assume that his rapid rise through the ranks of both the Catholic Church and the political hierarchy led him to search for a private house with which to convey something of his new-found status. He was clearly very proud of his new home, inviting the king and queen to visit just weeks after taking ownership, and he set about enlarging the building almost immediately.

1.1.10 Wolsey's first phase of building work, planned in 1514 and carried out between 1515 and 1522, saw the construction of Base Court with the Great Gatehouse and Inner (now Anne Boleyn) Gatehouse. By building to the west of the existing house, Wolsey broke from the medieval tradition of positioning the main entrance opposite to the great hall and he changed the alignment of the building from north-south to east-west.

1.1.11 A repetition of the history of the palace is not considered to be necessary however a full gazetteer of all archaeological excavations/findspots and aerial observations etc for the area has been compiled (OA, March 2008, Appendix I). Within the areas specifically of interest for this project, archaeological works and building recording has already taken place and has been written up as grey literature reports (see Bibliography). It is not the intention to repeat the findings of these works here, however pertinent conclusions and observations have been presented.

1.1.12 There have been excavations in the Tiltyard and watching brief and evaluation work in the area of the Bowling Alley. There has also been geophysical survey in the area of the former Privy Garden which may have identified the walls of the Bowling Alley. Finally there has been a building recording exercise on the surviving Tiltyard Tower, which is now incorporated into the 'Tiltyard Café' (OA Feb 2005a).

The Tiltyard and Tiltyard Towers

1.1.13 The Tiltyard was built for Henry, who famously had a great love of sports as illustrated by the tennis courts and bowling alleys constructed at the Palace. However the

Accession Day tilts of 1569, during the reign of Elizabeth I, may have been the first time that the Tiltyard was actually used.

1.1.14 The towers would have made poor viewing platforms for large numbers of people, and probably served as a theatrical backdrop for tournaments. They may also have functioned as storage and entertainment areas, and been utilised on occasions as lodgings for courtiers and guests, including ambassadors (Foyle 2001).

1.1.15 Building accounts from 1537 show that 258,000 bricks were used by William Clement to build the Tiltyard wall. Records also show that measurements for the Tiltyard were not taken until 1538, and therefore the exact sequence of events is the reverse of what would be expected. Notwithstanding this detail it is likely that, as a group, the Tiltyard wall and associated towers were conceived and constructed by 1538.

1.1.16 The Tiltyard consisted as a complex of five towers associated with, and mainly located within, a large 4-sided walled enclosure. Apart from the surviving stretches of wall and NE tower little accurate is known of the position and layout of this group of structures.

1.1.17 The only other reference from the Tudor period is in the Pipe Roll account for 1575 – 1576 and refers to 'repairing the five Towers in the Tylteyarde' (Heath 1982). There are no maps from the period showing either the positions or the relationships between the structures within the complex, which means that in terms of appearance and organisation of this group we must rely on later views and the inherent problems of artistic representation and perspective.

1.1.18 Early views are however quite detailed. The earliest representation is Wyngaerde's drawing of 1558 (Plate 9), which depicts the towers in their historical setting. The surviving Tiltyard Tower, now incorporated into the Tiltyard Café is shown with a substantial stair turret with a small entrance facing north, and possibly a small window at the top of the tower. Four faces are shown with that to the north providing access, and its height suggests it was also possible to gain access to the roof. It is possible that the Tower was octagonal in plan and internally circular, and that some artistic licence has been employed. Some of the same detail is also represented on the drawing prepared for Cosimo III de Medici (Plate 10).

1.1.19 In both early images the NE tower is shown straddling the wall that divided the Tiltyard from the Great Orchard, with the bulk of the footprint of the structure on the eastern side of the wall. This may indicate that the two easternmost towers were orientated more towards the Great Orchard than towards the Tiltyard. If this is the case, it suggests an earlier construction date and perhaps a function as herbers to embellish Cardinal Wolsey's Great Orchard (Thurley 2003). No definitive physical evidence for this was found during the building recording investigation (OA 2008).

1.1.20 By 1700 all but the surviving tower had either fallen or been demolished and the former tiltyard was subdivided into gardens.

1.1.21 Until the end of the 19th century the tower was two storeys in height. At a date after 1898 the internal layout was reconfigured to accommodate three floors within the existing shell. This major phase of activity is probably associated with the conversion of the tower into a tea-room after 1923. In 1932 and 1964 the tea-rooms were extensively enlarged and rebuilt and in 1994-1995 the 1964 building was modified.

Acknowledgements

1.1.22 OA extends its thanks to all from Time Team for cooperation and support throughout the duration of the project.

1.1.23 OA wishes to thank all from Hampton Court Palace for assistance and patience during the project, particularly the smokers whose facilities were diminished by the Bowling Alley excavations within the Smokers Garden.

1.1.24 The excavation was carried out over four days by Ben Ford (Project manager), Dan Sykes (Project Officer), Jacek Gruszczynski (Supervisor), Becky Griffin and Emily Plunkett (Assistant Supervisors) of Oxford Archaeology, and Phil Harding, Matt Williams, Tracey Smith, Faye Simpson and Hana Lewis of Time Team. On site finds supervision and coordination was carried out by Kate Brady (Project Officer, OA), and Tori Wilkinson (Supervisor, OA) conducted the survey.

2 Evaluation Aims and Methodology

Aims

2.1.1 The overall aims of this archaeological project were :

- Where possible to preserve the archaeological resource *in situ*,
- To preserve by record all archaeological deposits which fell within the impact levels of the scheme;
- To continue to establish (and test our understanding of) the character, extent and phasing of the various historical surfaces,
- To produce initially a client report and full archive and if the results warrant it, propose an Updated Project Design, which will eventually make the results of the investigation available through publication.

2.1.2 In addition, all the methodologies relating to the archaeological works listed below aimed to:

- Seek to recover artefactual and ecofactual evidence for the use of the areas of the Bowling Alley and Tiltyard from all periods encountered
- Recover ceramic evidence to help to develop a pottery chronology and typology.
- Recover clay pipe evidence to help to develop a clay pipe chronology and typology.
- Recover bricks to enhance and develop the brick typology of Hampton Court
- Recover architectural worked stone and architectural terracotta pieces by context and location to understand the nature of the standing buildings from which these would have derived, and to understand the processes by means of which they were deposited.

Methodology

2.1.3 Four separate archaeological methods were implemented. Each is set out below, together with the justification for using each method.

2.1.4 OA's standard fieldwork methodologies were used except where superseded by the site specific methodologies outlined below.

Method 1 - Geophysical Survey

2.1.5 Geophysical survey was carried out by GSB Prospection Ltd within the selected areas of the site (GSB 2009). The survey area was divided into a grid of 20 m x 20 m squares and sampled at 0.25 m intervals and 1 m transects (resistance meter). For the resistivity survey an RM15 resistance meter was used. For the ground penetrating radar survey the instrument used was a Noggin Smartcart Plus with 250 MHz Antennae, in transects, typically 1.0 m / 0.5 m apart. A Bartington field coil was used for testing magnetic susceptibility where deemed appropriate. This work was conducted by Dr John Gater, Director of GSB Prospection Ltd and was carried out according to English Heritage Professional Guidelines on *Geophysical Survey in Archaeological Evaluations* (David 2008) and the Institute of Field Archaeologists Paper No 6 (Gaffney, Gater and Ovenden 2002).

2.1.6 The results were analysed using a mixture of GSB and commercial software. The plots were overlain on modern survey plans of the area.

Method 2 - Mechanical ground reduction

2.1.7 All plant movements within the monument were conducted so as not to damage extant surfaces, gardens etc. This required the use of boards on which to track vehicles and plant to areas of work.

2.1.8 Turf, topsoil, and the backfill of modern service trenches and other modern (19th-century) deposits were removed in spits no greater than 0.10 m in depth, down to the level of the first significant archaeological horizon using mechanical excavators fitted with toothless ditching buckets and operated by experienced drivers. This work was carried out under archaeological supervision.

2.1.9 The relatively low archaeological potential of these deposits did not justify hand excavation or very detailed recovery of all finds.

Method 3 - Machine Assisted Excavation with controlled recovery of finds

2.1.10 It was deemed appropriate that some of the deposits beneath the modern levels were for removed individually or in groups of contexts by means of mechanical excavation.

2.1.11 These layers included redeposited masonry and brick, and dump layers associated with the making up of ground levels. The 'dumped' nature of these deposits meant that detailed hand excavation would have provided little added value in terms of information recovered. However, there was high archaeological potential in the finds (particularly architectural finds), which justified close control of the machine work and careful finds collection and recording.

2.1.12 The mechanical excavator was fitted with a narrow 3 foot wide toothless bucket and excavation was completed in spits no more than 0.05 m deep. The mechanical excavation was undertaken under the complete control of qualified archaeologists.

2.1.13 This method required very close archaeological supervision, and monitoring of the deposit for the extraction of finds, particularly all worked architectural stone and pieces

of architectural terracotta. Care was taken to retain the integrity of each architectural piece, and hand excavation of vulnerable deposits was used where appropriate.

2.1.14 All finds were recorded by reference to the context from which they were recovered.

Method 4 - Hand Excavation

2.1.15 Where significant archaeological surfaces, occupation deposits, structures and discrete archaeological features were encountered these were excavated by hand.

2.1.16 These archaeological contexts were of high potential and were part of a scheduled site, Hampton Court Palace, which is of international importance. Detailed hand excavation, recording and recovery of finds was therefore essential.

2.1.17 After hand cleaning, all archaeological structures and deposits were hand-drawn at the appropriate scales. Some structures were also recorded by means of geo-rectified photography (see methodology 2.1.22 below).

2.1.18 Artefact assemblages were recovered by context by hand to assist in dating the stratigraphic sequences and to obtain ceramic assemblages for comparison with other sites. The finds provide an invaluable contribution for the interpretation of the functions and activities taking place on, and off, the site, as well as revealing aspects of trade and economy. All artefacts were retained from excavated contexts unless they were of recent origin. In these cases sufficient of the material was retained to date and establish the function of the feature.

Provision for protection of archaeological deposits *in-situ*

2.1.19 Any areas of archaeology that were left *in-situ* after the excavations had been completed were fully planned, recorded and described on context sheets, and levels taken. Where sections were available these were also drawn. All drawings were tied to the Ordnance Survey grid and Ordnance Datum.

2.1.20 Upon completion of the archaeological works the remaining archaeology had to be preserved *in-situ* and protected from compaction/compression from plant movements or any other potentially damaging activity.

2.1.21 To avoid potential damage by plant to exposed archaeological deposits, all backfilling was to be undertaken by plant positioned away from the excavated areas. Infilling was then to progress across the already backfilled areas until the process of backfilling was completed. No plant was allowed to track or move across any area revealed by the archaeological works unless it was on a base/sub-base that offered protection from compaction and/or compression. Backfilling was supervised by qualified archaeologists to ensure that *in situ* remains were protected.

Photogrammetrical recording of Significant Structural Evidence

2.1.22 Georectified photography was utilised to photograph structural features such as walls and culverts as well as any exposed areas of historic surfacing i.e. cobbles. The photos were then processed and merged together to produce a large image of the whole feature etc. This method produced a highly accurate digital record more rapidly than than is the case with hand-drafted plans.

Other Recording and finds retrieval

2.1.23 All on-site recording was undertaken in accordance with the requirements of the *OAU Field Manual* (ed. D Wilkinson 1992).

2.1.24 Plans were normally drawn at a scale of 1:20. Detailed plans were drawn at an appropriate scale. Long sections of trenches showing layers were drawn at 1:20. Sections of features or short lengths of trenches were drawn at 1:20 or 1:10. All sections and plans were tied to Ordnance Datum and the site grid.

2.1.25 All finds and samples were treated in line with standards agreed in advance with the approved recipient museum. These were exposed, lifted, cleaned, conserved, marked, bagged and boxed in accordance with the guidelines set out in UKIC's *Conservation Guidelines No. 2*. Metal objects were X-rayed and then selected for conservation.

3 RESULTS

Introduction and presentation of results

3.1.1 All trenches, with the exception of Trench 5, yielded archaeological deposits and artefacts. Trenches 1 – 3 were sited to investigate the Bowling Alley, and trenches 4 – 8 to investigate the Tilt Yard towers.

3.1.2 The reported results of the archaeological investigations are organised by trench with descriptions of the archaeological deposits presented in a stratigraphic sequence. The descriptions are followed by a summary of results of the analyses of artefacts retrieved during the evaluation.

Trench 1 (Figs 3-4)

3.1.3 A clean silt-sand deposit, (113), possibly natural, was encountered at 8.26 m OD and excavated to a depth of 0.19 m. This deposit was cut by a N-S aligned trench containing a trench-built foundation 127, which consisted of a conglomeration of brick and mortar and measured 0.94 m wide. Most of its visible upper face was screeded to a level surface (Fig.4).

3.1.4 A sondage, measuring 1.80 m N-S x 0.70 m E-W, was excavated to the east side of foundation 127. This revealed layer 126, which was a similar deposit to 113, and also possibly natural. Layer 126 was found below the base of foundation 127 at 7.94 m OD. Layer 126 was cut by a pit [125] filled with greensand rubble. Pit 125 was not excavated.

3.1.5 A N-S aligned brick wall 109 was built on foundation 127. The wall was constructed of red bricks which measured 260 mm x 120 mm x 60 mm (10¼ in x 4¾ in x 2¾ in) and which were bonded with a creamy lime mortar. Wall 109 was generally 0.4 m wide, but its lowest three courses, which were located off-centre on foundation 127, measured 0.52 m wide and 0.20 m high. The offset to the east side of the wall was 0.10 m wide, and that to the west was 0.30 m wide. There was a further offset between the brick wall itself, and its lowest three courses.

3.1.6 Within the sondage to the east, a rectilinear cut, [120], truncated both pit 125 to the north and a sand-silt deposit (111) to the south. The latter deposit contained frequent inclusions of greensand fragments. Cut 120 measured 1.10 m wide N-S x > 0.70 m E-W and contained the remains of a further foundation 115, which consisted of large chalk blocks overlain by smaller chalk fragments, bonded with lime mortar. This appears to have abutted foundation 127 to the west and continued beyond the edge of excavation to the east (Fig.3).

3.1.7 In the SW corner of the trench a further sondage, measuring 1.25 m E-W x 0.70 m N-S was excavated against the extant garden wall, which marked the W end of the trench. A possible natural silt-sand deposit, (122), was encountered below 8.45 m OD. This was cut by a N-S aligned linear [124], which revealed the base of a similarly aligned brick wall at its western edge at the extreme W end of the trench. A small patch of early brickwork [129] was identified within this wall alignment. This early brickwork survived to a height of 4 courses (0.26 m) and was at least 0.30 m long; it continued into the section to the north. Brickwork 129 was built of orange/red bricks measuring 225 mm x ? x 40 - 50 mm (8 7/8 in x ? x 1 5/8 - 2 in) which were bonded with a hard, double-struck, lime mortar (Fig.3). This had been incorporated into the overlying wall 130 for which [124] appears to have been the construction cut.

3.1.8 Wall 130 measured 0.55m in height and consisted of 8 courses of brickwork. The bricks were orange/red in colour, measured 150 mm x >60 mm x 45-60 mm (5 7/8 in x >2 3/8 in x 1 3/4-2 3/8 in), were roughly pointed with a cement mortar with chalk and CBM inclusions and were randomly bonded. It was abutted by the fill (121) of cut [124].

3.1.9 At the eastern side of the trench, rubble deposit 107, which tipped from the SE, sealed the foundation 115 and abutted wall 109. The western edge of wall 109 was abutted by deposit 119 and the truncated wall was sealed by levelling deposits (contexts 104, 105 and 108) (Fig.5).

3.1.10 A N-S aligned cut [112] just west of wall 109 formed the E edge of a linear feature with a rubble-fill which ran across the middle of the trench. Its western edge was possibly the N-S cut [123] revealed in the sondage in the SW corner of the trench (Figs 3 & 4, section 101). If cuts 123 and 112 were the opposite edges of the same feature this would mean that the feature was some 4.35 m wide.

3.1.11 Wall element 131 overlay Wall 130 and was offset by 60 mm to the west. A fairly solid mortar and brick rubble deposit (117) abutted the upper courses of Wall 130 and provided a construction horizon for the overlying wall. Wall 131 consisted of 8 courses of bricks overlain by two further courses which were offset by a further 80 mm to the west. Wall 131 measured 0.68m in height and was constructed of orange/red bricks which measured 205-215 mm x >80 mm x 40 – 55 mm (8 - 8½ in x >3 1/8 in x 1½ - 2¼ in).This was randomly bonded with a poorly pointed light grey cement mortar (Fig.3). Rubble deposit 103 abutted wall element 131, extending eastwards from the wall and a similar rubble levelling deposit (104), covered the eastern part of the trench.

3.1.12 The trench was then sealed by subsoil/buried topsoil (102), which also abutted Wall element 131. Above 131, a further Wall element, 132, continued upwards with a further offset 0.66 m above the previous one. This consisted of orange/red/brown bricks which measured >150 mm x 60 – 110 mm x 45-55 mm (>5 7/8 in x 2 3/8 - 4¼ in x 1¾ -2¼ in) and were irregularly bonded in a mismatch of lime and cement mortars. Two courses of 132, however, appear to be pointed with penny-wheeled lime mortar. Topsoil (101) sealed the trench.

Trench 2 (Figs 3 &, Section 201; Plate 1)

3.1.13 Natural gravel 218 was observed below 8.25m OD. Wall foundation 210 was built on this natural gravel. Where exposed within a sondage on the east side of the wall, 210 consisted of a rough base of brick rubble and lime mortar which measured 0.70 m deep was at least 0.6 m wide and was revealed for a length of 1.46 m. A brick course set back between 80 and 100 mm from the edge was laid on the foundation. Above this

course was a further course of bricks offset by 60 mm and measuring 0.40 m in width . The two courses were constructed from red bricks which measured 260 mm x 150 mm x 70-80 mm (10¼ in x 5 7/8 in x 2¾ – 3 1/8 in) and were bonded with a grey/white lime mortar.

3.1.14 A compacted surface (211) abutted the western side of wall 210 up to its upper extant course. Surface 211 consisted of crushed brick and mortar and extended beyond the limit of excavation to the north and west. Overlying 211 was a sand-silt layer containing rubble (214). This in turn was truncated by the construction cut [204] for well 203.The well was constructed from yellow stock bricks measuring 200-230 mm x 100 mm x 60 mm (7 7/8 – 9 in x 4 in x 2 3/8 in) which were bonded with a hard yellowish mortar and capped with a pair of stone slabs (Plate 1).

3.1.15 A redeposited brickearth (205), 0.90 m thick, abutted and partly overlay Wall 210 to the east. Cut into this was an E-W aligned linear feature [206], the fill (208) of which was a grey sandy silt with CBM and mortar inclusions. This feature was sealed by a subsoil deposit (202) which spread across trench. Layer 202 was truncated by a garden feature [213] in the NW corner of the trench. Topsoil (201) sealed the whole trench.

Trench 3 (Figs 3 & 5, Section 300; Plates 2-4)

3.1.16 The earliest element encountered in Trench 3 was a N-S aligned brick and mortar built foundation [306], on which wall elements [305] and [304] were laid (Fig. 5, section 300; Plate 2). Foundation 306 was exposed only on the eastern side of wall 305 at the southern end of the trench (Fig. 3). It extended 0.25 m to the east of the line of the wall, and ran beyond the ends of the trench to both north and south. Its surface was at 8.30 m OD.

3.1.17 The lower element of the overlying brick wall [305] was three courses high (0.20 m) and 0.52 m wide. It was constructed from orange/red bricks which measured 250-255 mm x 120 mm x 50-55 mm (9 7/8 -10 in x 4¾ in x 2 - 2¼ in) and bonded with a creamy lime mortar in alternate header and stretcher courses.

3.1.18 The upper wall element [304] was stepped in from the edge of 305 on both sides and measured 0.40 m in width. A single course of 304 survived. The bricks matched those of 305 in size although they appeared more purple in colour.

3.1.19 Redeposited dirty brickearth deposits (312) and (318) abutted the east side of the wall elements.

3.1.20 The trench was extended to the E at both north and south ends,to reveal a pair of rectangular construction cuts adjacent to wall 305. To the south, cut 308 was exposed in plan and contained a chalk, greensand, tile and brick rubble foundation [307] (Plate 4). To the north, cut 317 contained a similarly constructed foundation [309]. However, the latter supported elements of a brick-built buttress [311], which had survived later robbing and/or demolition activities.

