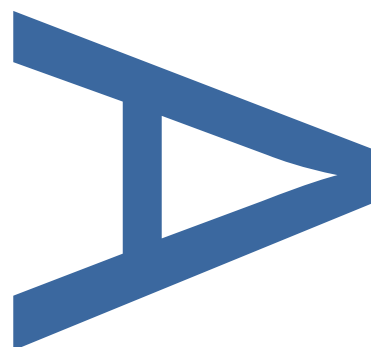
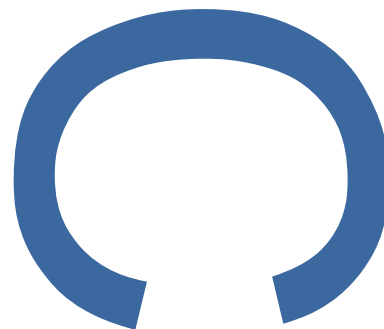


**SOUTH-WEST ENTRANCE CAUSEWAY  
TOWER OF LONDON  
LB TOWER HAMLETS**



**ASSESSMENT OF AN  
ARCHAEOLOGICAL INVESTIGATION**



**TOL147  
OCTOBER 2015**

**PRE-CONSTRUCT ARCHAEOLOGY**

DOCUMENT VERIFICATION

SOUTH-WEST ENTRANCE CAUSEWAY  
TOWER OF LONDON  
LONDON BOROUGH OF TOWER HAMLETS

ARCHAEOLOGICAL INVESTIGATION

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**An Assessment of an Archaeological Investigation at South-west  
Entrance Causeway Project, Tower of London, Tower Hill, London  
Borough of Tower Hamlets EC3N4AB**

**Site Code: TOL147**

**Central National Grid Reference: TQ 533474,180521**

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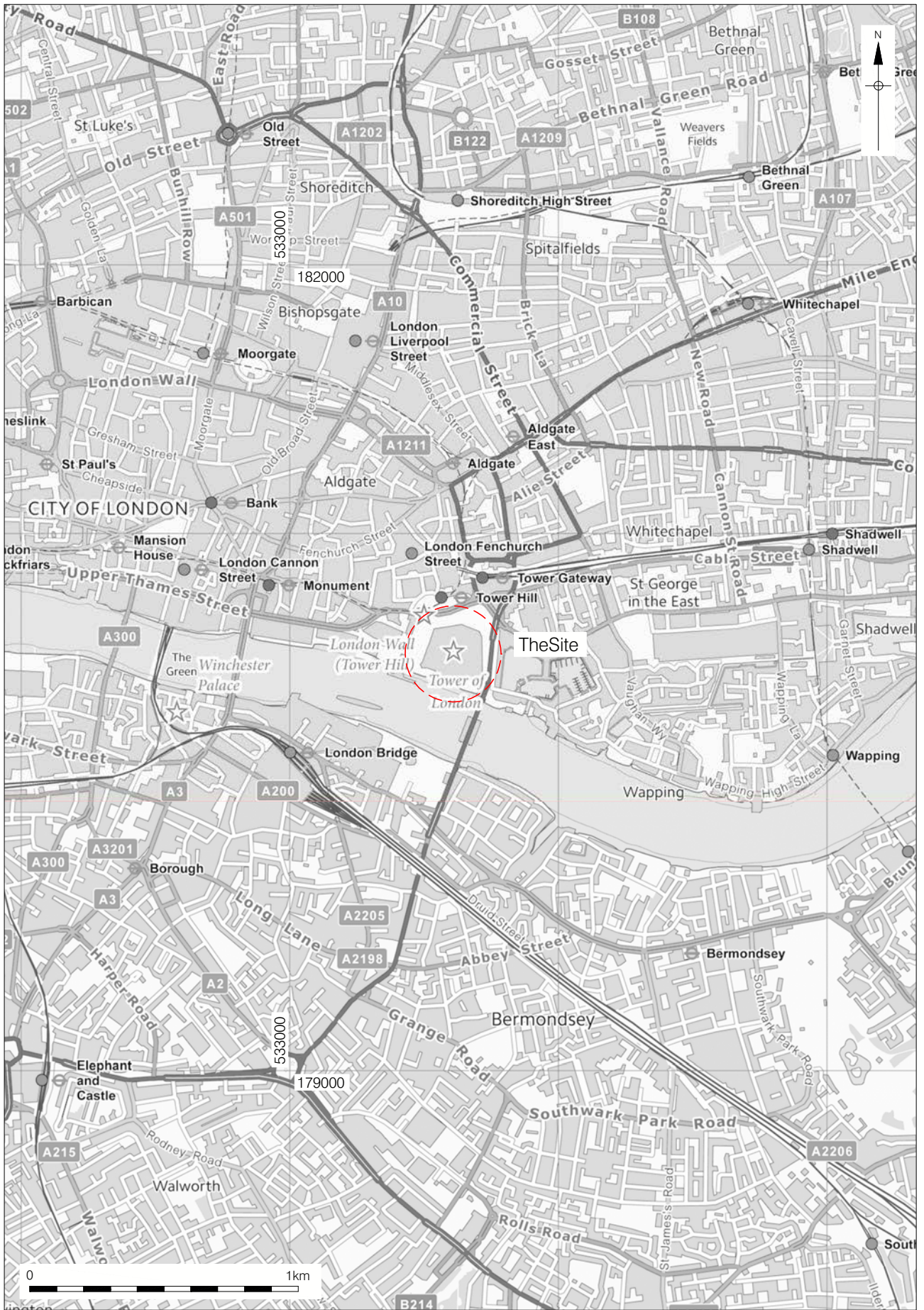
## 1 ABSTRACT