3.1.21 The lower two courses of buttress 311 sat directly upon foundation 309 and although heavily truncated would have formed a rectangular base measuring 1.20 m E-W and 1.0 m N-S. It was two brick courses high. A further single course of bricks [310] was set in from the edge of 311 by 100 mm on the eastern edge and by 40 mm on the north and south edges (Plate 3). This would have provided a rectangular base 1.10 m E-W and 0.92 m N-S. The bricks forming both 311 and 310 were red in colour and measured 225 mm x 102 mm x 55 mm (9 in x 4 1/8 in x 2 7/8 in) and were bonded with a creamy lime

mortar. A localised pit/robbing episode [315] had removed much of 311 and 310 adjacent to wall 304/305.

3.1.22 At the southern end of the trench, a sand-silt deposit (313), which abutted wall 305, appears to have been truncated by robber/demolition cut [314] which effectively removed wall 304 throughout the trench (Fig. 5, section 300). A rubble layer, (303), consisting of roof tile, brick and floor tile was overlain by subsoil (302) and topsoil (301) to complete the stratigraphic make-up of Trench 3.

Trench 4 (Fig. 6; Plates 5-6)

3.1.23 The lowest recorded deposit in Trench 4 was 409, a naturally deposited gravel layer, which was observed below 9.47m OD. This had been cut along the length of the eastern side of the trench by construction cut 411 (Fig. 6, plan; Plate 6). Within this cut, which was not bottomed during fieldwork, a N-S aligned brick-built foundation 406 was exposed to a depth of 0.60m.The face of the foundation was laid as brick headers only, measuring 95 mm x 40 mm (3 ¾ in x 1 ½ in).These red bricks were bonded with a yellow-white lime mortar, which was not pointed. The construction cut was backfilled with a grey-brown sandy-silt with frequent lime mortar inclusions (410).

3.1.24 Above foundation 406, was a 0.06 m thick layer of hard light grey lime mortar 412. Over the mortar layer was a further levelling deposit of broken brick and roughly hewn lumps of chalk and greensand (413) This layer was 0.10 m in depth.(Fig.6, section 400)

3.1.25 Overlying 413 and following the N-S orientation of foundation 406, was a brick-built wall 404. This wall consisted of red bricks which measured 210 mm x 100 mm x 45mm (8 ¼ in x 4 in x 2 in) and was bonded with a yellow-white lime mortar.

3.1.26 Layer 407, a yellow-brown silt-sand containing charcoal and inclusions of ceramic builsing materials (CBM), abutted the lower courses of wall 404, layers 412 and 413 as well as the foundation 406.This layer was cut at the northern end of the trench by a construction cut [401] for a brick-built drain [402] which was aligned E-W. Drain 402 was constructed of yellow bricks which measured 220 mm x 65 mm x 110mm (8 5/8 in x 2½ in x 4¼ in) (Plate 6). An electrical service trench was observed running down the western edge of the trench. Topsoil 400 sealed the trench.

Trench 5

3.1.27 In Trench 5, sand-gravel deposit (503) probably represented the natural. This was overlain by subsoil (502) comprising yellow-brown clay sand 0.40m deep. This in turn was overlain by hogging and tarmac (501) and to the west side of the trench by garden soil (500).

Trench 6 (Fig. 7, Plates 7-8)

3.1.28 The main rectangular trench (5 m x 3 m) was extended by small sondages at its NW and SW corners. At the base of the NW sondage (Fig. 7; Plate 8) at 7.60 m OD, a loose rubble deposit (623) was observed though not excavated. This was overlain by a solid conglomeration of similar material bonded with lime mortar [621], which probably represented the remains of a substantial foundation. The top of this foundation was at 8.40m OD, and it was at least 0.70 m deep. The foundation appears to have been aligned N-S and to have extended to the west beyond the limit of the trench. It appears that the face of the foundation had been cut away by subsequent robbing and although no cut was defined the robber trench [630] appears to have been aligned N-S and

continued along the face of 621 to north and south. It continued into the edge of the sondage to the S. The robber trench [630] was not bottomed. Cut 630 was backfilled with a yellow-brown clay silt (622), and this was sealed by a deposit of firm yellow sand-clay (628).

3.1.29 In the SW sondage (Fig.7, Plate 7) a loose yellow-brown sandy clay (627) was recorded below 8.15m OD and continued below the base of excavation at 7.83m OD. This layer was overlain by a compacted yellow sand-clay deposit (629). A linear robber cut [618] with near vertical sides and aligned N-S cut these deposits. The cut was filled with a compact brick and mortar rubble deposit (620) with an upper fill of dark yellow-brown clay sand (619). No continuation of the footing 621 found in the NW sondage was located. It would seem that if it had continued this far it had been totally robbed out subsequently.

3.1.30 The compacted yellow sand-clay deposit (629) mentioned above spread across the whole trench at about 9.50m OD, and was cut by 5 parallel-sided linear cuts aligned E-W (Fig. 7). From north to south these contemporary cuts and fills were:[615]/(614); [613]/(612); [611]/(610); [609]/(608) and [607]/(606). Both 609 and 613 were sampled. The features were all very similar and were greater than 3.00 m long, between 0.75 m and 0.85 m wide and less than 0.35 m deep, with mid grey-brown clay sand fills (Fig. 7, section 600).

3.1.31 A brick and mortar rubble deposit (604) sealed these features to the west of the trench and this deposit was in turn overlain by a brown-orange sand-clay with frequent rubble inclusions (603). Subsoil 602, a dark-orange brown clay silt sealed layer 603 and was itself covered by a friable dark grey brown loam topsoil (601). A modern electrical service [625]/(624) was recorded running along the western edge of the trench.

Trench 7 (Fig.8)

3.1.32 A naturally derived orange brown sand clay (720) was recorded at 9.70m OD. A series of rectangular or sub-rectangular pits [709, 714, 712, 707, 716 and 718] was recorded cutting through this deposit;

3.1.33 Pits 709 and 714 were both rectangular and aligned E-W and located near the south edge of the trench. Pit 709 had a flat base and near vertical sides. The fill was a friable brown sand clay with 20% CBM and mortar inclusions (710) . Pit 714 had gently curved concave sides and base and was slightly truncated on its north side by pit 707.

3.1.34 The 4 N-S aligned pits [712, 707, 716 and 718] on the north side of the trench all extended beyond the N edge of the trench. Pit 712 at the east end of the trench was rectangular and filled with a friable brown sand clay with inclusions (713) similar to layer 710 in pit 709. Pit 707 was sub-rectangular, and filled with grey brown sand clay fill with CBM and mortar inclusions (708). Pits 716 and 718 were both unexcavated, but the fills of each, (respectively 717 and 719) were apparently similar in character to 710 in pit 709.

3.1.35 On the southern side of the trench a layer of brick rubble (705) overlay pit 714. Layer 704 was sealed in turn by a thin lens of orange brown sandy clay (706). Both of these deposits and indeed all the previously described features within Trench 7, were truncated by a large E-W aligned linear cut [703]. Only the S edge of this feature was located close to the S edge of the trench. In section the cut had a 60-70% slope, was 0.55 m deep with a slightly undulating base. The cut extended beyond the northern limit of the trench, and contained two fills: the lower fill 711 was a fairly sterile brown silt clay

with occasional charcoal and CBM flecks and formed a 0.44 m thick deposit; the upper fill 704 was a darker brown silt clay and contained 10% CBM and mortar inclusions.

3.1.36 A layer of topsoil (702) sealed the fills of feature 703, and was sealed by the overlying stone patio surface and make-up deposit (701).

Trench 8 (Fig. 9)

3.1.37 A probable natural brown orange clay sand deposit was recorded at 9.40m OD. Into this layer had been cut a series of parallel E-W aligned linear features: From north to south [805], [807], [809] and [811].The fills of these features (respectively 804, 806, 808 and 810) were all virtually identical and comprised friable mid brown grey clay sands with inclusions of gravels and charcoal flecking. Cut 809 was sampled and recorded as having an irregular concave base with steep, irregular sides measuring 0.87m wide and 0.24m deep (Fig. 9, section 801).

3.1.38 Sealing these features was a mid orange brown clay sand (803), 0.24m in depth. This layer was overlain by the subsoil (802) which was in turn overlain by topsoil (801).

Finds summaries

3.1.39 Summaries of the finds reports follow. The full reports can be found in Appendix B.

Pottery *By John Cotter*

A total of 179 sherds of pottery weighing 2.874 kg. was recovered from 30 contexts. All is of post-medieval or late post-medieval/modern date. Pottery types of the 17th to the 20th century are represented.

3.1.40 In terms of volume most of the pottery here is 19th century in date and mainly comprises ubiquitous Staffordshire-type mass-produced white earthenwares including blue transfer-printed wares. The other main class here is common garden flowerpot in red earthenware or terracotta. Most of these are clearly of 19th- and even 20th-century date. The latter include a machine-made 20th-century flowerpot (context 201) with a partially surviving stamp on the rim - apparently a royal logo or monogram with the initials 'E' and '[?missing]' separated by a stylised crown. Most probably - in view of the late-looking pot - this is the 'ER' monogram for Queen Elizabeth II. The only other notable piece in the assemblage is a smallish sherd of post-medieval red earthenware (PMR) in a similar fabric to the 19th-century flowerpots (context 601). This is unglazed and clearly from a large vessel. The internal surface is covered with a thin film of brushed white slip (liquid clay) - a technique that is absolutely typical of later 18th- and 19th-century sugar-making cones or moulds.

3.1.41 The smaller 17th- and 18th-century assemblage comprises domestic wares (dishes, jars, bowls, pipkins or small saucepans) commonly found in the London area and south-east England generally. These mainly comprise post-medieval glazed red earthenwares (PMR) including vessels similar to products of the 17th-/18th-century kilns at Woolwich. Also tin-glazed ware (TGW) tablewares and storage jars probably produced at various potteries along the Thames in London and green- or yellow-glazed 'Border' whitewares and redwares produced at potteries along the Surrey/Hampshire border. A few other minor regional and rarer imported types (German stoneware, Chinese porcelain) are also detailed in the catalogue.

Clay tobacco pipes *by John Cotter*

3.1.42 The excavation produced a total of 75 pieces of clay pipe weighing 336 g from 21 contexts. The assemblage is generally in a fairly poor condition consisting almost entirely of fairly short pieces of pipe stem (69 pieces) with only four pieces of bowl and two mouth pieces. Many pieces show slight abrasion although individual pieces can be in a fresh condition. A few pieces are burnt and may derive from ash rakings from domestic bonfires or hearths perhaps scattered in the garden. The predominance of short stem pieces and the obvious presence of earlier material in 19th-century contexts (dated by pipes or pottery) reinforces the impression that much of the assemblage is residual in its contexts.

3.1.43 Material of the 17th to 19th century is present. Datable bowls include a fresh but broken bowl of *c.* 1660-1680 residual in a 19th-century context (603) and a bowl profile of *c.* 1730-1780 which has an unclear maker's mark on either side of a broad circular heel (context 107). The two other bowls are represented by smallish residual fragments of 17th- and 18th-century date. One 17th-century stem has traces of Dutch-style milled decoration around the stem (202) and another 19th-century stem has rows of small pellet decoration probably leading up to a now-missing maker's name on either side of the stem (800).

3.1.44 Most contexts are dated by pipes to the 18th or 19th centuries. Only two contexts (201 and 604) are dated to the 17th century but even here the later pottery dates indicate that the pipe from context 201 is residual. A mouth piece datable to the 17th or early 18th century, however, is in broad agreement with the pottery date for context 605, and some of the 18th- and 19th-century pipes are broadly contemporary in their contexts.

Glass *by Ian Scott*

3.1.45 The glass assemblage comprises 79 sherds, more than half of which are window glass sherds.

3.1.46 Much of the glass is unstratified or from modern contexts, and most is of 19th- or 20th-century date. No context produced significant quantities of glass.

3.1.47 The window glass is predominantly post-medieval glass, comprising sherds with slightly irregular surfaces and variations in colour and thickness. There are some more modern sherds, including float glass.

3.1.48 The largest quantity of window glass came from Trench 3, and most came from context 303 – a rubble layer sealed below the topsoil and subsoil - and amongst the glass from this context was a group of 10 blue green sherds from diamond-shaped quarries, with some evidence for leading on their edges. These sherds varied a little in thickness and the colours were slightly variable. They are of post-medieval date and could very well come from the 16th-century palace.

3.1.49 The vessel glass is dominated by wine bottle sherds (n = 22). The wine bottle sherds include thick walled sherds from late 17th- or early 18th-century bottles from contexts 119 and 710. The wine bottle sherds from context 303 are probably from late 18th- or early 19th-century wine bottles. There are modern wine bottle sherds from contexts 201 and 202. Most of the other wine bottle sherds are undiagnostic and cannot be dated closely. Trench 1 produced part of a perfume bottle embossed with a partial inscription reading (line 1) ' . . . RIE FARINA / (line 2) ' . . . HIN No. 2'. This is almost

certainly a bottle of the firm of Jean Marie Farina, founded in Cologne in 1709. This firm marketed and popularised 'Eau de Cologne'. In 1837, Queen Victoria granted a Royal Warrant to Jean Maria Farina of Cologne was as 'purveyor of Eau de Cologne to Her Majesty'.

Metalwork b*y Ian Scott*

3.1.50 The metalwork assemblage from the Tilt Yard excavation is quite large at 201 items, but this total include 91 nails and 43 pieces of lead waste, both offcuts and melted waste.

3.1.51 The metal finds are largely unstratified, and most need date not earlier than the 19th century. The assemblage comprises the general scatter of lost and broken objects that would be expected in a garden soil.

Architectural stonework *by Alison Kelly*

3.1.52 There are 4 stone samples, all from Bowling Alley trenches. The earliest piece was a sample of limestone rubble from a mid 18th-century (context 107) in Trench 1. There is one fragment of worked Reigate sandstone stone (context 110) also from Trench 1.Two pieces were from topsoil (context 301) in Trench 3, and are probably natural. They comprise a piece of shelly limestone and a fragment of slate.

Bricks *by Alison Kelly*

3.1.53 There are 39 brick samples recovered from 11 different contexts in Trenches 1, 4, 6 and 7. Of these samples 17 were suitable for further analysis (Table 1). The remaining fragments are too small for analysis or had no finished surfaces. The latter are from the following contexts: (103) - 1 fragment; (403) - 1 fragment; (603) - 2 fragments; (605) - 2 fragments; (608) - 1 fragment; (710) - 8 fragments; (715) - 7 fragments.

Table 1: Catalogue of analysed brick samples

Ctx.	Ref.	Size (mm)	Notes	Date/Type
103	BM1	(65) x 100 x 61	Fragment of pale orange coloured brick with large stone inclusions. Hole in one corner - poss clay pipe or organic frag?	Late17thC/ early 18thC
103	BM5	(105) x 115 x 60	Frag. of wine coloured brick with blue grey glaze.	1500-1800
107	BM1	(110) x 98 x 54	Frag of orange/rose coloured brick with rough arrises and mixed stone inclusions	1500-1800
107	BM5	(105) x 110 x 55	Frag of wine coloured brick with vitrified header. Mortar is cream coloured with lime and laid 17mm thick.	18thC
107	BM5	225 x 105 x 51	Whole orange coloured brick with traces of cream coloured lime mortar. Upper face has sandy inclusions, all other faces creased and roughly formed.	Henrician - 16thC. Prob Type C or D
107	BM5	223 x 109 x 51	Whole brownish orange coloured brick. Upper face has strike marks and sunken margins. Prob internal as one header has render on with a thin layer of plaster/limewash on top.	Henrician - 16thC. Prob Type C or D
109	BM6	219 x 110 x 58	Whole brownish orange coloured brick. Upper face has strike marks and sunken margins. Mortar is hard and cream coloured with lime inclusions.	Henrician - 16thC. Prob Type C or D

400	BM6	(100) x 100 x 63	Frag of wine coloured brick with hard cream coloured lime mortar.	1500-1800
603	BM3	(65) x 98 x 60	Frag of wine coloured brick with hard cream coloured lime mortar.	1500-1800
603	BM3	155 x 78 x (55)	Frag of orange/rose coloured brick. This brick is moulded and has a deep indent running along one stretcher. This has not been cut but formed as lip at one end, rub marks on one face. Inside of brick has been gouged out with finger marks within the clay. Unknown use and date but prob early in date as very roughly formed.	1500-1900
605	BM4	(140) x 103 x 54	Fragment of rose coloured brick with friable cream coloured lime mortar.	16th/17thC
605	BM4	(110) x 101 x 52	Fragment of rose coloured brick with friable cream coloured lime mortar. Darker orange clay particles within mix, poss poor puddling.	1500-1800
605	BM4	(60) x 108 x 58	Frag of brown coloured brick with hard cream coloured lime mortar. Header partially covered with pale green glaze.	16thC
605	BM6	(110) x 105 x 52	Frag of orange coloured brick.	16thC
620	BM6	(95) x 107 x 54	Frag of wine coloured brick with pale green glaze/vitrified header.	16thC
620	BM6	(145) x 104 x 55	Frag of orange/brown coloured brick with large quantity of gritty inclusions.	Henrician - 16thC. Prob Type C or D
620	BM6	(145) x 106 x 55	Frag of orangey red coloured brick.	Henrician - 16thC. Prob Type C or D

3.1.54 Documentary evidence indicates that bricks were made on-site for Wolsey's building works, but that during the later phases of Henrician work bricks both made on-site and brought in from outside makers.

3.1.55 Three whole bricks from the Bowling Alley appear to be of Henrician date and of Types C and D. The other bricks from Trick 1 include bricks of 18th-century date and others that cannot be closely dated.

3.1.56 Nine fragments of brick came from Tiltyard Trench 6. These include bricks of Henrician date (Types C and D), some early 18th-century glazed bricks and other of uncertain post-medieval date.

3.1.57 The single sample from Tiltyard Trench 4was of uncertain post-medieval date (*c* 1500-1800).

Assessment of *in situ* brickwork revealed in evaluation trenches *by Alison Kelly*

3.1.58 Trench 1 - Bowling Alley: Wall 109 - Size matches with Wolsey type A brickwork; Walls 129, 130, 131 and 132 - unable to compare with typology without full measurements. The bowling alley was probably constructed of Type C or D Bricks so it would be safe to say any brickwork associated with the bowling alley are probably Type C or D.

3.1.59 Trench 2 – Bowling Alley: Wall foundation 210 - abnormally large brick, comparable to medieval great bricks. Possibly reused? Wall 203 - yellow stock bricks. The colour suggests that these bricks are probably late 17th-/early 18th-century London stock bricks, with some cut smaller to fit.

3.1.60 Trench 3 - Bowling Alley: Wall 305 - large stretcher measurement and orange colour suggests Type A Wolsey phase bricks. Possibly reused? Walls 310 and 311 - size and colour comparable with Henrician Type C and D bricks. Early 16th century.

3.1.61 Trench 4 – Tiltyard: Foundation Wall 406 and Wall 406 - Unusually small depth/thickness measurements with no match. The assumption is that these bricks from wall 406 are Type C as used in the construction of the standing tiltyard tower, but that the depth was measured incorrectly due to overlapping mortar, access or erosion of the arrises; Drain 402 - Yellow stock bricks. Appear similar to those in tTrench 2. Size fits with type Q Malm bricks (late 18th/19th century).

Ceramic building materials (CBM) excluding bricks *by Alison Kelly*

3.1.62 A total of 94 sherds of tile weighing 16.9 kg were recovered from 18 different contexts. Most of the assemblage consists of fragments of plain roofing tile with some samples of glazed floor tile and a smaller quantity of other CBM.

3.1.63 Roof tile with a total of 68 samples is by far the largest category of CBM from this site. The samples all appear to be rectangular in form with, where visible, two nail holes near the upper end. All nail holes are circular with diameters ranging from 12 mm to 18 mm, except one piece from context 603, which has a square nail hole.

3.1.64 Floor tile - 14 pieces of floor tile were recovered, although none were complete. The majority of pieces were fragments of Flemish style 'black and white' which consists of glazed tiles of varying colour, quality and execution. Two fragments of tile with a solid bright green glaze were found in contexts 103 and 307. The colour is unusually bright in comparison to other samples from the period seen by the author on other projects at Hampton Court Palace. Two fragments of unglazed floor tile were recovered; one from context 202 is, at 45 mm, deeper than the other pieces in the assemblage and is probably of 18th-/19th-century date. Another piece is 26 mm deep and probably an unglazed Flemish style tile.

3.1.65 Only 6 fragments of tile were recovered which were not either floor tile or flat roof tile. There is a fragment of pantile from context 202 probably of 18th-century. The remaining fragments are all of curved ridge tile (contexts 107, 202 and 214). These are of uncertain date but one piece from context 107 appears early in date. One fragment of cream coloured tile was recovered from modern topsoil (context 601) and appears to be a modern bathroom tile probably dating from the 20th century.

Mortars and plasters *by Alison Kelly*

Table 1 Mortar samples

Ctx.	Ref.	Notes	Phase
103	Misc. 1	Hard solid mortar with gritty texture. Cream coloured with small stone and lime inclusions. Flat surfaces and pigmentation suggest used within brick wall. Prob. post Tudor.	19th-century rubble layer
107	Misc. 1	Hard mortar with small stone and lime inclusions. Pale cream in colour. Small frags. of red brick to one side. Prob. post Tudor.	1730-1780+
109	Misc. 1	Friable mortar with mixed size lime inclusions. Pale greyish cream in colour and similar to other mortar samples from around this date seen elsewhere in the palace (eg. Anne Boleyn Gatehouse, astronomical clock insertion).	1537/8 - Bowling alley construction
214	Misc. 1	Hard cream coloured mortar with lime inclusions and imprints of bricks. Prob. post Tudor.	Post 1730 demolition layer

603	Misc. 1	Dark cream coloured friable render/mortar. Brick frags are wine coloured - poss 18th C?	Victorian
710	Misc. 1	Hard gritty mortar with mixed size lime inclusions and some small stone inclusions. Dark orange coloured brick frag. Prob. post Tudor.	1700-1825 Garden features
713	Misc. 1	Hard gritty mortar with mixed size lime inclusions and some small stone inclusions. Prob. post Tudor.	1700-1825 Garden features

Table 2 Plaster samples

Ctx.	Ref.	Notes	Phase
103	Misc. 1	Three large fragments of decorative plaster (gypsum?). Traces of limewash on one piece. All have a series of flat surfaces and raised decorative shape suggesting these fragments were possibly infill sections for decorative panelling or part of a plaster decorative ceiling. Absence of hair suggest higher status use.	19th-C rubble layer
110	Misc. 1	Three large fragments. One is plain, hard, dark cream in colour with lime inclusions. The second sample has one face blackened prob. by exposure to elements. This is hard, rich creamy coloured with small stone and lime inclusions. The final sample is creamy coloured with lime inclusions and a possible red wash. All three pieces are probably more of a render than plaster.	19th-C dumping
605	Misc. 1	Small fragments of a dark cream coloured mortar with small stone and lime inclusions. Friable. No defining features. Sample probably more of a render than plaster.	17th/18th C

Lithics *by David Mullin*

3.1.66 *A* total of four worked flints were recovered from two contexts in Trench 6: 605 and 608. Context 605 contained two waste flakes whilst 608 contained a waste flake and a burnt flint. The material is entirely residual within later contexts and has little value beyond demonstrating a human presence in the area in prehistory.

Summaries of environmental reports

3.1.67 Summaries of the environmental reports follow. The full reports can be found in Appendix C.

Animal bones *by Rachel Scales*

3.1.68 A small assemblage comprising of 41 bird and mammal bones was recovered from excavations at Hampton Court Tilt yard and Bowling Alley. They were recovered by hand collection during the excavation of a series of deposits dating principally to the 18th and 19th centuries.

3.1.69 The bones were mainly in a fair condition. No bones were burnt. Traces of carnivore gnawing were noted on 6 (15%) of the bones. Cut and chop marks from both the filleting and dismembering processes were recorded on 17 (41%) bones.

3.1.70 The main domestic mammal species are represented in small numbers (Table 1). Nine bird bones were recorded. One goose (*Anser anser*) coracoid was noted in the twentieth century topsoil while a domestic fowl (*Gallus gallus*) tarsometatarsus was recovered from drain context 403, spot dated 1680-1800 AD. A duck (*Anas sp.*) scapula was recovered from make up layer context 106 dated to 1675-1850. Nineteenth century

rubble layer context 110 contained five large passerine bones (cf. starling - *Sternus vulgaris*) thought to belong to the same bird. One rabbit (*Oryctolagus cuniculus*) tibia was recovered from another nineteenth century rubble layer (context 103). The bones identifiable to species level are too few in number to yield any useful information. Suffice it to say that the bones derive mainly from domestic waste, and that the animals that were present in the assemblage were sub-adult and/or adult at the time of death.

Table 1. Number and percentage of identifiable bones.

Period	Element	Cattle	Sheep/ goat	Pig	Rabbit	Bird	Large Mammal	Medium Mammal	Indet.
Late 17th-18th Century	Pelvis	1							
	Femur		1						
	Rib						1		
	Vertebra							1	
	Indeterminate								3
19th Century	Hyoid	1							
	Scapula					1			
	Radius		1			1			
	Astragalus			1					
	Metatarsal	2							
	Pelvis		1	1					
	Femur		2			2			
	Tibia	1	2		1	2			
	Tarsometatarsus					1			
	Rib						4	2	
	Vertebra						1	1	
	Indeterminate								2
20th Century	Coracoid					1			
	Indeterminate								3
Total		***5***	***7***	***2***	***1***	***8***	***6***	***4***	***8***

Shell *by Leigh Allen*

3.1.71 A total of 6 fragments of hand collected shell weighing 47g was recovered from the archaeological investigation, no shell was recovered from environmental samples (Table 1). All the fragments were from oyster shell (*ostrea edulis*) and they were recovered from contexts 103, 301, 603 and 700. The shells are in poor condition, powdery and flaking, there are 3 fragments from right valves and 3 from left valves. Oyster would have added variety to the basic diet but the small quantities recovered do not indicate that they formed a significant part of the diet.

Table 1: List of oyster shell fragments

Context	*Frag Count*	*Weight*	*Description*
103	1	14g	Right valve
301	1	7g	Left valve
603	3	9g	2 right valves, 1 left valve
700	1	17g	Left valve

4 Discussion

Reliability of field investigation

4.1.1 The archaeological structures and deposits were revealed mainly in plan. Sondages were hand excavated to clarify relationships. Time constraints, and the need to preserve archaeological deposits and structures *in situ*, restricted the number of sondages that could be excavated, but sufficient were dug to enable the understanding of the stratigraphic sequence.

4.1.2 Almost all the finds, excluding building materials were from contexts post-dating the structures of Tudor date. The pottery is mainly 19th-century in date with a small quantity of 17th- to 18th-century material, and tobacco pipes are of 17th-century or later date. Much of the glass is from topsoil, and the vessel glass is mainly of 19th-century or later date. The brick, tile and other ceramic building materials seem to have been largely, though not exclusively, derived from Tudor structures. The main environmental evidence consisted of animal bone from 18th and 19th century deposits.

4.1.3 Dating from the pottery, pipes and glass reflects the fact that excavation generally stopped at the level of structural remains, and that few occupation deposits and associated features were investigated. The mitigation strategy was designed to preserve extant structures and deposits *in situ*. Most of the excavated contexts therefore were stratigraphically and chronologically later than the structures, and mainly comprised demolition and levelling deposits. Earlier Tudor horizons were either not investigated or had been removed during demolition.

Evaluation objectives and results

4.1.4 The results of the evaluation are listed below in relation to the specific project aims outlined in Section 2.1.

Preservation of the archaeological resource in situ

4.1.5 The archaeological intervention was successful in preserving archaeological structures and deposits *in situ*. Intrusive excavation was limited to the minimum required to understand the archaeological sequence.

Preservation by record of archaeological deposits within the impact levels of the scheme

4.1.6 Where archaeological deposits were excavated to clarify the stratigraphic sequence detailed plans, sections, photographs, written records and survey data ensured their preservation by record.

Continue to establish (and test our understanding of) the character, extent and phasing of the various historical surfaces

4.1.7 The results of the archaeological work were analysed and interpreted in the context of previous archaeological investigations at Hampton Court Palace and historical studies of the construction and occupation of the palace. The building materials, and in particular the bricks and brickwork, were studied within the framework set by previous work on building materials and in particular the established brick typology (Ford 1991).

Produce a client report and full archive

4.1.8 The present report fulfils the requirement to produce a client report and is backed by full paper and digital record and finds archive which will be deposited with Historic Royal Palaces in due course.

4.1.9 The results of this investigation on their own do not warrant publication and no publication is planned..

Recovery of artefactual and ecofactual evidence for the use of the areas of the Bowling Alley and Tiltyard from all periods encountered

4.1.10 Artefactual and ecofactual material was recovered from the archaeological trenches, but as noted above (section 4.1) the information that these data provided was limited to later post-Tudor activity.

Recover ceramic and clay pipe evidence to help to develop a pottery chronology and typology.

4.1.11 The evidence for both pottery and clay pipes was limited to 17th-century and later contexts and does not therefore add materially to the chronology and typology of ceramics and pipes relating to the construction and use of the Tudor Palace.

Recover bricks to enhance and develop the brick typology of Hampton Court

4.1.12 Brick samples were recovered and standing brickwork analysed and interpreted in the light of the existing brick typology for the Palace of Hampton Court. Quantities of brick recovered were limited.

Recover architectural worked stone and architectural terracotta pieces

4.1.13 The architectural stonework recovered was limited to one fragment. Other samples were either rubble or natural fragments.

4.1.14 No architectural terracottas were found, but some examples of roof tile and floor tile were recovered.

Interpretation

Bowling Alley

4.1.15 Trenches 1, 2 and 3 were targeted on the results of the geophysical survey carried out in advance of these works, which showed a NNE-SSW aligned linear anomaly with projecting stubs from its eastern side (GSB 2009). The regular spacing of these stubs matched those of projecting buttresses shown on Fort's plan of 1711 (Fig. 3).

4.1.16 The trenches revealed structural remains of the historic Bowling alley. In particular, the alignment of the eastern wall was revealed running through all three trenches (Fig. 3; Plates 1-4). A similar picture of a mortar rubble foundation overlain by an offset brick foundation wall 0.60m wide, in turn surmounted by a 0.40m wide wall was seen throughout.

4.1.17 In Trench 1, foundation 127 (top 8.26 m OD) appears to have been trench-built into a natural deposit, which was revealed on its W side. To the E of foundation 127, a similar natural deposit had been truncated to the level of the base of the foundation, most likely as a result of later buttressing works or robbing. As a result no trace of the construction cut was found on the E side of the wall. In Trenches 2 and 3, the foundation was not fully exposed on the W side and in both trenches the E side of the foundation slabs and the overlying walls were abutted by redeposited material that seem likely to have

derived from later activity. The raked angles of the foundation in both Trench 1 (to the W, especially where cutting through a clean deposit) and Trench 2 (to the E) would seem to confirm that the foundations were trench-built. However, the reversed angle or batter seen to the E of the foundation in Trenches 1 and 2 might appear to cast doubt on this idea.

4.1.18 The brickwork above the foundation, where exposed in Trenches 1 and 3, was three brick courses high. Above these brick courses, which measured 0.52 m wide in Trench 1, were the remains of a wall 0.40m wide, which would have formed the above ground wall of the Bowling Alley. In Trench 2 a patch of crude mortar/rubble surface (211) abutted the wall. This was not found elsewhere and is likely to represent a construction horizon for the upper wall or a sub-floor rather than the floor of the bowling alley.

4.1.19 In Trench 1 a rectilinear construction cut [120] was found to the E of wall 109 and abutting foundation 127. This was matched by two similar cuts [308] and [317] in Trench 3 abutting the wall footing. The fills of these cuts were similar compacted rubble and mortar deposits [respectively 115, 307 and 309] which are interpreted as the foundations for brick buttresses for the Bowling Alley wall. The remains of one brick-built buttress [311/310] was found on footing 309 in Trench 3. It is clear in all three cases that the buttress foundations abutted the wall foundations and were not bonded into them. This indicates that the buttress foundations were of later build the wall footings. The walls revealed no indication that buttresses had been bonded to them. Furthermore the bricks used in buttress 311/310 were of a different and later type from those used in the main wall, which strongly suggests that the buttresses were of later build than the wall.

4.1.20 The spacing of the buttresses found in the excavations (Fig. 3) would seem to be slightly wider than that recorded by Fort in 1711, but otherwise confirms his overall layout of the buttresses of the Alley walls.

4.1.21 At the W end of Trench 1 a small fragment of brick-built wall or foundation [129] was located. It was the earliest element of a series of rebuilds on this alignment which culminated in the present garden wall. Of significance is the fact that wall 129 is parallel to the presumed E wall of the Bowling Alley. The spacing between wall 129 and the E wall 109 is approximately 6 m, which suggest that wall 129 might be the remains of the W wall of the Bowling Alley. Fort's plan of 1711 suggest that the bowling Alley was about 6 m wide. The double-struck pointing exhibited on the face of wall 129 is characteristic of Henrician brickwork. However, no such pointing was apparent on the E wall, the bricks of which were also a of much larger size. Furthermore there was a difference in the construction of the two walls. The W wall foundation was constructed of brickwork laid directly onto the underlying natural deposit, whereas the E wall was constructed on trench-built foundations. However, because of the early features of the wall 129, the possibility that it may have formed part of the W wall of the Bowling Alley cannot be ruled out entirely.

4.1.22 The 18th-century demolition of the Bowling Alley truncated the eastern wall to a height of between 8.46 m OD (Trench 1) to the south and 8.68 m OD to the north (Trench 2). The resultant rubble deposits overlay the walls and the area was landscaped following the dumping of levelling deposits.

4.1.23 Later activity, particularly in Trench 2 points to a more horticultural usage of the area with the installation of the well and the excavation of probable planting beds.

Tiltyard Towers

4.1.24 There is no early plan to provide information on the positions of the towers (OA March 2008, Appendix III). The only early evidence is provided by two views from the 16th and 17th centuries which show the towers (Plates 9-10). Two towers, the NE and SE towers, were positioned on the wall dividing the Tiltyard from the gardens to the east. The SE tower is now incorporated in the present Tiltyard Café. The remaining three towers comprised a central tower apparently in the form of mock castle, and NW and SW towers. The positions of these towers have proved elusive. Daphne Ford (in Thurley 2003) has proposed possible locations for the towers (Fig. 2), but geophysical survey and small scale archaeological interventions have failed to confirm these.

4.1.25 Trenches were positioned to investigate anomalies revealed in geophysical survey (GSB 2009). Trenches 4 and 5 were sited to investigate and anomaly on or near the proposed site of the NE tower. Trench 6 was positioned to investigate a substantial anomaly to the NW of Ford's proposed location of the SW tower, and Trench 7 was positioned just N of the proposed location of the Central Tower. Trench 8 was located to investigate an anomaly found to the W of the proposed positions of the Tiltyard towers.

4.1.26 Trench 5 produced no significant archaeological evidence. However Trench 4 produced evidence of a N-S aligned brick wall foundation 406 that had been truncated above 9.90m OD, and which was subsequently reused as the base to the current garden wall. This foundation no doubt belonged the NE Tiltyard Tower which formed a pair with the extant SE Tower. It seems likely that Wall Foundation 406 supported the outer, westernmost wall of the tower, particularly as Trench 5, located to the west yielded no significant evidence.

4.1.27 In Trench 6, the two sondages on the W edge of the trench revealed the alignment of another probable Tiltyard Tower wall, possibly the E wall of the SW Tower. In the NW sondage, the rubble core of a wall foundation [621] survived below 8.40m OD. The face had been robbed out by cut 630. In the SW sondage of Trench 6, a further robber cut [618] was observed which appears to have completely removed any structural remains. The cut was however filled with brick and mortar rubble (619). The alignment of this cut is slightly to the W of the alignment of cut 630 to the N. The orientation of the wall foundation which can be assumed to have ran between the two sondages was more NNE-SSW than strictly N-S. The wall appears to have continued beyond both of the sondages to the north and south, suggesting an overlying wall of more than 5 metres in length. That the robbing activity appears to have occurred on the eastern side of the foundation wall suggests that this was also the likely exterior face of the building, where dressed stone or fine brickwork would have featured. This would therefore point to the main body of the tower being situated immediately to the west of Trench 6. This inconveniently contradicts the findings of the Ground Penetrating Radar survey upon which the trench was located which indicated a rectangular feature, a potential building footprint, with its western limit on the western edge of the trench.

4.1.28 The back filled robber cuts in Trench 6 were covered by levelling deposits as part of re-landscaping of the vicinity. A series of east-west aligned trenches, probable garden beds were then dug across the area. An almost identical set of east-west aligned beds, each up to 1.00m wide were uncovered in Trench 8. These garden features date to 17th or 18th centuries.

4.1.29 In Trench 7 a further set of probable garden features were revealed. These six features ,only two of which were fully revealed, appeared to be a mismatch of small rectilinear pits or beds on both an E-W and a N-S orientation rather than the long E-W aligned beds of Trenches 6 and 8. These are however likely to be of 17th- or 18th-century date, representing the transition of the area's focus from sporting pursuits to horticulture.

4.1.30 Further landscaping then occurred across the area of The Tiltyard, from the large scale east-west aligned cut [703] in Trench 7, to the rubble deposits (603) and (604) which respectively truncated and sealed the earlier garden features. In Trench 8 these earlier features were sealed by a further horticultural horizon (803) a buried topsoil or possible plough soil. This layer would suggest that the area of the western tiltyard no longer mirrored the east in terms of horticultural activity and would point to a separation of the two areas, most probably by this point in the areas development, with the construction of the garden wall.

4.1.31 The stratigraphic sequence of the Tiltyard area is completed by the subsoil and topsoil deposits present in all of the trenches which relate to the present landscaping regime of the Palace gardens.

Significance

Bowling Alley

4.1.32 It is clear from the evidence unearthed in Trenches 1, 2 and 3 that substantial remains of Henry VIII's Northern Bowling Alley have survived robbing episodes and subsequent re-landscaping of the area which returned it to gardens. These trenches were targeted upon the results of the geophysical survey which clearly showed the alignment of the eastern wall and positions of abutting buttresses. Of note is the fact that the actual wall alignment is some 4 to 5 metres to the east of that indicated by the best fit reproduction of T. Forts plan of 1711 when overlaid on the current digital map of the Palace. Its orientation also differs by some 5 degrees from the alignment confirmed by the archaeological trenches.

4.1.33 The general layout of the Bowling Alley revealed by Fort's 1711 plan seems to be confirmed by the archaeological investigations. If the alignment of Fort's plan is adjusted to fit the known archaeological features, then the the W wall of the Bowling Alley would appear to follow the line of the present garden wall. This would tend to confirm that the small fragment of early Henrician brickwork [129] found in Trench 1 might very well be part of the W wall. The difficulty with this interpretation is that the structure, pointing and brick sizes in wall 129 differ from the same features in the E wall. Wall 129 is unlikely to postdate the demolition of the Bowling Alley in the 18th century because of its distinct 16th-century characteristics, and therefore it is possible that it represents and earlier wall pre-dating the building of the Bowling Alley. Another less likely possibility is that different 'gangs' built different parts of the structure and used different bricks and techniques.

4.1.34 The spacing of the buttresses along the eastern wall as indicated on Ford's 1711 plan and suggested by the geophysics results, was confirmed by excavation. The buttress foundations abutted the original eastern wall foundation and upper brickwork indicating their later insertion. Indeed, in Trench 3 the construction cuts truncated the deposit that abutted the earlier wall and the limited amount of surviving buttress brickwork would also appear to post-date that of the main wall. The reason why the buttresses were added later is uncertain. Possibly they were planned but only added once the precise

size and spacing of the windows for the alley were decided upon, or possibly they were added later to to support an existing structure.

4.1.35 The only possible piece of internal surface found in excavation was a rough construction horizon or sub-floor in Trench 2. The interior of the Bowling Alley was not investigated in Trench 3, and in Trench 1 no internal surface relating to the Bowling Alley was uncovered. The crude surface recorded abutting Wall element 130 in Trench 1 was also most probably a construction horizon for the overlying Wall 131. It is probable that any surface contemporary with the Bowling Alley was removed during the demolition and robbing of the structure.

Tiltyard Towers

4.1.36 The north-south aligned foundation uncovered in Trench 4 appears to be the base of an external W wall of the original NE Tower with the main body of the tower likely to have extended to the E, beyond the present garden wall. The lack of any archaeology in Trench 5 , to the west, would tend to support this interpretation. The demolition of the tower appears to have coincided with the re-modelling of the area into gardens when the foundation was reused for the overlying garden wall. The demolition probably dates to the 18th century, but the pottery dating is inconclusive. There is some later 17th-18th-century from the trench , but most of the pottery in of mid 20th-century date.

4.1.37 The foundation wall alignment observed within the sondages at the western edge of Trench 6 would appear to be that of an external east facing wall of the South-Western Tower. This is likely because of the fact that robbing appears to have occurred on this probable external face, where high quality facing materials tended to be used rather than internally. This would suggest that the rectilinear geophysics plot on which the trench was targeted relates more to the overlying garden features than the Tower. Pottery from Trench 6 was very mixed ranging in dated from the 16th to the 19th centuries. If the walls found in Trench are those of the SW tower this has implications fr the location a spacing of the other towers and in particular the Central tower

4.1.38 The GPR plots recorded in the vicinity of Trenches 7 and 8 which those trenches were targeted seem also to be reflecting garden features. No structural evidence for the Tiltyard Towers was found. Later garden bed features were uncovered.