- 1.1 This report details the results and working methods of an archaeological excavation carried out at the South-west Entrance Causeway, Tower of London. The work was undertaken by Pre-Construct Archaeology Limited on behalf of Historic Royal Palaces. The project was supervised by the author. The monitoring of three test pits was undertaken between 10th and 12th December 2014 and this was followed by a further archaeological investigation between the 19th January and 2nd March 2015. The investigations revealed a continuous stratified sequence of archaeological deposits, features and structures that extended from the late 13th century to the 20th century.
- 1.2 The natural drift geology was seen not seen during the excavation.
- 1.3 The earliest datable archaeological deposits were structures associated with the entrance causeway which was originally built between 1275 and 1285. These structures included the north and south walls of the causeway, the foundations of the original road and the Byward Tower's drawbridge pit.
- 1.4 Medieval brickwork identified on the inner face of the south wall was comparable to that of the Beauchamp Tower which dated to 1275-1285. The drawbridge pit was located in front of the Byward Tower and extended 6.1m to the west from the tower's outer portcullis. The fabric of the pit was predominately yellow Caen Stone with at least one band of grey Purbeck Marble suggesting these may have formed a colourful pattern.
- 1.5 Two sections of wall, constructed from re-used materials, were seen to the north and south in the western area of the excavation. It is likely that they were repairs to the earlier masonry structures. Both were truncated by the construction cut for the central arch which is known to date from the 1780 remodelling of the causeway.
- 1.6 Evidence of the 1780 remodelling works was seen across the study area. The south-west corner of the causeway was widened by c. 1.6m and a new central arch was added. At this time both the northern and southern walls were remodelled. Portland Stone now dominated the masonry.
- 1.7 The next phase of activity on site dated from the late 19th/20th century. Bedding deposits and kerbs associated with the former road and footpath were recorded across the causeway and under the Byward Tower.
- 1.8 It is recommended that the results of the archaeological investigation will be published as an article in *London Archaeologist*.

## 2 INTRODUCTION

- 2.1 This report describes the results and working methods of archaeological investigations undertaken by Pre-Construct Archaeology Ltd on the South-west Entrance Causeway Project, Tower of London, Tower Hill, London Borough of Tower Hamlets, EC3N4AB (Fig.1). The work was carried out in accordance with the Written Scheme of Investigation prepared for the project (Mayo 2015) and was conducted during resurfacing works at the site. The site is centred on National Grid Reference TQ 533474 180521. Three test pits were monitored between 10th and 12th December 2014 and further archaeological investigations were undertaken in two phases between 19th January and 2nd March 2015.
- 2.2 The site is a linear area defined at its western end by the cobbled paving by which visitors to the Tower of London approach the Middle Tower, and at its eastern end by the cobbled paving immediately east of the Byward Tower. The northern and southern extents of the site are defined by the elevated causeway which conducts visitors into the Tower of London (Mayo 2015) (Figs.2 & 3). The site covers an area of 271m<sup>2</sup>.
- 2.3 The project was commissioned by Alexandra Attelsey and Guy Arnall of Historic Royal Palaces. Graham Keevill was the archaeological consultant for the project. The works were supervised by Shane Maher and the project was managed for PCA by Chris Mayo. The work was additionally monitored in respect of the Scheduled Monument Consent by Jane Sidel, Ancient Monument Inspector Historic England and for Historic Royal Palaces by Jane Spooner and Fiona Keith-Lucas.
- 2.4 The site lies within The Tower of London which is both a World Heritage Site and a Scheduled Ancient Monument (Number: SM LO 10, HA 1002061). Scheduled Ancient Monument Clearance (SMC) was applied for and granted (Ref: S00100546).
- 2.5 The Causeway had previously been the subject of a Geophysical Survey in 2013 (GSB2013) and an evaluation by Pre-Construct Archaeology in 2014 consisting of three test pits (reported on in the present report).
- 2.6 The completed archive comprising written, drawn and photographic records and artefacts will be deposited with Historic Royal Palaces Archive at the Tower of London.
- 2.7 The site was allocated the site code TOL147.