4.1.39 Trench 7 which was positioned to investigate an anomaly close to the proposed position of the Central tower proved to contain no structural evidence. Some shallow pits, probably garden features were identified. The pottery from Trench 7 was mainly of 19th-century date with a little 18th-century pottery.

4.1.40 Trench 8 which was positioned to investigate an anomaly some distance from the likely positions of the towers proved to contain only shallow parallel trenches, again probably garden features. The pottery from Trench 8 was exclusively of 19th-century date.

4.1.41 The results of the Tiltyard trenching have been mixed. Further locations have been investigated and some (Trenches 5, 7 & 8) have proved to be devoid of structural evidence. Trench 4 produce the best evidence and seems to have confirmed the location of the NE tower. Trench 6 produced structural evidence which may indicate the position of a Tiltyard Tower. The trench was located between and slightly W of the proposed positions of the SW and Central Towers. It is perhaps most likely to be part of the SW tower. If this is the case it may be that the proposed location of the Central Tower should be more to the N or E of the proposed position. The absence of structural evidence in Trench 7 may suggest that a position a little to the E is more probable.

Appendix A. Trench Descriptions and Context Inventory

Trench 1						
General description					**Orientation**	E-W/N-S
Trench revealed alignment of eastern bowling alley wall with buttress.					**Avg. depth (m)**	1.2
					Width (m)	2.3(E-W)/1.7(N-S)
					Length (m)	7.20(E-W)/ 4.1(N-S)
Contexts						
context no	**type**	**Dimensions (m)**	**Depth (m)**	**comment**	**finds**	**date**
101	Layer	-	0.40	Topsoil	Pottery 1850-1900; CP 19C	-
102	Layer	-	0.36	Subsoil	-pottery 1820-1900; CP 18C	-
103	Layer	-	<0.55	Rubble	-pottery 1850-1900; CP L18/E19C	-
104	Layer	-	0.23	Rubble		
105	Layer	-	0.22	Make-up	Pottery 1740-1800	
106	Layer		0.30	Make-up	Pottery 1675-1850; CP18C	
107	Layer		0.70	Rubble	Pottery 1675-1850; CP 1730-1780	
108	Layer		0.36	Sand-silt		
109	Wall	>4.1x0.52/0.40	0.20	N-S Brick wall (east)		
110	Layer		0.63	Rubble	Pottery 1825-1900; CP 18C	
111	Layer		>0.30	Levelling		
112	Cut	>2.3x2.5	>/=0.70	Robber cut?		
113	Layer		>0.19	Natural?		
114	Fill		Unexc.	Green sand rubble		
115	Structure	1.1x>0.70	>0.12	Buttress foundation		
116	Layer		Unexc.			
117	Layer		0.06	Surface?		
118	Fill		>0.55	Rubble		
119	Layer		0.28	Silt-sand		

120	Cut	1.1x>0.7	>0.12	Construction cut		
121	Fill		0.35	Rubble		
122	Layer		Unexc.	Natural?		
123	Cut	>0.7x>1.0	0.55	Cut		
124	Cut	>0.7x1.0	0.50	Cut for re-pointing		
125	Cut	>0.50x>0.50		Pit?		
126	Layer		Unexc.	Natural?		
127	Structure	>4.1x0.94	0.32	Wall foundation		
128	Cut	>4.1x0.94	0.32	Construction cut		
129	Wall	>0.30	0.26	Early wall		
130	Wall	>0.65	0.55	Roughly pointed wall		
131	Wall	>0.75	0.68	Cementitious wall		
132	Wall	>0.75		Upper wall		

Trench 2						
General description					**Orientation**	E-W
Trench revealed alignment of eastern bowling alley wall with construction horizon to west and later well.					**Avg. depth (m)**	1
					Width (m)	1.6
					Length (m)	3
Contexts						
context no	**type**	**Dimensions (m)**	**Depth (m)**	**comment**	**finds**	**date**
201	Layer	-	0.35	Topsoil	pottery 1950+; CP 17C	-
202	Layer	-	0.40	Rubble	pottery 1850-1900; CP 19C	-
203	Well	-	<0.55	Rubble deposit		-
204	Cut	>0.8x>0.38	>0.75	Well construction cut		
205	Layer		>0.9	Brickearth		
206	Cut	>1.55x0.70	0.35	E-W cut		
207	Cut	>1.46x0.70	0.22	Construction cut		
208	Fill		0.35	Fill of 206		
209	Fill		0.20	Backfill		

210	Wall	>1.46x0.4-0.6	0.48	Bowling alley wall		
211	Surface	>0.94x>0.94	0.05	Construction surface?		
212	Fill		0.20	Fill of 213		
213	Cut	>0.20x>0.30	0.20	Garden feature?		
214	Layer	0.5x?	0.20	Rubble	Pottery 1730-1800	
215	Fill		0.55	Fill of 204		
216	Fill		>0.50	Fill of 204		
217	Fill		>0.05	Fill of 204		
218	Layer		0.23	Natural?		

Trench 3						
General Description					**Orientation**	N-S
Eastern wall of Bowling Alley with two buttresses.					**Avg. depth (m)**	0.85
					Width (m)	0.95-2.00
					Length (m)	5.20
Contexts						
Context no	**Type**	**Dimensions (m)**	**Depth (m)**	**Comment**	**Finds**	**Date**
301	Layer		0.42	Topsoil	Pottery 1830-1900; CP 18C	
302	Subsoil		0.20	Subsoil		
303	Fill		0.35	Rubble	Pottery 1730-1780; CP 18C	
304	Wall	>5.20x0.40	0.06	Upper wall		
305	Wall	>5.20x0.52	0.20	Lower offset wall		
306	Structure	>5.20x0.70	>0.16	Wall foundation		
307	Structure	1.10x>1.26	Unexc.	S.buttress foundation		
308	Cut	1.10x>1.26	Unexc.	Construction cut for 307		
309	Structure	>1.10x>1.30	Unexc.	N.buttress foundation		
310	Wall	>0.42x>0.42	0.06	Upper course N.buttress		
311	Wall	1.0x1.2	0.12	Lower offset N.buttress		

312	Layer		0.34	Levelling		
313	Layer		0.20	Buried garden soil?	Pottery 1730-1780	
314	Cut	>2.20x>1.80	>0.20	Robber/Demolition cut		
315	Cut	1.25x1.00	0.07	Robber cut		
316	Fill		0.07	Fill of 315		
317	Cut	>1.50x>1.40	Not exc.	N.buttress construction cut		
318	Deposit		0.34	Clay sand with mortar		
319	Fill		Not exc.	Fill of 317		

Trench 4						
General Description					**Orientation**	N-S
Foundation of NE Tiltyard below extant garden wall					**Avg. depth (m)**	1.00
					Width (m)	1.00
					Length (m)	3.00
Contexts						
Context no	**Type**	**Dimensions (m)**	**Depth (m)**	**Comment**	**Finds**	**Date**
400	Layer		0.50	Topsoil	Pottery 1950+; CP 19C	
401	Cut	1.0x0.90	0.85	Drain construction cut		
402	Structure	0.80x0.46	0.70	Drain		
403	Fill		0.80	Fill of 401	Pottery 1680-1800+?; CP 19C	
404	Structure	>3.00	5.00	Extant garden wall		
405	Structure	>3.00x0.13	>0.80	Electric mains		
406	Structure	>3.00x?	0.60	Tower wall foundation		
407	Layer		0.40	Levelling		
408	Layer		0.08	Sand-clay		
409	Layer		>0.40	Natural?		
410	Fill		>0.40	Backfill of 411		
411	Cut	>3.00x>0.20	>0.40	Construction cut for 406		

412	Layer		0.06	Mortar levelling		

Trench 5						
General Description					**Orientation**	N-S
No archaeology					**Avg depth (m)**	1.20
					Width (m)	1.50
					Length (m)	3.00
Contexts						
Context	**Type**	**Dimension (m)**	**Depth (m)**	**Comment**	**Finds**	**Date**
500	Layer		0.5	Topsoil		
501	Layer		0.30	Tarmac		
502	Layer		0.40	Subsoil		
503	Layer		>0.20	Natural?		

Trench 6						
General Description					**Orientation**	N-S
Foundation of western wall of SW Tower. Garden features.					**Avg depth (m)**	1.00
					Width (m)	2.50-3.90
					Length (m)	5.00
Contexts						
Context no	**Type**	**Dimensions (m)**	**Depth (m)**	**Comment**	**Finds**	**Date**
600	Deposit			Spoilheap	Pottery 1550-1850; CP 19C	
601	Layer		0.56	Topsoil	Pottery 1830-1900; CP 19C	
602	Layer		0.29	Subsoil	Pottery 1800-1830	
603	Layer		0.25	Rubble	Pottery 1770-1830; CP 19C	
604	Layer		0.14	Rubble	CP 17C	
605	Layer		0.50	Made ground	Pottery 1600 - 1750; CP 17/E18C	
606	Fill		0.14	Fill of 607	Pottery 1550-1700	
607	Cut	>2.50x0.70	0.14	Garden feature		
608	Fill		0.28	Fill of 609	Pottery 1600-1750; CP 18C	

609	Cut	>2.50x0.70	0.28	Garden feature		
610	Fill		Unexc.	Fill of 611		
611	Cut	2.00x0.75	Unexc.	Garden feature		
612	Fill		0.30	Fill of 613	CP 18C	
613	Cut	>2.00x0.90	0.30	Garden feature		
614	Fill		0.32	Fill of 615		
615	Cut	>3.00x0.75	0.32	Garden feature		
616	Fill		0.20	Fill of 617		
617	Cut	>1.50x0.40	0.20	Garden feature		
618	Cut	0.70x0.20	>0.9	Robber cut		
619	Fill		0.56	Fill of 618		
620	Fill		0.30	Rubble, Fill of 618		
621	Structure	>0.75x>0.30	>0.70	Foundation		
622	Fill		>0.50	Fill of 630		
623	Layer		Unexc.	Rubble		
624	Fill		0.60	Fill of625		
625	Cut	>5.00x0.30	0.60	Modern service cut		
626	Layer		0.17	Buried soil		
627	Layer		>0.26	Levelling deposit		
628	Layer		<0.60	Levelling deposit		
629	Layer		<0.52	Redeposited natural		
630	Cut		>1.00	Unseen robber cut		

Trench 7						
General Description					**Orientation**	E-W
Garden features					**Avg Depth (m)**	1.10
					Width (m)	1.80
					Length (m)	4.30
Contexts						
Context No.	**Type**	**Dimensions (m)**	**Depth (m)**	**Comment**	**Finds**	**Date**

700	Spoil			Unstratified finds	Pottery 1830-1900	
701	Layer		0.22	Modern overburden		
702	Layer		0.22	Buried topsoil	pottery1850-1900	
703	Cut	>4.30x>1.54	0.62	Garden feature		
704	Fill		0.40	Upper fill of 703	Pottery 1830-1900; CP 18C	
705	Layer		0.30	Brick rubble		
706	Layer		0.04	Redeposited clay		
707	Cut	>0.94x0.74	0.19	Garden feature?		
708	Fill		0.19	Fill of 707		
709	Cut	1.12x0.49	0.22	Garden feature?		
710	Fill		0.22	Fill of 709	Pottery 1550-1800	
711	Fill		0.44	Fill of 703		
712	Cut	>0.74x0.80	0.23	Garden feature		
713	Fill		0.23	Fill of 712	Pottery 1700-1825?	
714	Cut	0.90x0.76	0.57	Posthole?		
715	Fill		0.57	Fill of 714		
716	Cut	>0.60x0.60	Unexc.	Garden feature?		
717	Fill		Unexc.	Fill of 716		
718	Cut	>0.40x>0.56	Unexc.	Garden feature?		
719	Fill		Unexc.	Fill of 718		
720	Layer		>1.10	Natural sand/clay		

Trench 8		
General description	**Orientation**	N-S
Garden features	**Avg Depth (m)**	1.10
	Width (m)	1.85-2.00
	Length (m)	2.70
Contexts		

Context No	Type	Dimensions (m)	Depth (m)	Comment	Finds	Date
800	Spoil			Spoil heap finds	Pottery 1830-1900; CP 18C	
801	Layer		0.59	Topsoil	Pottery 1820-1900	
802	Layer		0.22	Subsoil		
803	Layer		0.24	Interface/ploughsoil		
804	Fill		>1.10	Fill of 805		
805	Cut	>2.00x>0.42	>1.10	Garden feature		
806	Fill		>1.10	Fill of 807		
807	Cut	>2.00x0.70	>1.10	Garden feature		
808	Fill		0.24	Fill of 809		
809	Cut	>2.00x0.87	0.24	Garden feature		
810	Fill		>0.16	Fill of 811		
811	Cut	>2.00x>0.40	>0.16	Garden feature		
812	Layer			Natural sand		

APPENDIX B. FINDS REPORTS

B.1 Pottery

By John Cotter

Introduction and methodology

B.1.1 A total of 179 sherds of pottery weighing 2.874 kg. was recovered from 30 contexts. All is of post-medieval or late post-medieval/modern date. All the pottery was examined and spot-dated during the assessment stage. For each context the total pottery sherd count and weight were recorded on an Excel spreadsheet, followed by the context spot-date which is the date-bracket during which it is estimated that the latest pottery types in the context were produced or were in general circulation. Comments on the presence of datable types were also recorded, usually with mention of vessel form (jugs, bowls etc.) and any other attributes worthy of note (eg. decoration etc.). Post-medieval pottery fabric codes noted in the comments field or mentioned below are those of the Museum of London (LAARC 2007) which can be applied to most post-medieval types in south-east England.

Date and nature of the assemblage

B.1.2 The pottery assemblage is in a fairly fresh but mostly very fragmentary condition. One or two complete dish/plate profiles survive amongst the later industrialised wares. Ordinary domestic and horticultural pottery types are represented and one 'industrial' piece probably from a sugar-mould. The pottery is described in some detail in the spreadsheet and therefore only briefly summarised below.

B.1.3 Pottery types of the 17th to the 20th century are represented. In terms of volume most of the pottery here is 19th century in date and mainly comprises ubiquitous Staffordshire-type mass-produced white earthenwares including blue transfer-printed wares - mainly tablewares and some preserve or ointment jars (REFW, TPW). The other main class here is common garden flowerpot in red earthenware or terracotta. Most of these are clearly of 19th- and even 20th-century date. The latter include a machine-made 20th-century flowerpot (context 201) with a partially surviving stamp on the rim - apparently a royal logo or monogram with the initials 'E' and '[?missing]' separated by a stylised crown. Most probably - in view of the late-looking pot - this is the 'ER' monogram for Queen Elizabeth II. A recent excavation in the Orangery at Hampton Court also yielded a couple of flowerpots with a crowned 'GR' monogram - probably in this case for George VI, or less likely George V. Though very late in archaeological terms these pieces are of some interest in suggesting that the royal household commissioned their own monogrammed flowerpots. More research would be needed however to determine how widespread this practice was and whether other royal palaces were also supplied with these personalised flowerpots.

B.1.4 The only other notable piece in the assemblage is a smallish sherd of post-medieval red earthenware (PMR) in a similar fabric to the 19th-century flowerpots (context 601). This is unglazed and clearly from a large vessel. The internal surface is covered with a thin film of brushed white slip (liquid clay) - a technique that is absolutely typical of later 18th- and 19th-century sugar-making cones or moulds. Whether this single sherd originated from the kitchens of Hampton Court or from a small sugar-making factory on

the estate or was simply dumped here in garden soil brought from outside the estate, can only be guessed at.

B.1.5 The smaller 17th- and 18th-century assemblage comprises domestic wares (dishes, jars, bowls, pipkins or small saucepans) commonly found in the London area and south-east England generally. These mainly comprise post-medieval glazed red earthenwares (PMR) including vessels similar to products of the 17th-/18th-century kilns at Woolwich. Also tin-glazed ware (TGW) tablewares and storage jars probably produced at various potteries along the Thames in London and green- or yellow-glazed 'Border' whitewares and redwares produced at potteries along the Surrey/Hampshire border. A few other minor regional and rarer imported types (German stoneware, Chinese porcelain) are also detailed in the catalogue.

Recommendations

B.1.6 The composition of the assemblage is typical of post-medieval and late post-medieval or modern pottery assemblages in the wider London area and is fairly unremarkable. It is also has nothing to do with the Tudor tiltyard under investigation. The high presence of flowerpots suggests that many of these contexts may represent garden soil or other horticultural deposits perhaps with domestic pottery types casually dumped as rubbish within them. The royal monogrammed flowerpots are of some interest despite their late (mid 20th century?) dating and could spawn a research project in themselves if more examples come to light. The sugar-mould sherd is also an unexpected find, although also late in date. In view of the fairly small size and the mainly late post-medieval emphasis of the assemblage, no further work is recommended. However this may be reviewed if future excavations here produce a considerably larger collection of material..

B.2 Clay tobacco pipes

By John Cotter

Introduction and methodology

B.2.1 The excavation produced a total of 75 pieces of clay pipe weighing 336 g from 21 contexts. These have been catalogued and recorded on an Excel spreadsheet. The catalogue records by context, the spot-date, the quantity of stem, bowl and mouth fragments, the overall sherd count, weight, and comments on condition and any makers' marks or decoration present.

Date and nature of the assemblage

B.2.2 The assemblage is generally in a fairly poor condition consisting almost entirely of fairly short pieces of pipe stem (69 pieces) with only four pieces of bowl and two mouth pieces. Many pieces show slight abrasion although individual pieces can be in a fresh condition. A few pieces are burnt and may derive from ash rakings from domestic bonfires or hearths perhaps scattered in the garden. The predominance of short stem pieces and the obvious presence of earlier material in 19th-century contexts (dated by pipes or pottery) reinforces the impression that much of the assemblage is residual in its contexts.

B.2.3 Material of the 17th to 19th century is present. Bowls have been dated by reference to Oswald's simplified national typology and stems mainly by the slight variations in stem bore diameter and overall stem thickness (Oswald 1975). Fuller details may be

consulted in the catalogue. Very few pieces recovered are worthy of note. Datable bowls include a fresh but broken bowl of *c.* 1660-1680 residual in a 19th-century context (603) and a bowl profile of *c.* 1730-1780 which has an unclear maker's mark on either side of a broad circular heel (context 107). The two other bowls are represented by smallish residual fragments of 17th- and 18th-century date. One 17th-century stem has traces of Dutch-style milled decoration around the stem (202) and another 19th-century stem has rows of small pellet decoration probably leading up to a now-missing maker's name on either side of the stem (800).

B.2.4 Most contexts are dated by pipes to the 18th or 19th centuries. Only two contexts (201 and 604) are dated to the 17th century but even here the later pottery dates indicate that the pipe from context 201 is residual. A mouth piece datable to the 17th or early 18th century, however, is in broad agreement with the pottery date for context 605, and some of the 18th- and 19th-century pipes are broadly contemporary in their contexts.

Summary and recommendations

B.2.5 The pipe assemblage is fairly unremarkable. It has very few featured pieces and is generally in a poor condition suggestive perhaps of domestic rubbish scattered and re-deposited over a long period. In view of these facts no further work is recommended.

B.3 Glass

By Ian Scott

Introduction

B.3.1 The glass assemblage from HCP66 comprises 79 sherds, more than half of which are window glass (Table 1).

Table 1: HCP66: Summary quantification of glass by Trench, Context and Glass Type

Trench	Context	type	wine bottle	medicine/ tonic bottle	perfume bottle	soda water bottle	bottle	vessel	window	Total
Tr 1	101	topsoil			1					1
	103	rubble layer	1						1	2
	110	rubble layer					1		3	4
	119	silt/sand layer	2					3	2	7
Tr 1 Total			***3***		***1***		***1***	***3***	***6***	***14***
Tr 2	201	topsoil	2	1					1	4
	202	rubble layer	2			1	1		6	10
Tr 2 Total			***4***	***1***		***1***	***1***		***7***	***14***
Tr 3	301	topsoil	1	2					2	5
	303	rubble fill	4					1	18	23
Tr 3 Total			***5***	***2***				***1***	***20***	***28***
Tr 4	400	topsoil	1				1		1	3
	403	fill							1	1
Tr 4 Total			***1***				***1***		***2***	***4***
Tr 6	601	topsoil	2	1			1	1		5
	603	rubble layer	4						3	7
	608	fill							1	1
Tr 6 Total			***6***	***1***			***1***	***1***	***4***	***13***

	710	fill	2							2
Tr 7	713	fill							1	1
Tr 7 Total			***2***						***1***	***3***
	800	spoilheap							1	1
Tr 8	801	topsoil	1						1	2
Tr 8 Total			***1***						***2***	***3***
Total			**22**	**4**	**1**	**1**	**4**	**5**	**42**	**79**

Window glass - provenance and assemblage composition

B.3.2 The window glass is predominantly post-medieval glass, comprising sherds with slightly irregular surfaces and variations in colour and thickness. There are some more modern sherds, including float glass.