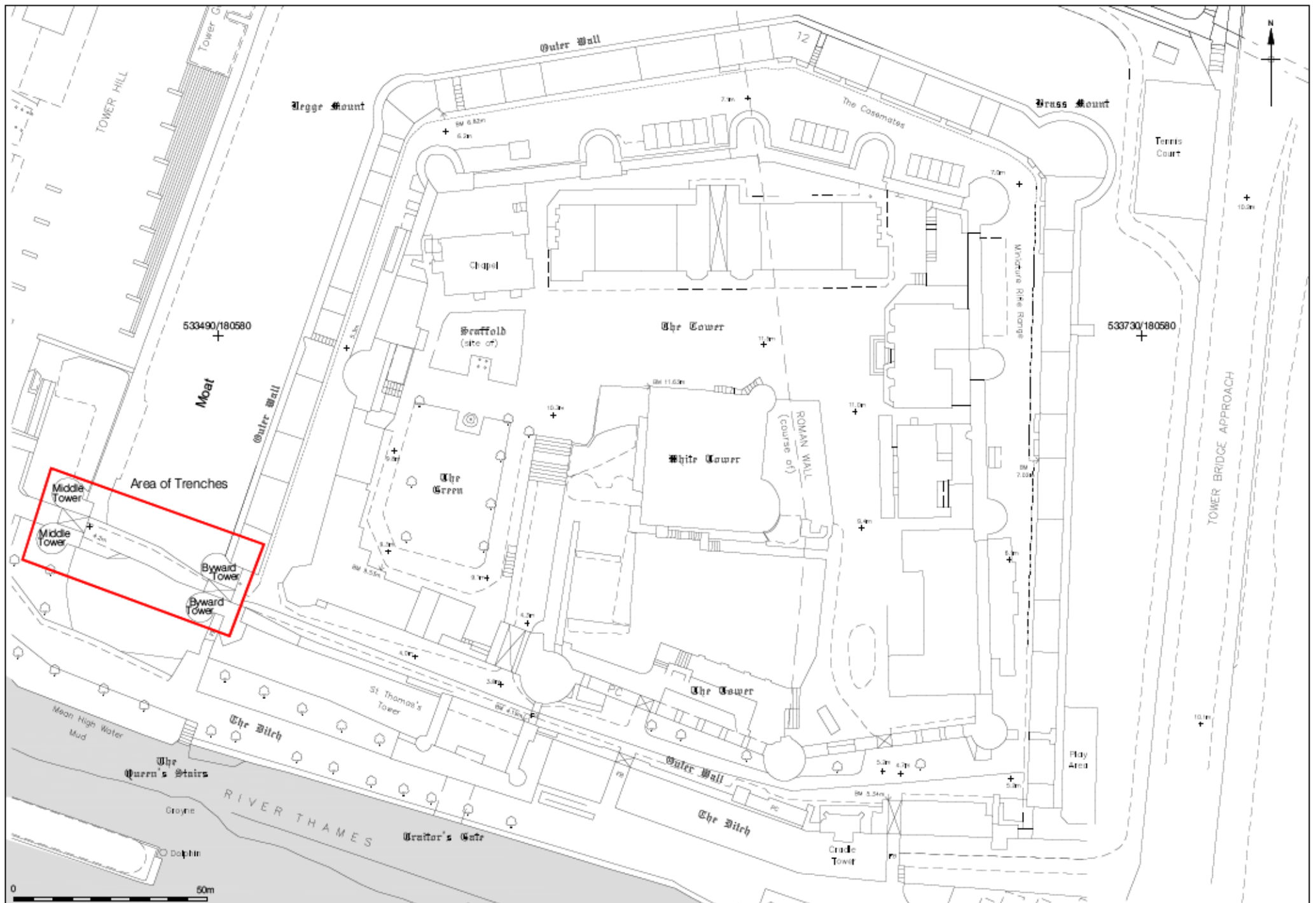




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 10/08/15JS

Figure 1  
 Site Location  
 1:20,000 at A4





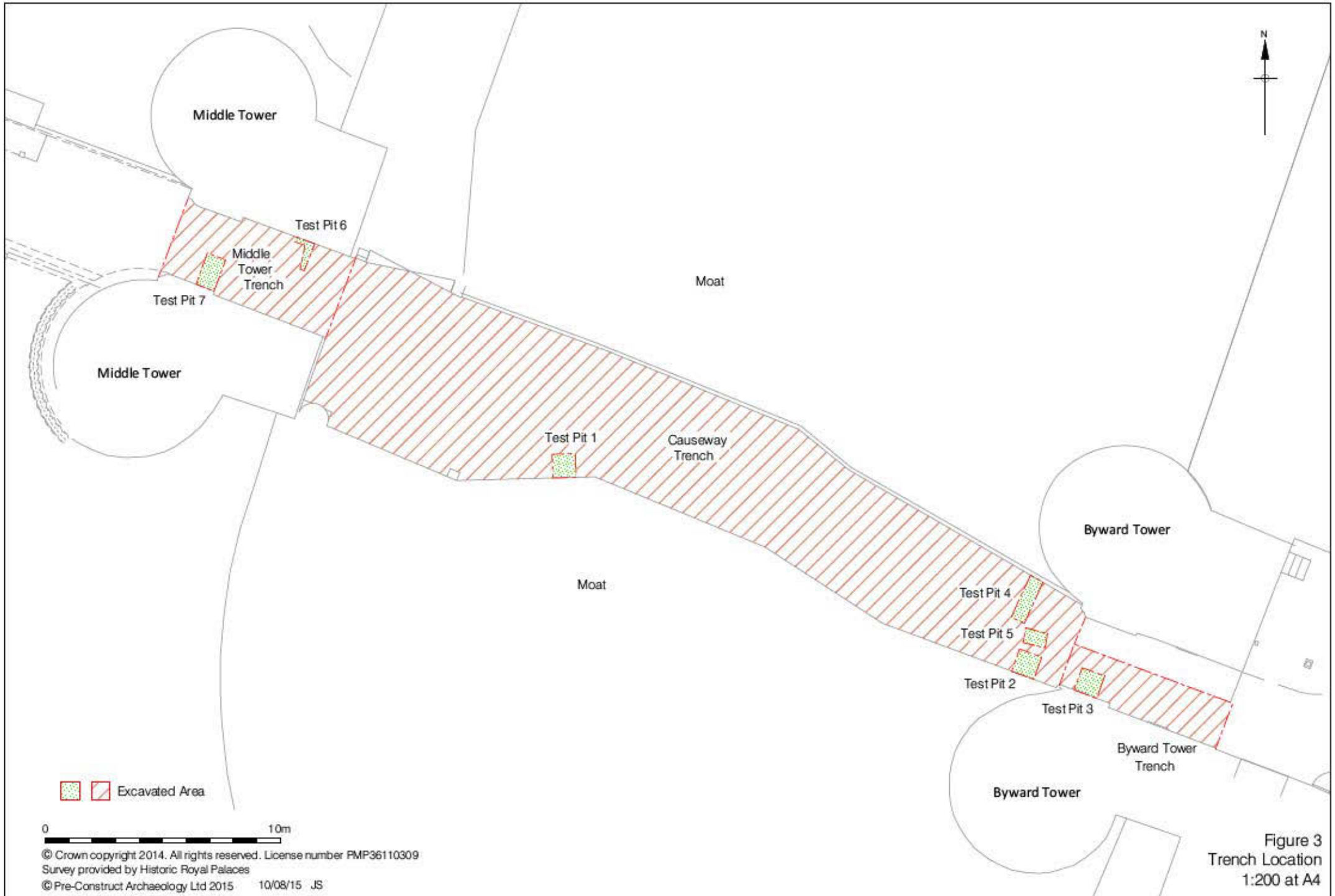


Figure 3  
Trench Location  
1:200 at A4

### **3 PLANNING BACKGROUND**

**3.1** The development site is subject to planning guidance and policies contained within National Planning Policy Framework (NPPF), The London Plan and policies of the London Borough of Tower Hamlets. The site in addition lies within a World Heritage Site and is a Scheduled Ancient Monument.

**3.2** An Application for Scheduled Monument Clearance at HMT Tower of London, South- Western Causeway, Between the Middle and Byward Towers (Scheduled Monument No: SMLO 10, HA1002061) was granted ref: S00100546

## **4 GEOLOGY AND TOPOGRAPHY**

### **4.1 Geology**

4.1.1 The British Geological Survey online resource shows the underlying geology consisting of sand/gravel of the Tapolow formation and alluvium overlying London Clay.

### **4.2 Topography**

4.2.1 The study site was relatively flat at carriageway level with spot heights ranging from approximately 4.3m OD at the western end to approximately 4.2m OD at the eastern end (May 2015).

## 5 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

### 5.1 Roman

5.1.1 By c. AD 200 *Londinium* was protected by a defensive wall, and the site of the future Tower of London lay within the south-east corner of the Roman city defences (Parnell 1993, 13-16).

### 5.2 Anglo-Saxon and Early Medieval

5.2.1 With the arrival of the Normans, William The Conqueror (1066-1087) consolidated his authority over Saxon London by establishing a motte and bailey castle utilising the surviving Roman city walls to the south and east and adding defensive ditches to the north and west. During the last decade of William's rule, the building that was to form the core of the Tower of London, the White Tower, was constructed (Parnell 1993, 17-22).

5.2.2 The first significant expansion of the defences of the Tower date to the end of the 12th century in the reign of Richard I (1157-1199). During this period the fortifications extended to the west with the Bell Tower being the only surviving masonry associated with this phase of construction (Parnell 1993, 24-26).

5.2.3 During the reign of Henry III (1216-1272), the Tower of London underwent extensive alterations and expansions (Parnell 1993, 27-34).

5.2.4 Edward I commenced a large scale building programme at the Tower, which would see it expanded in all directions. This included the construction of the outer curtain wall and South-west entrance Causeway between 1275 and 1285. At this time the Beauchamp Tower was also built, replacing Henry III's entrance. Building accounts mention the purchase of almost a quarter of a million bricks for this purpose, which was the first use of bricks on this scale since Roman times (Parnell 1993, 35-46).

5.2.5 The south-west entrance had an outer barbican (the Lion Tower), an outer gatehouse (the Middle Tower) and an inner gatehouse (the Byward Tower). Stone causeways which incorporated drawbridge pits linked the three buildings. The Lion Tower was demolished in the mid 19th century, but the Middle and Byward Towers and the South-west Causeway are still standing today (Parnell 1993, 40-42). On the Haiward and Gascoigne map three sluices are shown on the causeway (Parnell 1993, 56). The Causeway originally separated the moat from the river directly before the wharf was built.

### 5.3 Post-Medieval

5.3.1 In the post-medieval period, specifically the late 17th century, the Tower began to be used as an armoury, and as a result underwent numerous alterations to adapt it from its medieval form.

- 5.3.2 In the early part of the 18th century the Middle Tower was renovated and refaced with Portland Stone (Parnell 1993, 84). The South-west Entrance Causeway was the subject of major remodelling c. 1780 when the three original arches of the sluices were replaced with the single arch we see today and the road was widened to the rear of the Middle Tower (Keevill 2004, 164- 165).
- 5.3.3 By the 19th century, as architectural trends reverted back towards those of the medieval period, many of the post-medieval constructions were removed to reinstate the earlier vistas.
- 5.3.4 During his tenure as Constable of the Tower of London, Sir Arthur Wellesley, the Duke of Wellington, in 1843, ordered that the moat be drained and backfilled as it had come to pose a health hazard to his garrison. The work of draining the moat commenced in March or April of that year and infilling seems to have been completed by 1845. From 1846 a series of defensive improvements were carried out culminating with the construction of the North Bastion in 1848 (Keevill 2004, 14, 207, 210).
- 5.3.5 Some bomb damage was sustained by the buildings of the Tower during World War II. The North Bastion as well as the northern half of the Hospital Block and the Main Guard were damaged beyond repair and subsequently demolished (Historic Royal Palaces 2007, 33). During excavations within the north arm of the moat in 1995 and 1997 portions of the North Bastion were uncovered (Keevill 2004, 210).

## 6 ARCHAEOLOGICAL METHODOLOGY

- 6.1 Initially three test pits (Test Pits 1 -3), excavated to determine the depth of services and the nature of the underlying deposits, were monitored between 10th and 12th December 2014 prior to the start of the main works.
- 6.2 After the depth and nature of services and the underlying deposits had been determined a Written Scheme of Investigation and Health and Safety Method Statement for the main Archaeological Works (Mayo 2015) were prepared before the investigations took place, which detailed the methodology required for the excavation of specified areas.
- 6.3 The archaeological works were conducted over two phases, as an access between the Byward and Middle Towers had to be maintained, throughout the duration of the project, to conduct 'The Ceremony of The Keys'. Works began at the eastern limit of the Byward Tower on the 19th January with the removal of the southern half of the tarmac road (that ran from the Byward Tower to the Middle Tower) and progressed across the South-west Causeway to the public entrance of the Middle Tower. Spoil was moved to skips placed beyond the excavation area and removed from site every morning.
- 6.4 Archaeologists then cleaned and recorded the underlying 19th/20th-century surfaces. After consultation, with Jane Sidel and Graham Keevill, it was agreed that these could be removed and ground reduction could proceed, either to the formation level or until historic masonry or materials were encountered. Following the open area ground reduction two hand dug sondages (Test pits 4 & 5) were excavated through soft back fill deposits to expose the upper portion of masonry in the drawbridge pit of the Byward Tower and the southern face of the medieval masonry encountered at the western end of the causeway. Two further test pits (Test pits 6 & 7) were excavated on the tarmac surface at the entrance of the Byward Tower. This phase of archaeological investigation was completed on the 10th February 2015.
- 6.5 Protective sheeting was placed over the exposed archaeology then the trench was backfilled and a new tarmac road was laid.
- 6.6 The next phase of works commenced on 24th February 2015. The same process was repeated this time on the northern half of the Causeway, with the now reinstated southern half of the causeway acting as the access for the 'Keys'. All archaeological works were completed on the 2nd March 2015.
- 6.7 A 3D survey of the Causeway by the Glanville Group was undertaken when formation level was reached on both the northern and southern strips to record the location of services.
- 6.8 A mini-digger was used to remove the tarmac road and upper modern concrete deposits that were encountered. When the potential for damage to the historic resource became too great,