B.3.3 Trench 1 produced 6 sherds of window glass, all probably post medieval in date, except a probable sherd of modern float glass from context 110, and modern sherd from context 119.

B.3.4 There are 7 sherds of window glass from Trench 2 including 6 sherds from context 202. The latter included a number of sherds of more regular modern window glass including some float glass dating to the later 20th century. The single sherd of window glass from 201 (topsoil) is late post medieval or modern.

B.3.5 The largest quantity of window glass came from Trench 3, and most came from context 303 – a rubble layer sealed below the topsoil and subsoil - and amongst the glass from this context was a group of 10 blue green sherds from diamond-shaped quarries, with some evidence for leading on their edges. These sherds varied a little in thickness and the colours were slightly variable. They are of post-medieval date and could very well come from the 16th-century palace. A sherd from context 302 (topsoil) was modern.

B.3.6 There is 1 sherd of window glass from topsoil (context 400) in Trench 4 and possible sherd of thin window glass from context 403. Both sherds are probably post medieval in date.

B.3.7 There is no window glass, or vessel glass from Trench 5.

B.3.8 Trench 6 produced 4 thin sherds of probable window glass from contexts 603 and 608. The glass is all probably post medieval in date.

B.3.9 The single sherd of window glass from Trench 7 is thick, and heavily weathered with an iridescent surface weathering. This could be a medieval sherd.

B.3.10 There are two sherds of window glass from Trench 8. One sherd from context 800 is modern. The second sherd, from context 801, is the only fragment of cast window glass from the site. It is post-medieval or later in date.

Vessel glass - provenance and assemblage composition

B.3.11 The vessel glass is dominated by wine bottle sherds (n = 22). The wine bottle sherds include thick walled sherds from late 17th- or early 18th-century bottles from contexts 119 and 710. The wine bottle sherds from context 303 are probably from late 18th- or early 19th-century wine bottles. There are modern wine bottle sherds from contexts 201 and 202. Most of the other wine bottle sherds are undiagnostic and cannot be dated closely.

B.3.12 Trench 1 produced 8 sherds of vessel glass, comprising 3 wine bottle sherds all modern or undaignostic, 1 perfume bottle of later 19th century date, 1 bottle sherd and 3 undiagnostic vessel sherds. The perfume bottle has part of an embossed inscription reading (line 1) ‘ . . . RIE FARINA / (line 2) ' . . . HIN No. 2’. This is almost certainly a bottle of the firm of Jean Marie Farina, founded in Cologne in 1709. This firm marketed and popularised ‘Eau de Cologne’. In 1837, Queen Victoria granted a Royal Warrant to Jean Maria Farina of Cologne was as ‘purveyor of Eau de Cologne to Her Majesty’.

B.3.13 From Trench 2, there are 7 sherds of vessel glass including 4 wine bottle sherds, all modern or undiagnostic, 1 medicine/tonic bottle sherd of later 19th- or early 20th-century date, 1 sherd from the neck and rim of a soda water of later 19th- or early 20th-century date, and 1 undaignostic sherd from a bottle.

B.3.14 There are 8 vessel sherds from Trench 3, including 5 wine bottle sherds, 2 medicine/tonic bottle sherds and 1 undiagnsotic vessel sherd. The wine bottle sherd from context 301 (topsoil) is probably modern, but the sherds from context 303 include the base of a late 17th- or early 18th-century broad cylindrical wine bottle, and three sherds from a later 18th- or early 19th century cylindrical wine bottle. The medicine/tonic bottle sherds from context 301 are of later 19th- or early 20th-century date.

B.3.15 There are only 2 vessel sherds from Trench 4, one from a wine bottle and the other from a bottle in bright green glass. Both are modern.

B.3.16 Trench 5 produced no vessel glass, as well as no window glass.

B.3.17 Trench 6. There are 9 sherds from this trench, including 6 wine bottle sherds all undiagnostic and none closely dateable, 1 medicine/tonic bottle of late 19th- or early 20th-century date, 1 amber coloured bottle sherd and 1 undiagnostic pale blue vessel sherd.

B.3.18 Trench 7 produced 2 wine bottle sherds from context 710. One is a thick walled weathered sherd from a late 17th- or early 18th-century wine bottle and the other a thick walled sherd from the neck of a wine bottle, possibly of late 18th-century date.

B.3.19 Trench 8 produced 1 small undiagnostic wine bottle sherd from context 801 (topsoil).

Conclusions

B.3.20 Much of the glass is unstratified or from modern contexts, and most is of 19th- or 20th-century date. No context produced significant quantities of glass.

B.4 Metalwork

By Ian Scott

Introduction (Table 1)

B.4.1 The metalwork assemblage from the Tilt Yard excavation is quite large at 201 items, but this total include 91 nails and 43 pieces of lead waste, both offcuts and melted waste.

Provenance and assemblage composition

B.4.2 Trench 1 produced 48 metal items including 29 nails and 8 pieces of lead waste. Twenty three pieces were unstratified. The finds included a worn halfpenny of George 1 (unstratified), a lead pan weight decorated on one face with concentric circles and a cross (context 103), and a stamped copper alloy button inscribed 'CHATWIN' and 'T & I R PATENT' (context 101). There was a length of broad window came, and a fragment of decorative leadwork with scalloped edging (context 103). None of the finds need date before the 19th century.

B.4.3 Trench 2 produced 15 metal finds comprising 13 nails and 2 small miscellaneous fragments.

B.4.4 Trench 3 produced 27 pieces of metal, including 9 nails and 10 pieces of lead waste, all from topsoil (context 301). Other finds included a cast lead pan weight with a swirling pattern on one face, fragments of two buttons, and a piece of window came. One of the buttons was inscribed 'A GUTHRIE 54 NEW BOND ST' on the front and on the back: 'A. M. COOKE LONDON'.

B.4.5 Trench 4 produced only 2 finds again from topsoil. They comprised a nail and a possible piece of lead yotting for securing structural ironwork.

B.4.6 Trench 5 produced no metal finds

B.4.7 Trench 6 produced 91 metal finds including 34 nails and 20 pieces of lead waste. Most of the finds (n = 86) were unstratified. Identified finds included a George VI threepenny piece date 1941 (unstratified), a piece of lead shot, a pistol ball and a percussion cap for firing a pistol or musket. Personal items comprise 8 buttons, one inscribed 'BEST MAKE' and a lace chape. The buttons are all of 19th- or 20th-century date, the lace chape is of 16th- or 17th-century date. Household items include a probable handle, and attachment plate for a saucepan handle and the top of a toothpaste or similar tube with screw thread closure. There is a small lock probably from a piece of furniture and large heavily encrusted key. The latter is from a rubble layer 603.

B.4.8 Trench 7. There were only 7 metal items from this trench. They included a small copper alloy hook with screw attachment (unstratified) and a bar with a lead knob at one end. The function of the latter object is uncertain. It came from context 719.

B.4.9 Trench 8 produce 11 metal finds, 10 of which were unstratified. They include a pistol ball, part of the rear left leg of small toy horse, and a very small fragment of lead window came.

Conclusion

B.4.10 The metal finds are largely unstratified, and most need date not earlier than the 19th century. The assemblage comprises the general scatter of lost and broken objects that would be expected in a garden soil.

Table 1: HCP 66: Summary quantification of metal finds by Trench, Context and Function

Trench		type	Function															Total
			Coin	Arms	Measure	Personal	Leisure	Household	Window	Security	Structural	Binding	Nails	Misc	Query	Waste	Industrial	
Tr 1	100	u/s	1									1	15	1		5		**23**
	101	topsoil				1							7	1		1		**10**
	103	rubble layer			1						1		3	1		2		**8**
	107	rubble layer									1		4			1		**6**
	110	rubble layer							1									**1**
		Sub total	***1***		***1***	***1***			***1***		***2***	***1***	***29***	***3***		***9***		***48***
Tr 2	201	topsoil											13	1				**14**
	214	rubble layer												1				**1**
		Sub total											***13***	***2***				***15***
Tr 3	301	topsoil			1	2			1		1		9	2	1	10	*	**27**
		Sub total			***1***	***2***			***1***		***1***		***9***	***2***	***1***	***10***		***27***
Tr 4	400	topsoil									1		1				*	**2**
		Sub total									***1***		***1***					***2***
Tr 6	600	u/s	1	3		9		3	4	2	3		32	6	3	20	*	**86**
	601	topsoil															*	*
	602	subsoil															*	*
	603	rubble layer							1	1	1		1					**4**
	605	made ground															*	*
	608	feature fill											1					**1**
		Sub total	***1***	***3***		***9***		***3***	***5***	***3***	***4***		***34***	***6***	***3***	***20***		***91***
Tr 7	700	u/s						1						1	1	1		**4**
	713	feature fill											1					**1**
	715	feature fill											1					**1**
	719	feature fill									1							**1**
		Sub total						***1***			***1***		***2***	***1***	***1***	***1***		***7***
Tr 8	800	u/s		1			1		1		1		2	1		3		**10**
	808	feature fill											1					**1**
		Sub total		***1***			***1***		***1***		***1***		***3***	***1***		***3***		***11***
		Total	**2**	**4**	**2**	**12**	**1**	**4**	**8**	**3**	**10**	**1**	**91**	**15**	**5**	**43**		**201**

B.5 Architectural stonework

by Alison Kelly

Introduction and methodology

B.5.1 A total of 4 samples of stone were recovered, all from the trenches connected to the Henrician bowling alley. The earliest piece was rubble found in a mid 18th-century context in Trench 1. The only worked fragment was also found in Trench 1. Two fragments were found in modern topsoil in Trench 3 and on examination found to be natural rather than worked.

B.5.2 Each piece was examined and any features recorded including the presence of tool marks and type of moulding. The different types of stone were recorded but without specialist lithological knowledge the finds can only be classed as unidentified limestone or sandstone. A catalogue of the samples is included within this report.

Date and nature of the assemblage

B.5.3 The earliest dated piece is a piece of rubble limestone from context 107. This measures approximately 110 mm x 100 mm x 80 mm and has a pinkish colouring which may be from brickdust. The only worked piece of stone was found in context 110 and is a small (70 mm x 90 mm x 30 mm) piece of Reigate sandstone with two worked faces. One face is smooth with fine claw marks and the other has chisel marks and traces of limewash or lime mortar. It is likely this fragment predates the context it was found in but its origin remains unknown.

B.5.4 Two fragments were recovered from modern topsoil (context 301) in Trench 3 . One is a small (30 mm x 25 mm) piece of grey slate, the other is a small (32 mm x 32 mm) fragment of shelly limestone, both pieces appear to be natural.

Recommendations

B.5.5 In view of the small size and nature of the assemblage, no further work is recommended.

Catalogue

Ctx.	Ref.	Notes	Description	Lithology
107	Misc. 1	Piece of rubble with reddish colouring (poss from brick dust)	Rubble	Limestone
110	Misc. 1	Small frag. of worked stone. Two worked faces, one smooth with fine claw marks, one with chisel marks and traces of limewash/lime mortar. Unknown use.	Unknown	Reigate Sandstone
301	Misc. 1	Small frag. of shelly limestone.	Natural?	Shelly limestone
301	Misc. 1	Small frag. of slate.	Natural?	Slate

B.6 Bricks

by Alison Kelly

Introduction and methodology

B.6.1 A total of 39 brick samples were recovered from 11 different contexts Trenches 1, 4, 6 and 7. Most samples came from Trenches 1 and 6. Trench 1 is part of the Henrician bowling alley excavations and Trenches 4, 6 and 7 were part of the Tiltyard excavations. Of the total samples, 17 were of a size suitable for further analysis and the results are discussed in this assessment report. A catalogue of the assessed brickwork is included. A total of 22 samples were either too small or had no finished surfaces. The majority of brick samples are fragments and do not provide full dimensions for comparison with the size of known samples; however there were three whole bricks in the assemblage which were fully analysed.

B.6.2 All the samples were individually examined for striations and imprints, mortar, size (stretcher x header x depth) in mm, inclusions and colour, and the information was entered into an Excel spreadsheet. Sizes and descriptions of whole bricks were compared to dated samples using the Hampton Court brick typology devised by Daphne Ford for English Heritage in 1991. A further discussion on the typology is included below.

Brick supply to the Palace

B.6.3 Documentary evidence tells us that there was an itinerant brickmaker and a kiln based at the Palace for the earliest Wolsey building phase, the construction of the ranges forming Base Court, which began in 1515 (Musty 1990, 412). However it is also known that, for later phases, bricks were brought in from outside. Documentary evidence from the building accounts of this period show that bricks were obtained from Battersea and Wandsworth, both easily accessible by barge (Ford 1991).

B.6.4 The Henrician phases of works used imported bricks as well as bricks fired in a kiln in the park (Colvin et al 1982, 132). The building accounts for this period show that brick was brought from Westminster as well as from local suppliers in Hampton, Hampton Wick and Kingston. Oatlands Palace was acquired in 1537 and some bricks were sent from Oatlands for the construction works at Hampton Court (Ford 1991). The bricks of light red colour for the Great Hall (1530-2) were produced in Taplow from local clay (Wight 1972, 214). It is likely that any construction on the Tiltyard towers and Bowling Alley would be done using Type C or Type D bricks. Type C bricks have a colour range including dark orange/brown orange/dark rose and dimensions of 108-123 mm x 210-235 mm x 102-108 mm. Type D bricks are brown/orange and orange coloured with dimensions of 210-235 mm x 95-108 mm x 51-57 mm. Both brick types have a shorter maximum stretcher length than is seen in bricks used in the Wolsey phase works.

B.6.5 Because of the higher status of red bricks, early 16th-century external brickwork would be covered with painted decoration and the internal covered with tapestries, meaning that a consistency in the colour and size of the brick was not required (White 2005, 64). Late 17th-century works used bricks from suppliers local to the palace (Hammersmith and Twickenham) suggesting a more widespread brickmaking industry at this time which removed the necessity for on-site brickmaking. The Wren re-building works used many brick suppliers, including one from Vauxhall and the remainder thought to be based in Twickenham (Musty 1990, 416).

Date and nature of the assemblage

B.6.6 The majority of the brick samples within the assemblage are fragmentary which means that complete measurements could not be taken. However three complete bricks were recovered from Trench 1. Without large quantities of samples and other datable indicators the estimated dates for the bricks can only be tentative at most.

B.6.7 The bricks are all post medieval, unfrogged and rose, red, brown or orange coloured. The majority of brick samples had traces of lime mortar with variation in the type and quantity of inclusions and the depth of the cream/white colour.

B.6.8 There is a small number of vitrified and glazed bricks in the assemblage. Naturally green glazed bricks are formed during the firing process and depend on the iron content of the clay. Glazing can be added to a brick by the addition of agents (sand, potash, silica) during the firing process. Testing of green glazed bricks from Hampton Court Palace in 2001/2002 suggest that these bricks had natural glazing (White 2005, 41), however it is possible that there are some purposely overfired and glazed bricks in the assemblage.

B.6.9 The bricks in the assemblage have features that indicate the manufacturing technique used: the clay was set in a wooden mould and carried to the drying area, known as the 'place', where the brick would be turned out of the mould and laid flat for drying prior to being stacked within the kiln. The majority of bricks had irregular lower bed faces (often with straw impressions), crease marks and relatively smooth upper faces formed by the strike removing surplus material from the wooden mould (Smith 2001, 35). The appearance of sunken margins suggests the clay was moist when the bricks were turned out resulting in raised lips on the edges of the upper face of the bricks. The mould was then used to push down the raised edges leaving straight depressions and slightly raised central faces (Betts 1996, 8).

Bricks from Trench 1 (Bowling alley)

B.6.10 Three whole bricks were recovered from Trench 1 (bowling alley excavation). One is a brownish orange coloured brick from context 109, a N-S brick wall. This brick measures 219 mm x 110 mm x 58 mm and has hard cream coloured lime mortar. This is a Henrician brick, probably Type C (1529-1566) or D (c.1536-1537). A further two bricks that were recovered from context 107 are similar in size and colour and so are also probably Type C or D bricks.

B.6.11 The remainder of brick fragments within this trench include a pale orange coloured brick with a large stone inclusion which appears to be of late 17th- or early 18th-century date and a wine coloured brick which has vitrified faces with a solid blue/grey glaze to the upper face and one stretcher. The date for this is uncertain (broadly 1500-1800). Both of these fragments were recovered from a 19th-century rubble layer (context 103). Also from context 107 were a fragment of vitrified/wine coloured brick with a thick mortar layer still attached which appears to be of 18th-century date and an orange/rose coloured brick of uncertain date (broadly 1500-1800).

Bricks from Trench 6 (Tiltyard)

B.6.12 A total of 9 fragments recovered from Trench 6 contexts were suitable for analysis. Two fragments of brown/orange coloured brick are consistent with Type C or D Henrician brickwork, and were recovered from context 620 which is associated with the subdivided garden of 1700. Two brick fragments with similar stretcher and depth

measurements had a similar pale green coloured glaze, one was found in context 620 and one in context 605, a context associated with the 17th-/18th-century garden remains. Both of these glazed bricks appear to be of early 16th-century date. Another fragment recovered from context 605 is orange coloured and also appears to be of early 16th-century date. Context 605 also produced two fragments of similar sized rose coloured bricks. One has particles of dark orange clay suggesting poor puddling and is of post medieval date (1500-1800), the other fragment has friable cream coloured lime mortar and is probably of 16th-/17th-century date. Two samples were recovered from context 603, a 19th-century Victorian context. One brick is shaped with a deep indent on one edge of the stretcher. This appears moulded rather than cut as there is a lip to one edge. However, there are cut marks elsewhere on the brick. The interior of the brick has been roughly gouged out by hand as finger marks can clearly be seen. The small stretcher measurement (155mm) suggests this brick was made to be used in a specific area; the roughness of the moulding suggests that it is early in date (c.16th/17th century).

Other bricks

B.6.13 A fragment of wine coloured brick was recovered from the topsoil (context 400) in Trench 4 (Tiltyard). This was an irregular shaped brick with defined arrises but the corner sections broken off. The mortar is hard, cream coloured with lime inclusions. This brick cannot be accurately dated but is probably *c*.1500-1800.

Comparison with the Hampton Court brick typology

B.6.14 Some bricks appeared to match types shown on the typology as discussed above, however, the majority of the fragments could not be accurately dated by comparison to the typology. Overall the brick typology is a very useful tool and, as a complete study of Hampton Court Palace, is invaluable to our understanding of the associated buildings and construction phases. However, it was found that there are limitations when using it to identify excavated brickwork without an historical context, particularly on mixed assemblages such as this. Within an elevation the differences between the different brick types are clearer when seen in combination with the associated mortar type and bond.

B.6.15 The brick typology has been used on several building recording projects within the palace by the author and the have been occurrences of inconsistency with the measurements taken from dated elevations and the measurements given in the brick typology. It was concluded that the difference was due to the OA recorded measurements being taken following the raking out of black ash mortar which often overlaps the outer edges of the brick (OA 2007, OA 2008).

Recommendations

B.6.16 In view of the small size and mixed nature of the assemblage, no further work is recommended at this stage. A more detailed catalogue and report could however be produced if the client desires this and if additional funding becomes available research could possibly be undertaken into the supply of construction material for Hampton Court Palace.

Catalogue

Ctx.	Ref.	Size (mm)	Notes	Date/Type

103	BM1	(65) x 100 x 61	Fragment of pale orange coloured brick with large stone inclusions. Hole in one corner - poss clay pipe or organic frag?	Late17thC/ early 18thC
103	BM5	(105) x 115 x 60	Frag. of wine coloured brick with blue grey glaze.	1500-1800
107	BM1	(110) x 98 x 54	Frag of orange/rose coloured brick with rough arrises and mixed stone inclusions	1500-1800
107	BM5	(105) x 110 x 55	Frag of wine coloured brick with vitrified header. Mortar is cream coloured with lime and laid 17mm thick.	18thC
107	BM5	225 x 105 x 51	Whole orange coloured brick with traces of cream coloured lime mortar. Upper face has sandy inclusions, all other faces creased and roughly formed.	Henrician - 16thC. Prob Type C or D
107	BM5	223 x 109 x 51	Whole brownish orange coloured brick. Upper face has strike marks and sunken margins. Prob internal as one header has render on with a thin layer of plaster/limewash on top.	Henrician - 16thC. Prob Type C or D
109	BM6	219 x 110 x 58	Whole brownish orange coloured brick. Upper face has strike marks and sunken margins. Mortar is hard and cream coloured with lime inclusions.	Henrician - 16thC. Prob Type C or D
400	BM6	(100) x 100 x 63	Frag of wine coloured brick with hard cream coloured lime mortar.	1500-1800
603	BM3	(65) x 98 x 60	Frag of wine coloured brick with hard cream coloured lime mortar.	1500-1800
603	BM3	155 x 78 x (55)	Frag of orange/rose coloured brick. This brick is moulded and has a deep indent running along one stretcher. This has not been cut but formed as lip at one end, rub marks on one face. Inside of brick has been gouged out with finger marks within the clay. Unknown use and date but prob early in date as very roughly formed.	1500-1900
605	BM4	(140) x 103 x 54	Fragment of rose coloured brick with friable cream coloured lime mortar.	16th/17thC
605	BM4	(110) x 101 x 52	Fragment of rose coloured brick with friable cream coloured lime mortar. Darker orange clay particles within mix, poss poor puddling.	1500-1800
605	BM4	(60) x 108 x 58	Frag of brown coloured brick with hard cream coloured lime mortar. Header partially covered with pale green glaze.	16thC
605	BM6	(110) x 105 x 52	Frag of orange coloured brick.	16thC
620	BM6	(95) x 107 x 54	Frag of wine coloured brick with pale green glaze/vitrified header.	16thC
620	BM6	(145) x 104 x 55	Frag of orange/brown coloured brick with large quantity of gritty inclusions.	Henrician - 16thC. Prob Type C or D
620	BM6	(145) x 106 x 55	Frag of orangey red coloured brick.	Henrician - 16thC. Prob Type C or D

The following contexts had fragments too small for analysis:

(103) 1 fragment; (403) 1 fragment; (603) 2 fragments; (605) 2 fragments; (608) 1 fragment; (710) 8 fragments; (715) 7 fragments.

B.7 Assessment of *in situ* brickwork revealed in evaluation trenches

by Alison Kelly

Trench 1 - Bowling Alley

B.7.1 Wall 109: 260 x 120 x 60mm - Size matches with Wolsey type A brickwork.

B.7.2 Wall 129: 225 x ? x 40-5 0mm- unable to compare to typology without full measurements.

B.7.3 Wall 130: 150 x >60 x 45-60mm- unable to compare to typology without full measurements.

B.7.4 Wall 131: 205-215 x >80 x 40-55mm- unable to compare to typology without full measurements.

B.7.5 Wall 132: >150 x 60-110 x 45-55mm - unable to compare to typology without full measurements.

NB - The bowling alley was probably constructed of Type C or D Bricks so it would be safe to say any brickwork associated with the bowling alley are probably Type C or D.

Trench 2 - Bowling Alley

B.7.6 Wall foundation 210: 260 x 150 x 70-80mm - abnormally large brick. Comparable to medieval great bricks. Possibly reused?

B.7.7 Well 203: 200-230 x 100 x 60mm - yellow stock bricks. Site images unclear. 200mm is a small stretcher measurement only seen in the typology on rubbed bricks of the 17th/18th century. The colour suggests these bricks are probably late 17th-/early 18th-century London stock bricks, with some cut smaller to fit.

Trench 3 - Bowling Alley

B.7.8 Wall 305: 250-255 x 120 x 50-55mm - large stretcher measurement and orange colour suggests Type A Wolsey phase bricks. Possibly reused?

B.7.9 Walls 310 and 311: 225 x 102 x 55mm - size and colour comparable with Henrician Type C and D bricks. Early 16th century.

Trench 4 - Tiltyard

B.7.10 Foundation Wall 406: ? x 95 x 40mm - Unusually small depth/thickness measurement with no match.

B.7.11 Wall 406: 210 x 100 x 45mm - Unusually small depth/thickness measurement with no match.

The assumption is that these bricks from wall 406 are Type C as used in the construction of the standing tiltyard tower, but that the depth was measured incorrectly due to overlapping mortar, access or erosion of the arrises.

B.7.12 Drain 402: 220 x 110 x 65mm - Yellow stock bricks. Appear similar to those in trench 2. Size fits with type Q Malm bricks (late 18th/19th century).

B.8 Ceramic building materials (CBM) excluding bricks

by Alison Kelly

Introduction and methodology

B.8.1 A total of 94 sherds of tile weighing 16.9 kg were recovered from 18 different contexts. The vast majority of samples were fragments and therefore could not provide full dimensions for comparison with known samples. This assessment deals with all categories of ceramic building material (CBM) excluding bricks, which are discussed in a separate assessment report.

B.8.2 Most of the assemblage consists of fragments of plain roofing tile with some samples of glazed floor tile and a smaller quantity of other CBM. The CBM was recorded on an Excel spreadsheet with the total samples for each context divided into three main functional types: flat roof tile, floor tile and other tile/CBM (e.g. ridge tile, hip tile, pantile etc.). The overall weight for each context of all CBM (minus brick rubble) was recorded. Measurable dimensions were recorded where possible; however there are no complete samples in the assemblage. More detailed descriptive comments were recorded for fairly complete or significant pieces. An approximate spot date was assigned where possible, however many pieces were found in later phase contexts, probably as a result of disturbance during works to the Palace gardens.

Date, nature and condition of the assemblage

B.8.3 All of the material is of post medieval date (*c*. 1500 and later) with no obvious samples dating earlier than this. Identification can be problematic as the roofing tile from the medieval and post medieval periods is very similar in appearance; however it is highly unlikely that any pieces date prior to *c.* 1500. The vast majority of samples have a smooth upper face with some strike marks and a rougher underside, showing the forming process. Gritty or sandy inclusions on the lower face show that the tiles were either formed on a sand strewn bench or laid out to dry before firing on a sandy/gritty surface.

Tile supply to the Palace

B.8.4 During the first half of the 16th century the main suppliers of plain roof tiles and ridge tiles were based in Kingston-upon-Thames. Other suppliers were based in Ruislip, Richmond, Stoke d'Abernon, Combe, Burnham and Chislehurst (Musty 1990, 415). The accounts also show entries for the purchase of tile wasters which were used in foundations and as hardcore. Twickenham became the main source of supply in the 17th century.

B.8.5 Flemish floor tiles were imported to England from the late 14th century onwards and reached a peak of popularity during the 15th and 16th centuries. However, it is thought that all the fragments recovered in the excavations are English made, and reference is made in the accounts to supplies of tiles coming from Chertsey and Chiselhurst. John Church of Chertsey who supplied 'black and white' tiles as well as other floor tiles at *18s./4d.* per thousand and green and yellow Flemish tiles were supplied from Chiselhurst at *50s./-* per thousand (Musty 1990, 417). These plain coloured floor tiles were often laid in chequerboard patterns and nail holes can sometimes be seen in the corner, particularly on true Flemish made tiles.

Flat roof tile

B.8.6 With a total of 68 samples, this is by far the largest category of CBM from this site. The samples all appear to be rectangular in form with, where seen, two nail holes near the upper end. All nail holes are circular with diameters ranging from 12 mm to 18 mm, except one piece from context 603, which has a square nail hole; however the tile is broken at this point so measurements could not be taken. Two tile fragments from contexts 214 and 303 have one nail hole filled with mortar suggesting the tile was either only fixed to the roof with one nail and/mortar or that the fragments had been used elsewhere in construction, either as infill pieces or as levelling for brickwork. One of these tiles from context (303) is also nearly full length, measuring 255mm long and with a width of 140mm. A smaller fragment also from this context has a width of 150mm and has the imprint of a cat's paw complete with claws.

Floor tile

B.8.7 A total of 14 pieces of floor tile were recovered, although none were complete. The majority of pieces were fragments of Flemish style 'black and white' which consists of glazed tiles of varying colour, quality and execution. The 'black' tiles have a greenish brown (occasionally black) glaze and the 'white' tiles appear yellow in colour due to the application of a clear glaze over a white slip. Four 'black' tile fragments were recovered from contexts 107, 119, 303 and 605; two 'white' tile fragments were recovered from contexts 307 and 603. The average depth of these tiles is 27 mm and the majority of tile fragments are in good condition with some traces of lime mortar suggesting these were used as flooring, although there are no obvious signs of wear. Only one fragment, from context 119, has two corners giving a width of 220 mm.

B.8.8 Two fragments of tile with a solid bright green glaze were found in contexts 103 and 307 and have a slightly smaller depth of 24 mm. The colour is unusually bright in comparison to other samples from the period seen by the author on other projects at Hampton Court Palace. Further research to establish whether or not similar tiles are to be found amongst existing finds archives for Hampton Court and the surrounding region would be useful. Two fragments of unglazed floor tile were recovered; one from context 202 is, at 45 mm, deeper than the other pieces in the assemblage and is probably of 18th-/19th-century date. Another piece is 26 mm deep and probably an unglazed Flemish style tile.

Other tile

B.8.9 Only 6 fragments of tile were recovered which were not either floor tile or flat roof tile. There was one fragment of pantile, indentified by the distinctive S-shaped curve, found in context 202. This tile is approximately 19 mm thick and is probably 18th century in date. The remaining fragments are all of curved ridge tile and were found in contexts 107, 202 and 214. These are of uncertain date but one piece in context 107 appears early in date. This tile is 17 mm thick and the curve of the tile appears to have been formed by hand as there are multiple finger marks where the tile has been smoothed into shape.

B.8.10 One fragment of cream coloured tile was recovered from modern topsoil (context 601). This piece is similar to modern tiles used in bathrooms and so probably dates to the 20th century.

Recommendations

B.8.11 In view of the small size and mixed nature of the assemblage, no further work is recommended at this stage. A more detailed catalogue and report could however be produced if the client desires this and if additional funding becomes available enabling research could possibly be undertaken into the supply of construction material for Hampton Court Palace.

B.9 Mortars and plasters

by Alison Kelly

Mortar samples

B.9.1 Mortar samples were obtained from a total of 7 contexts from this evaluation. Each sample was examined and the findings are listed below.

Ctx.	Ref.	Notes	Phase
103	Misc. 1	Hard solid mortar with gritty texture. Cream coloured with small stone and lime inclusions. Flat surfaces and pigmentation suggest used within brick wall. Prob. post Tudor.	19th-century rubble layer
107	Misc. 1	Hard mortar with small stone and lime inclusions. Pale cream in colour. Small frags. of red brick to one side. Prob. post Tudor.	1730-1780+
109	Misc. 1	Friable mortar with mixed size lime inclusions. Pale greyish cream in colour and similar to other mortar samples from around this date seen elsewhere in the palace (eg. Anne Boleyn Gatehouse, astronomical clock insertion).	1537/8 - Bowling alley construction
214	Misc. 1	Hard cream coloured mortar with lime inclusions and imprints of bricks. Prob. post Tudor.	Post 1730 demolition layer
603	Misc. 1	Dark cream coloured friable render/mortar. Brick frags are wine coloured - poss 18th C?	Victorian
710	Misc. 1	Hard gritty mortar with mixed size lime inclusions and some small stone inclusions. Dark orange coloured brick frag. Prob. post Tudor.	1700-1825 Garden features
713	Misc. 1	Hard gritty mortar with mixed size lime inclusions and some small stone inclusions. Prob. post Tudor.	1700-1825 Garden features

Plaster samples

B.9.2 Plaster samples were obtained from a total of 3 contexts from this excavation. Each sample was examined and the findings are listed below.

Ctx.	Ref.	Notes	Phase
103	Misc. 1	Three large fragments of decorative plaster (gypsum?). Traces of limewash on one piece. All have a series of flat surfaces and raised decorative shape suggesting these fragments were possibly infill sections for decorative panelling or part of a plaster decorative ceiling. Absence of hair suggest higher status use.	19th-C rubble layer
110	Misc. 1	Three large fragments. One is plain, hard, dark cream in colour with lime inclusions. The second sample has one face blackened prob. by exposure to elements. This is hard, rich creamy coloured with small stone and lime inclusions. The final sample is creamy coloured with lime inclusions and a possible red wash. All three pieces are probably more of a render than plaster.	19th-C dumping
605	Misc. 1	Small fragments of a dark cream coloured mortar with small stone and lime inclusions. Friable. No defining features. Sample probably more of a render than plaster.	17th/18th C

B.10 Lithics

By David Mullin

B.10.1 A total of four worked flints were recovered from two contexts in Trench 6: 605 and 608. Context 605 contained two waste flakes whilst 608 contained a waste flake and a burnt flint. The material is entirely residual within later contexts and has little value beyond demonstrating a human presence in the area in prehistory.

APPENDIX C. ENVIRONMENTAL REPORTS

C.1 Animal bones

By Rachel Scales

Introduction

C.1.1 A small assemblage comprising of 41 bird and mammal bones was recovered from excavations at Hampton Court Tilt yard and Bowling Alley. They were recovered by hand collection during the excavation of a series of deposits dating principally to the 18th and 19th centuries. A full record of the assemblage, documented in a *Microsoft Access* database, can be found in the site archive.

Methodology

C.1.2 The bones were identified at Oxford Archaeology using a comparative skeletal reference collection, in addition to standard osteological identification manuals. All animal bones were counted and weighed, and where possible identified to species, element, side and zone. For zoning, Serjeantson (1996) was used. Due to the over all small number of identifiable bones per species, the minimum number of individuals (MNI) was not calculated.

C.1.3 An attempt was made to distinguish sheep and goat, using Boessneck *et al.* (1964) and Prummel and Frisch (1986), although no bones could be identified to either species. Ribs and vertebrae, with the exception of atlas and axis, were classified by size: ‘large mammal’ representing cattle, horse and deer and ’medium mammal’ representing sheep/goat, pig and large dog.

C.1.4 The condition of the bone was graded on a 6-point system (0-5). Grade 0 equating to very well preserved bone, and grade 5 indicating that the bone had suffered such structural and attritional damage as to make it unrecognisable (see Table 1).

C.1.5 For ageing, Habermehl’s (1975) data on epiphyseal fusion was used. Three fusion stages were recorded: ‘unfused’, ‘in fusion’, and ‘fused’. ‘In fusion’ indicates that the epiphyseal line is still visible.

Table 1: Bone preservation grades:

Grade 0	Excellent preservation. Entire bone surface complete.
Grade 1	Good preservation. Almost all bone surface complete.
Grade 2	Fair preservation.
Grade 3	Poor preservation. Most bone surface destroyed.
Grade 4	Very poor preservation. No surface structure remaining.
Grade 5	Extremely poor preservation. Unlikely to be able to identify element.

Table 2: Quantifcation (fragment count) by Preservation levelS

n	0	1	2	3	4	5
46	0	1	26	9	4	0

The assemblage

C.1.6 The bones were mainly in a fair condition (see Table 2). No bones were burnt. Traces of carnivore gnawing were noted on 6 (15%) of the bones. Cut and chop marks from both the filleting and dismembering processes were recorded on 17 (41%) bones.

C.1.7 The main domestic mammal species are represented in small numbers (Table 3). Nine bird bones were recorded. One goose (*Anser anser*) coracoid was noted in the twentieth century topsoil while a domestic fowl (*Gallus gallus*) tarsometatarsus was recovered from drain context 403, spot dated 1680-1800 AD. A duck (*Anas sp.*) scapula was recovered from make up layer context 106 dated to 1675-1850. Nineteenth century rubble layer context 110 contained five large passerine bones (cf. starling - *Sternus vulgaris*) thought to belong to the same bird. One rabbit (*Oryctolagus cuniculus*) tibia was recovered from another nineteenth century rubble layer (context 103). The bones identifiable to species level are too few in number to yield any useful information. Suffice it to say that the bones derive mainly from domestic waste, and that the animals that were present in the assemblage were sub-adult and/or adult at the time of death.

Table 3. Number and percentage of identifiable bones.

Period	Element	Cattle	Sheep/ goat	Pig	Rabbit	Bird	Large Mammal	Medium Mammal	Indet.
Late 17th-18th Century	Pelvis	1							
	Femur		1						
	Rib						1		
	Vertebra							1	
	Indeterminate								3
19th Century	Hyoid	1							
	Scapula					1			
	Radius		1			1			
	Astragalus			1					
	Metatarsal	2							
	Pelvis		1	1					
	Femur		2			2			
	Tibia	1	2		1	2			
	Tarsometatarsus					1			
	Rib						4	2	
	Vertebra						1	1	
	Indeterminate								2
20th Century	Coracoid					1			
	Indeterminate								3
Total		***5***	***7***	***2***	***1***	***8***	***6***	***4***	***8***

C.2 Shell

By Leigh Allen

C.2.1 A total of 6 fragments of hand collected shell weighing 47g was recovered from the archaeological investigation, no shell was recovered from environmental samples.

C.2.2 All the fragments were from oyster shell (*ostrea edulis*) and they were recovered from contexts 103, 301, 603 and 700.

C.2.3 The shells are in poor condition, powdery and flaking, there are 3 fragments from right valves and 3 from left valves, the shells are in general of a small size measuring c.50mm across.

C.2.4 Oyster would have added variety to the basic diet but the small quantities recovered do not indicate that they formed a significant part of the diet.

Table 1: List of oyster shell fragments

Context	*Frag Count*	*Weight*	*Description*
103	1	14g	Right valve
301	1	7g	Left valve
603	3	9g	2 right valves, 1 left valve
700	1	17g	Left valve

Appendix D. Bibliography and References

Betts, I M, 1996 New thoughts on bricks with sunken margins, *British Brick Society Information* no. **68**, 6-8

Boessneck, J, Müller, H-H, and Teichert, M, 1964 Osteologische Unterscheidungsmerkmale zwischen Schaf (Ovis aries Linné) und Ziege (Capra hircus Linné), *Kühn-Archiv* **78**.

Colvin, H M, Smmerson, J, Biddle, M, Hale, J R, and Merriman, M, 1982 *History of the Kings Works IV (1485 - 1660)* HMSO, London, quoting works accounts (PRO, E36/244)

English Heritage, 1991 *Management of Archaeological Projects,* London

Ford, D, 1991 *Hampton Court - Elevations and Brick Typology,* English Heritage

GSB Prospection Ltd, 2009, *Hampton Court Palace, Bowling Alley and Tiltyard Towers* (Geophysical Survey Report 2009/0

Habermehl, K-H, 1975 *Die Altersbestimmung bei Haus- und Labortieren.* 2nd ed. Verlag Paul Parey, Berlin, Hamburg.

Hey, G, and Lacey, M, 2001 *Evaluation of Archaeological Decision-making Processes and Sampling Strategies.*

IFA, 2001 *Standards and Guidance for Archaeological Watching Briefs,* Reading

LAARC, 2007 Post 1992 Museum of London code expansions: Post-Roman pottery (www.museumoflondon.org.uk.post_rom.pdf)

Munby, J, 1996 Signor Verrio and Monsieur Beaumont, Gardeners to King James II, *J British Archaeol Assoc.* **149,** 55-71

Munby, J, et al. (2007) *From* Studium *to Station. Rewley Abbey and Rewley Road Station*, *Oxford,* OA Occasional Paper No.16, Oxford

Musty, J (1990) Brick Kilns and Brick and Tile Suppliers to Hampton Court Palace, *Archaeological Journal* Vol 147, 411-19

Oxford Archaeology, 1992, *Fieldwork Manual*, (ed. D Wilkinson, first edition, August 1992)

Oxford Archaeology, 2000, OA Environmental Sampling Guidelines and Instruction, Manual.(first edition, July 2000)

OA, October 1994, Tiltyard Archaeological Evaluation Report (OA Client Report for HRPA: Project Code HCP 4)

OA, April/May 1995, The Tiltyard: Report of Archaeological Works (OA Client Report for HRPA: Project Codes HCP 5 and HCP7)

OA, August 1998, The Melon Yard: Proposed real tennis Court Site Archaeological Evaluation Report (OA Client Report for HRPA)

OA, 2000 *OA Environmental Guidelines for sampling (first edition, July 2000)*

OA, February 2005a The Tiltyard Tower, Hampton Court Palace. Historic Building Recording (Client Report for HRP)

OA, February 2005b Hampton Court Palace, Nursery Drainage Improvements, Archaeological Watching Brief report (Client Report for HRP; Project Code HCP 42)

OA, 2007 Chapel Court, North Facing elevation. Building Recording and Investigation (Client Report for HRP).

OA 2008 Chapel Court, East Facing elevation. Building Recording and Investigation (Client Report for HRP)

OA, March 2008 The Tiltyard, Tiltyard Towers and northern Bowling Alley, Hampton Court Palace (Project Design, Issue No. 2)

Oswald, A, 1975 *Clay Pipes for the Archaeologist*, BAR British Series 14,Oxford

Prummel, W, and Frisch, H-J, 1986 A guide for the distinction of species, sex and body side in bones of sheep and goat, *Journal of Archaeological Science* **13**, pp. 567-577.

Rawlinson, K, Tiltyard Tower (Hampton Court Palace) Summary Statement of Significance(Internal Document HRP)

Ryan, P, and Andrews, D, 1993 A Brick and Tile Typology for Cressing Temple' in D. Andrews (ed), *Cressing Temple: a Templar and Hospitaller Manor in Essex,* Essex County Planning Department, Chelmsford

Ryan, P, 1999 *Brick in Essex : the clayworking craftsmen and gazetteer of clayworking sites*. Chelmsford: P Ryan

Salzman, 1967 *Building in England Down to 1540,* Oxford.

Serjeantson, D, 1996 The animal bones, In *Refuse and disposal at Area 16 east Runnymede. Runnymede Bridge research excavations, Volume 2*, S. Needham and T. Spence, British Museum Press; London. pp. 194-253.

Smith, T P, 2001 On 'small yellow bricks' from Holland, *Journal of Construction History* **17**, 31 – 41

Thurley, S, 1993 *The Royal Palaces of Tudor England: Architecture and Court Life 1460-1547,* New Haven and London.

Thurley, S, 2003 *Hampton Court , A Social and Architectural History*, New Haven and London

Wight, J A, 1972 *Brick Building in England from the Middle Ages to 1550*.

White, A, 2005 *The Tudor decorated brickwork at Hampton Court Palace.* (Unpublished MA dissertation)

Summary of Site Details

Site name: Hampton Court Palace,Tiltyard and Bowling Alley

Site code: HCP 66

Grid reference: TQ 156 687

Type: Evaluation

Date and duration: 22 March – 27 March 2009

Summary of results: Trenches 1, 2 and 3 revealed the line of the West wall of Henry VIII's Bowling Alley and the buttresses added to the wall. Trenches 4 – 8 investigated Henry VIII's Tiltyard. Trench 4 revealed brick wall probably part of the NE Tiltyard Tower, and Trench 6 revealed brick footings, partially robbed away, and probably part of the SW Tiltyard Tower as well as probably garden features of 17th- or 18th-century date. Trenches 7 and 8 revealed further garden features but no evidence of Tudor structures. Trench 5 contained no significant archaeological features or deposits.

Location of archive: The archive is currently held at OA South, Janus House, Osney Mead, Oxford, OX2 0ES, and will be deposited with the Historic Royal Palaces Agency in due course, under the following accession number: TBC

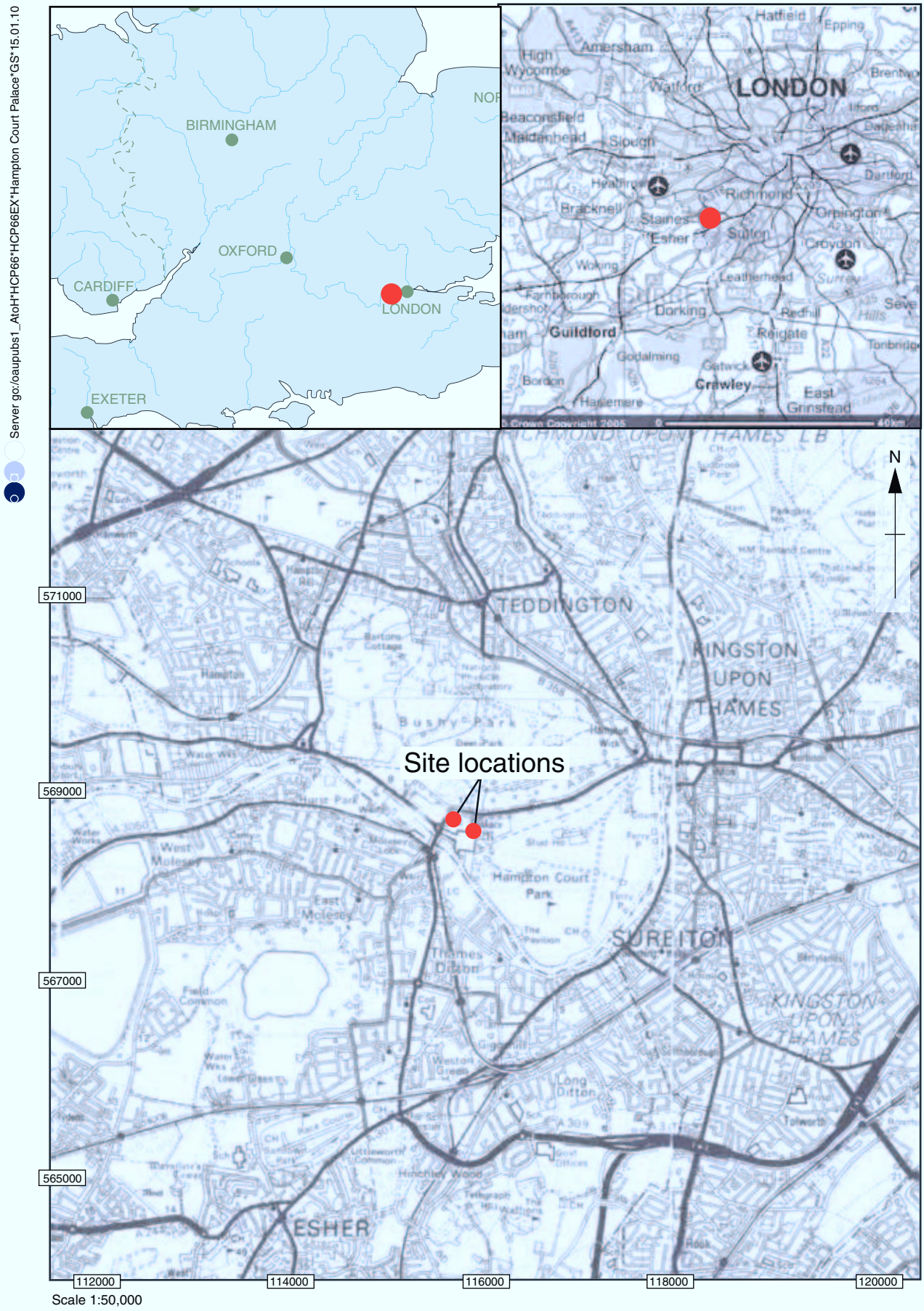


Figure 1: Site location

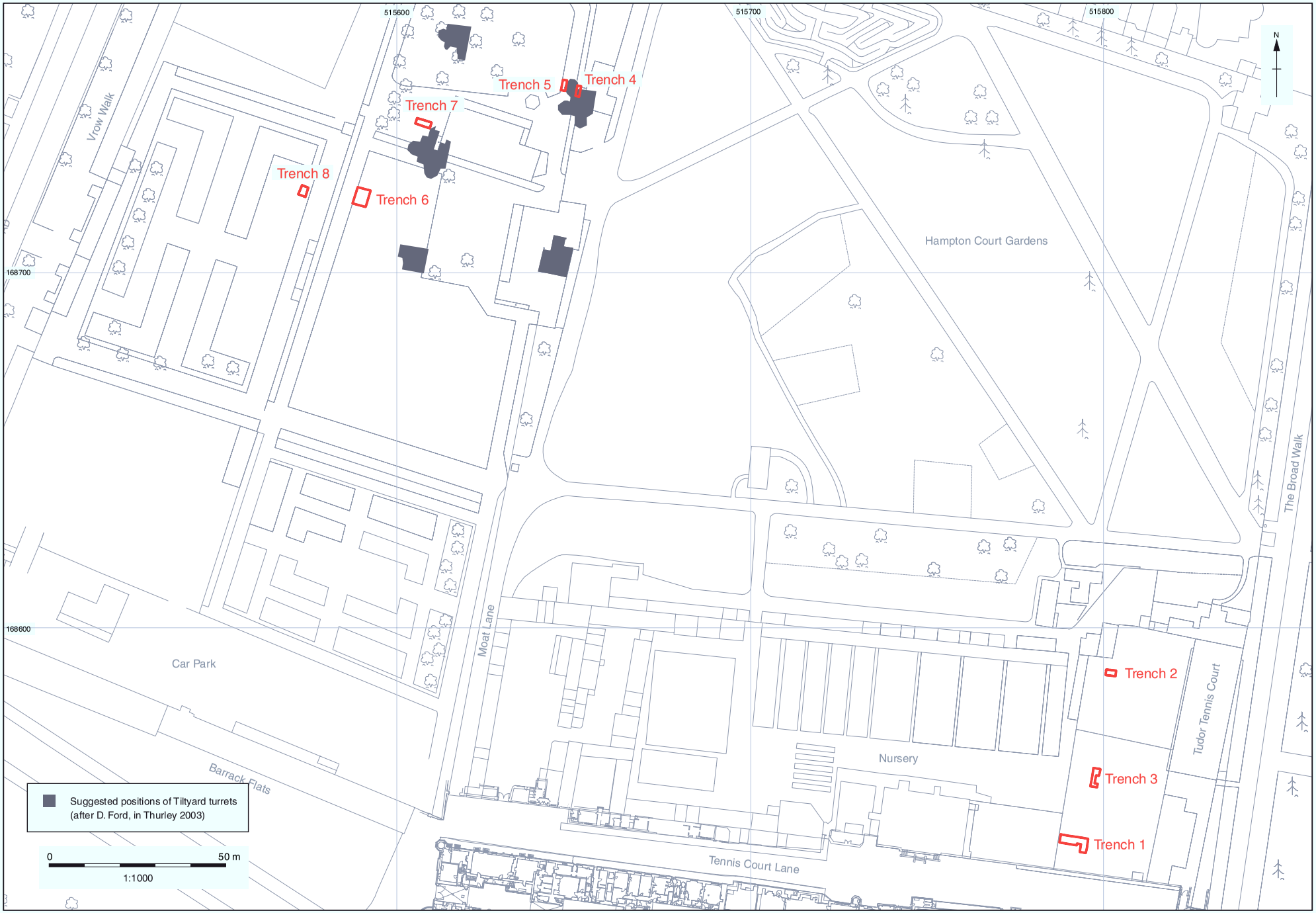


Figure 2: Trench locations

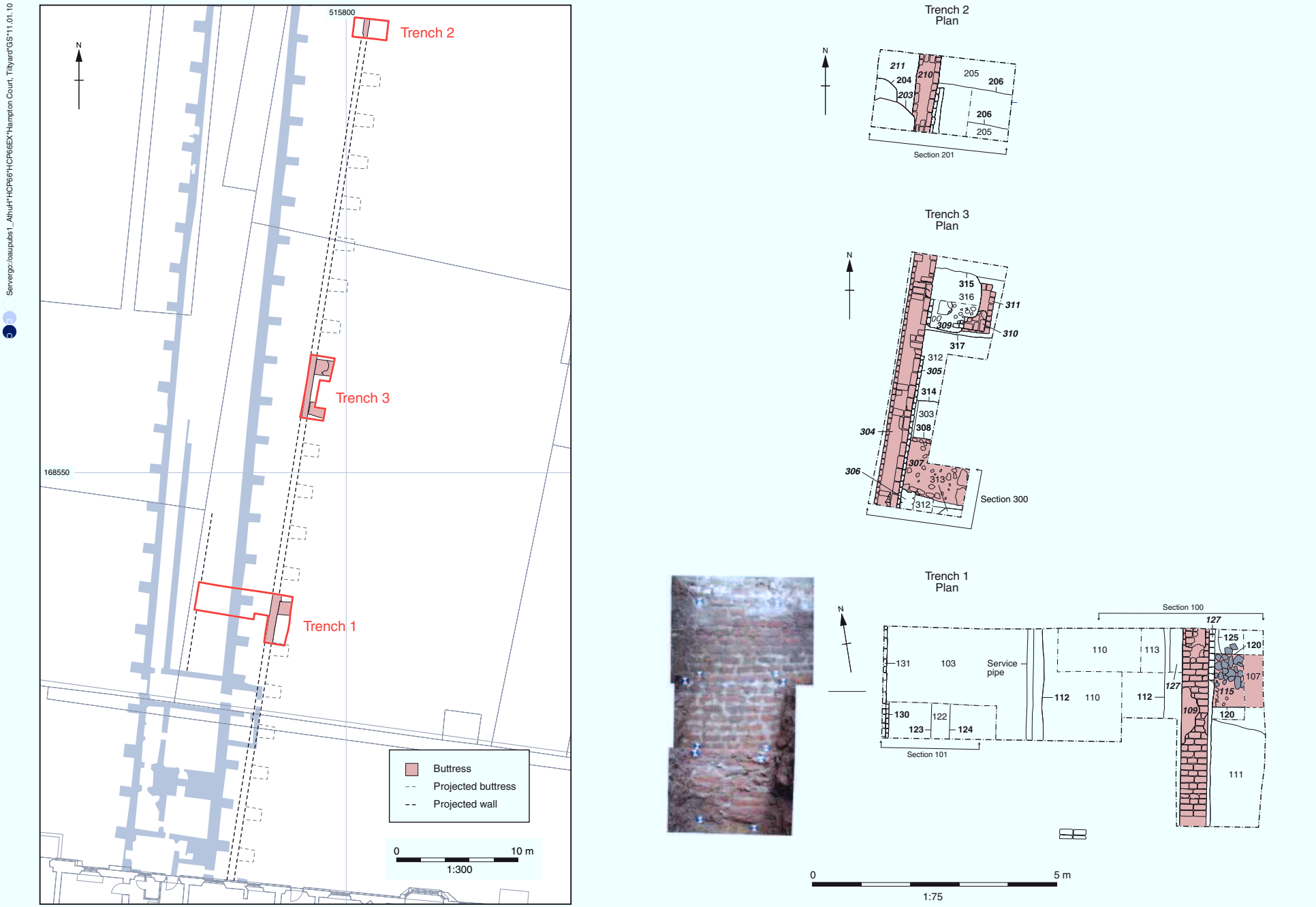


Figure 3: Hampton Court Bowling Alley, showing Forts's 1711 plan, the positions of Trenches 1 – 3, the projected line of the Bowling Alley wall based on archaeological finds, and detailed plans of Trenches 1 – 3

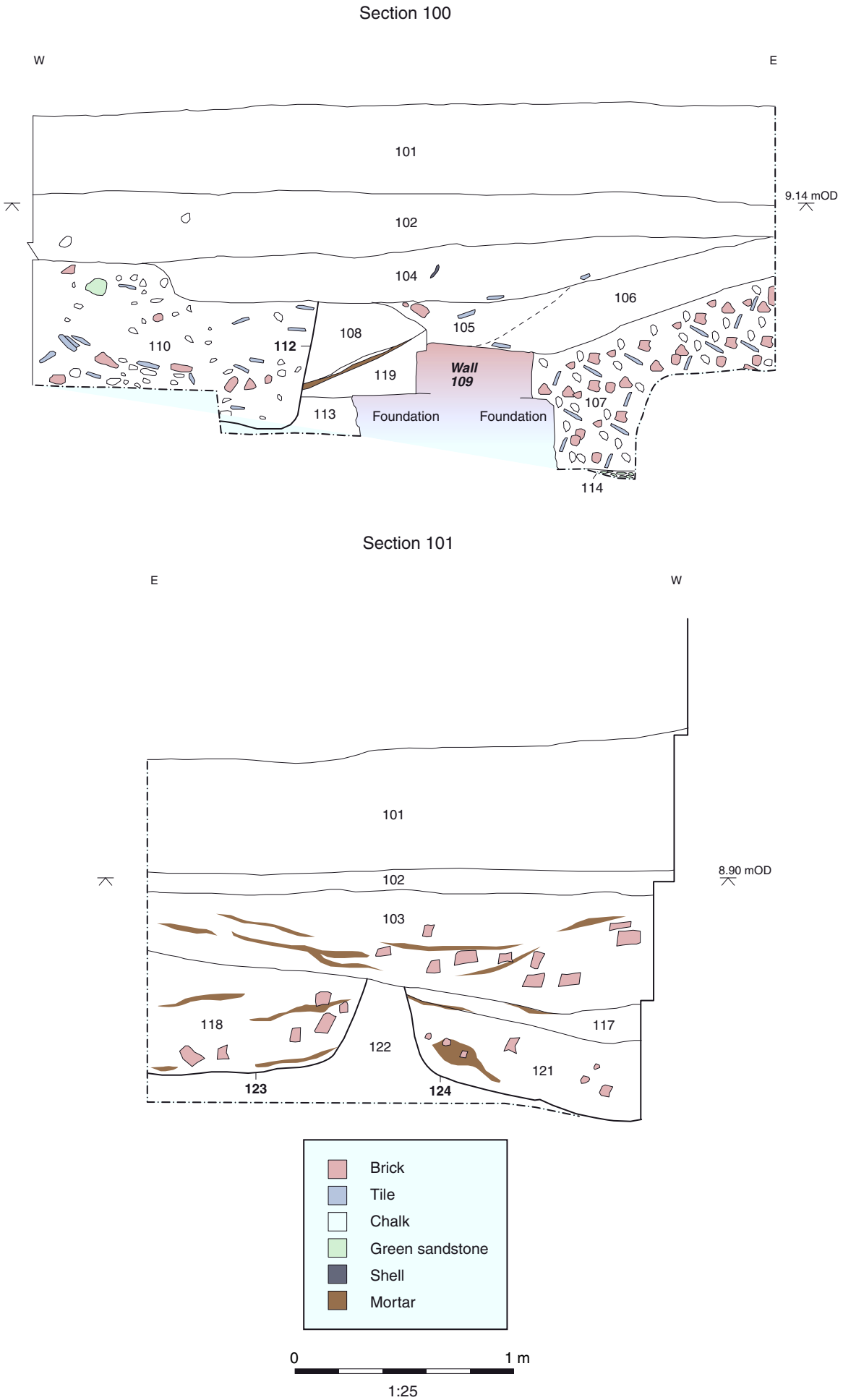


Figure 4: Bowling Alley, Trench 1: Sections 100 and 101

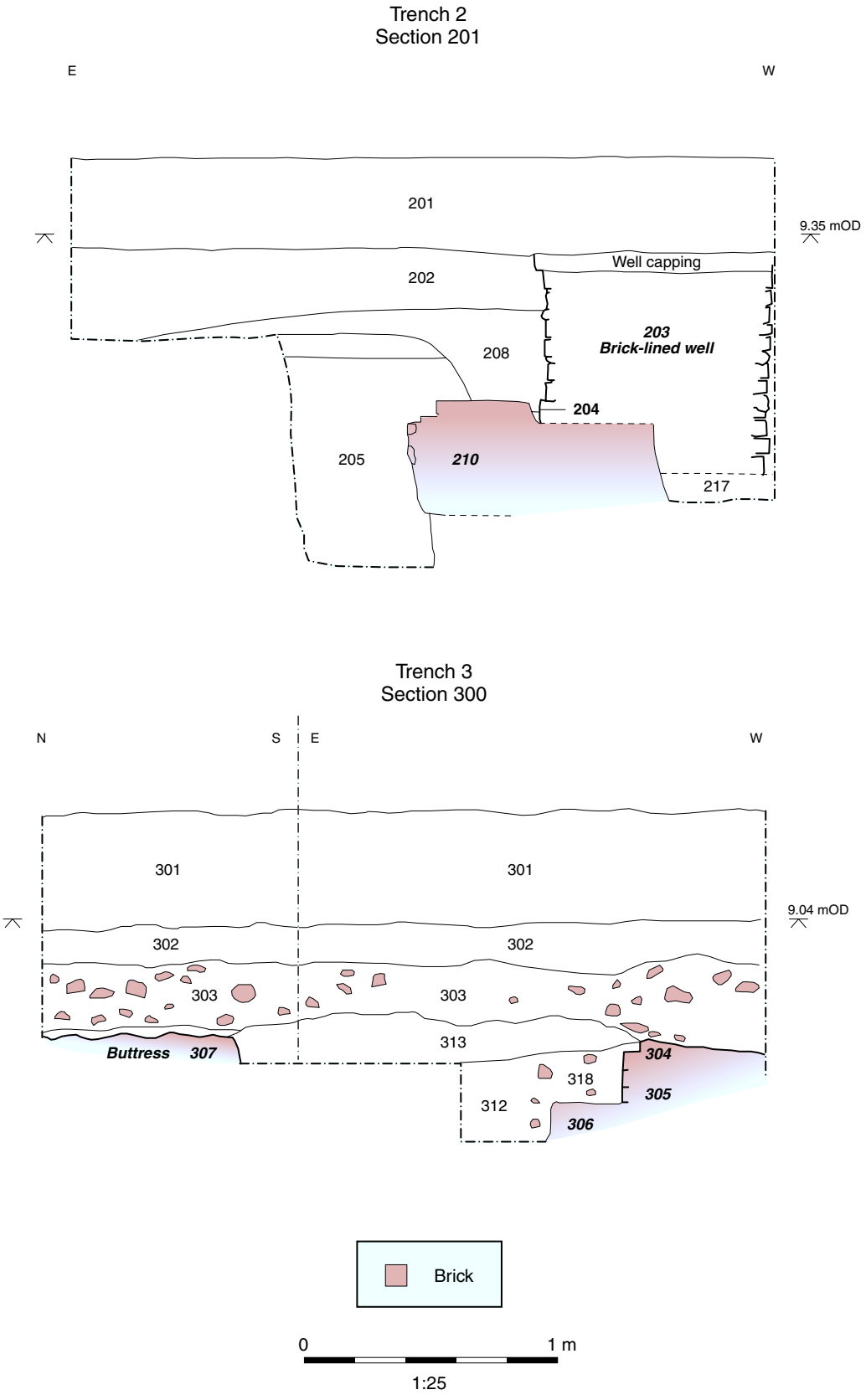


Figure 5: Bowling Alley, Trenches 2 and 3, Sections 201 and 300

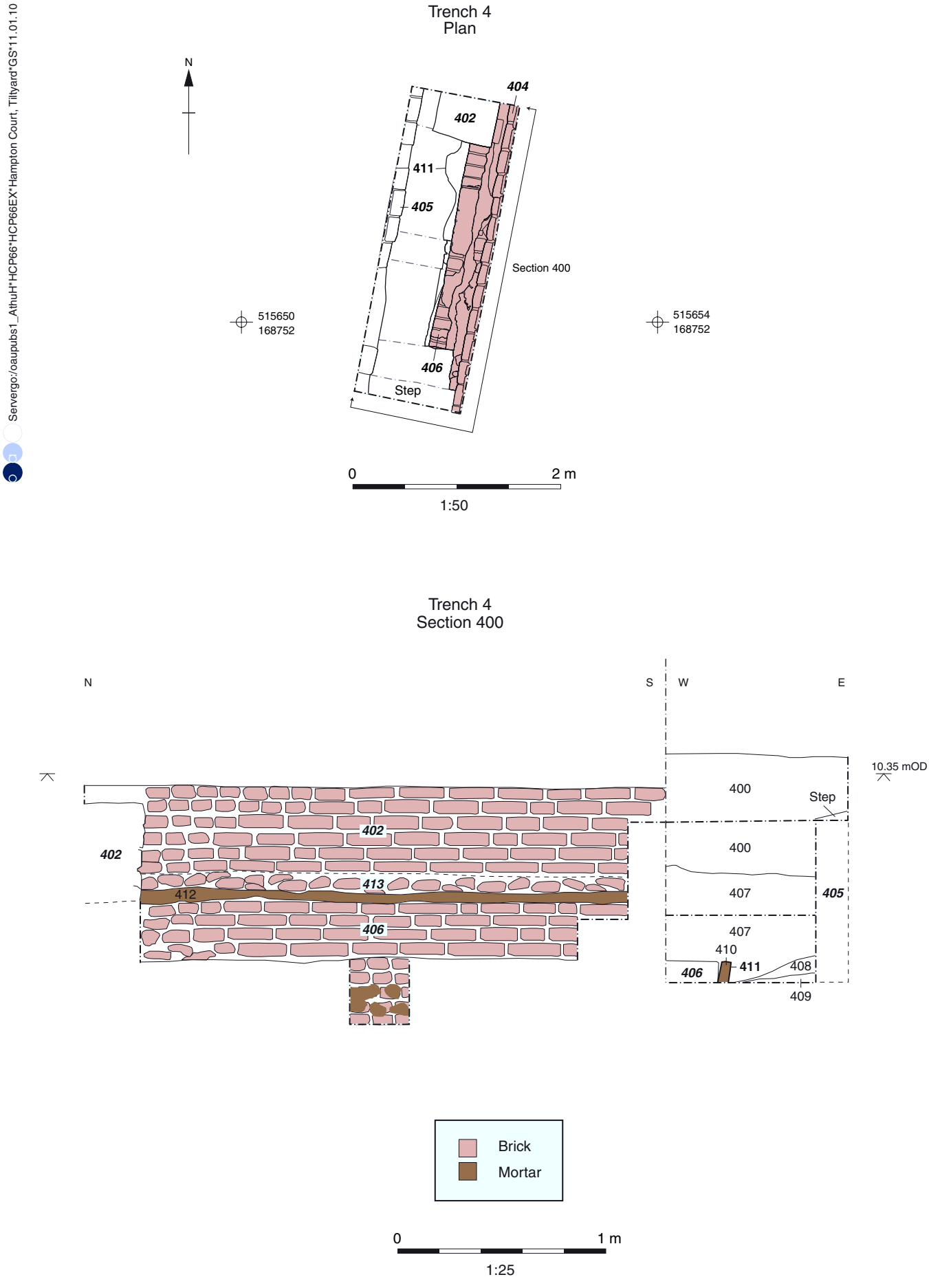


Figure 6: Tiltyard, Trench 4, plan and Section 400

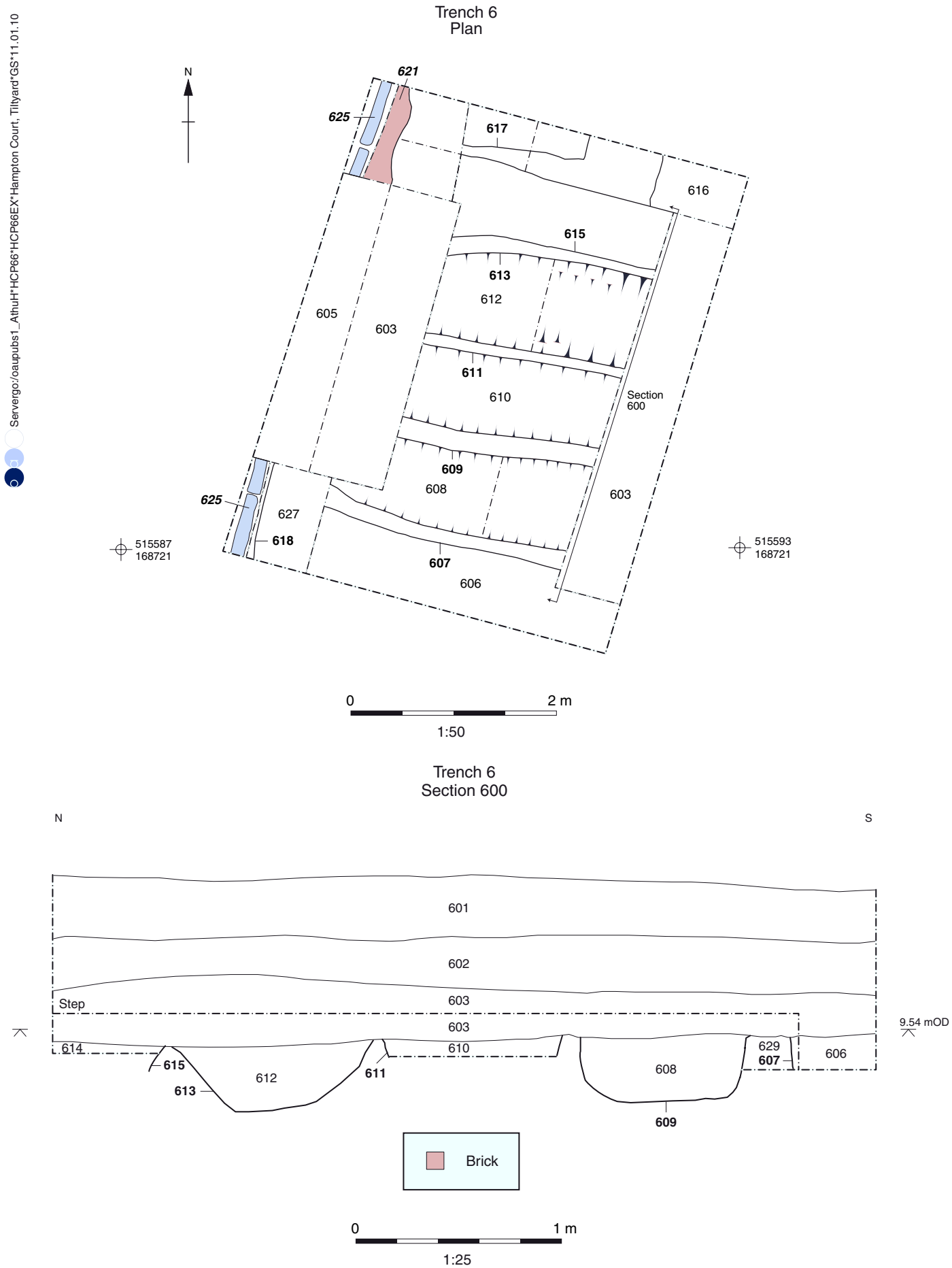


Figure 7: Tiltyard, Trench 6, plan and Section 600

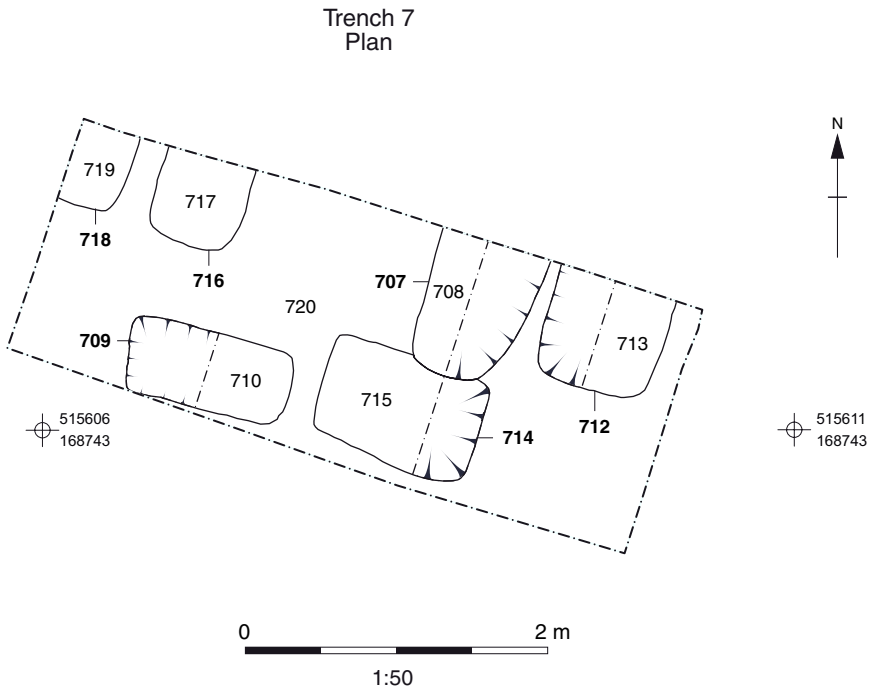
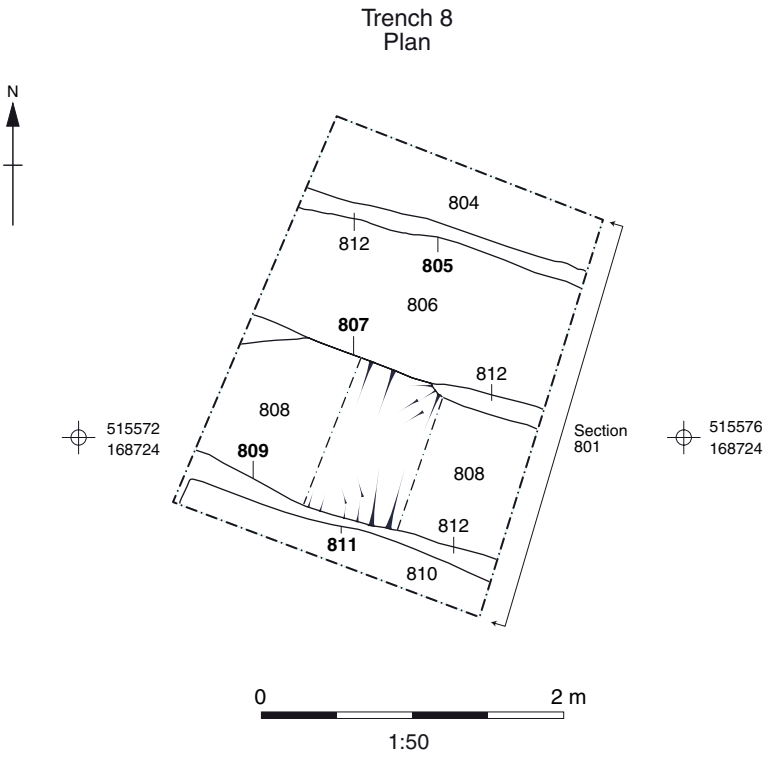


Figure 8: Tiltyard, Trench 7, plan



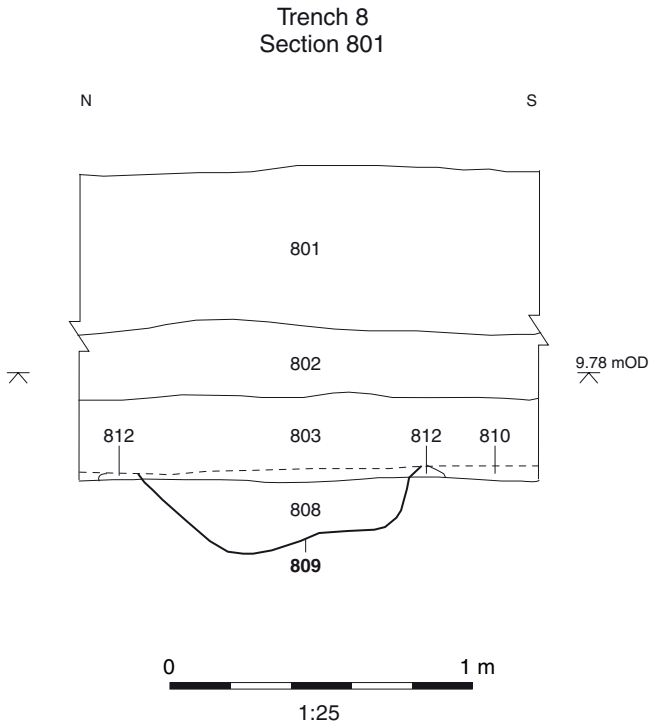


Figure 9: Tiltyard, Trench 8, plan and Section 801

Plate 1: Bowling Alley, Trench 2 bowling alley wall ***210*** with well ***203*** behind

Plate 2: Bowling Alley, Trench 2 looking along bowling alley wall ***305***

Plate 3: Bowling Alley, Trench 3 buttress ***310/311***, and foundation 309

Plate 4: Bowling Alley, Trench 3 buttress foundation 307

Plate 5: Tiltyard, Trench 4 showing tower wall brickwork 406 below later garden wall ***404***

Plate 6: Tiltyard, Trench 4 general view

Plate 7: Tiltyard, Trench 6, fill of robber trench 618 (loose rubble fill 620 with sandy clay 619 above) exposed in southwest sondage.

Plate 8: Tiltyard, Trench 6, tower wall foundation ***621*** exposed in northwest sondage

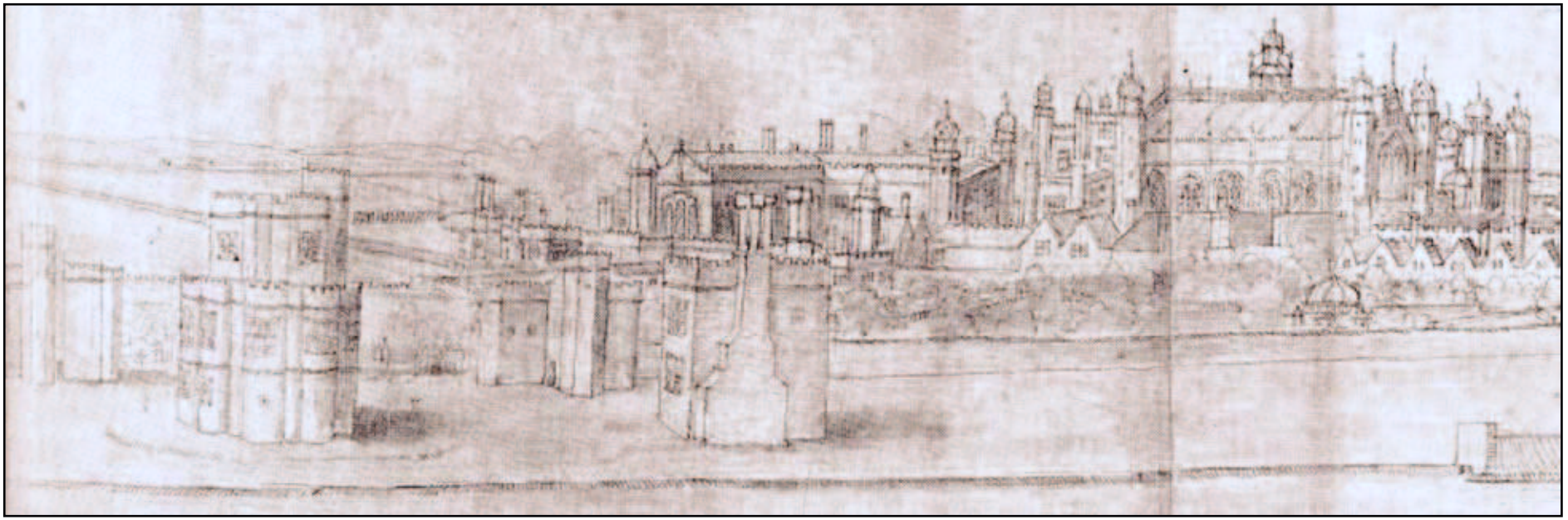


Plate 9: Anthonis van den Wyngaerde's view of Hampton Court from the north (1558-62).

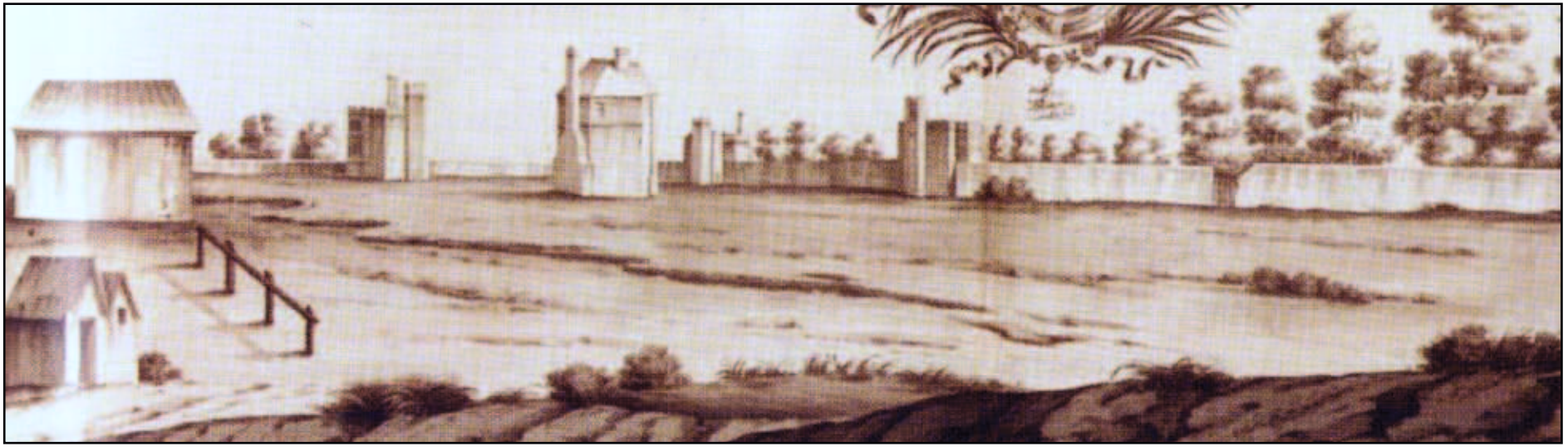


Plate 10: View of the north side of Hampton Court taken acrosss the Tiltyard for Cosimo III de Medici during his English tour in 1669.

Head Office/Registered Office/ OA South

Janus House
Osney Mead
Oxford OX2 0ES

t: +44 (0) 1865 263 800
f: +44 (0) 1865 793 496
e: info@oxfordarch.co.uk
w:http://thehumanjourney.net

OA North

Mill 3
Moor Lane
Lancaster LA1 1GF

t: +44 (0) 1524 541 000
f: +44 (0) 1524 848 606
e: oanorth@thehumanjourney.net
w:http://thehumanjourney.net

OA East

15 Trafalgar Way
Bar Hill
Cambridgeshire
CB23 8SQ

t: +44 (0) 1223 850500
f: +44 (0) 1223 850599
e: oaeast@thehumanjourney.net
w:http://thehumanjourney.net

OA Méditerranée

115 Rue Merlot
ZAC La Louvade
34 130 Mauguio
France

t: +33 (0) 4.67.57.86.92
f: +33 (0) 4.67.42.65.93
e: oamed@thehumanjourney.net
w: http://oamed.fr/

OA Grand Ouest

7 Rue des Monderaines
ZI - Ouest
14650 Carpiquet
France

t: +33 (0) 2 49 88 01 01
f: +33 (0) 2 49 88 01 02
e: info@oago.fr
w: http://oago.fr