machine excavation was stopped. Ground reduction then continued by hand, using handheld breakers (when modern concrete was encountered) and 'pick and shovel'.

- 6.9** In accordance with the Written Scheme of Investigation, following the removal of the modern overburden, all archaeological deposits were hand cleaned by archaeologists using appropriate hand tools.
- 6.10** Archaeological features were recorded using the single context recording system, with individual descriptions of all archaeological features and strata excavated and exposed entered onto pro-forma recording sheets. All detailed plans and sections of archaeological deposits and features were recorded on polyester based drawing film, the plans and sections being drawn at a scale of 1:10, 1:20 and 1:50 as appropriate. The OD height of all principal strata was calculated and indicated on the appropriate plans and sections. Features that were evidently modern were not given context numbers, and were recorded as modern intrusions in plan.
- 6.11** The limits of excavation were hand drawn and surveyed using GPS survey equipment. Three Temporary Bench Marks (TBMs) were established using spot heights on known locations, established during a previous topographic survey (Glanville Plan TOL-CW-12-A-01(A), Nov. 2012). Their values and location are listed below:
- TBM 14.22m OD on Manhole cover to the east of Middle Tower
- TBM 2 4.19m OD on Manhole cover to the west of Byward Tower
- TBM 34.15m OD on Manhole cover to the west of Byward Tower
- 6.12** Photographs in digital format were taken of the archaeological features and deposits where relevant. A professional archaeological photographer visited the site where required in order to take large format shots of areas or specific features. Site staff used 35mm digital cameras on a day-to-day basis, and the professional photographer used 35mm, medium format (120mm) and digital cameras.
- 6.13** In this report contexts are shown by square brackets e.g. [100], small finds by chevrons e.g. <1> and environmental samples by brackets e.g. {23}. Limits of excavation are given the abbreviation of LO E.

## 7 ARCHAEOLOGICAL SEQUENCE

### 7.1 Introduction

7.1.1 The stratigraphic sequence has been divided into 4 main phases, they are as follows:

### 7.2 PHASE 1 – Medieval (Fig.4)

7.2.1 The surviving masonry structures of the original 13th-century entrance causeway dominated this phase. These were seen at the eastern and western ends of the causeway and within the gateway to the Byward Tower.

7.2.2 In the west these were represented by the north and south causeway wall and the foundation of the central roadway.

7.2.3 The southern wall comprised an outer face [44] and an inner face [40/41] with rubble core [43] (Plates 1, 2 & 3). The wall was seen extending c. 10m from an 18th-century construction cut in the east to the cut for modern services in the west. An overall width of c. 2.05m was recorded. The outer face [44] (south face) was seen between 3.87m OD and 3.84m OD consisting of ashlar blocks of Caenstone with a spot date 1200-1500 and an average size of 0.22m x 0.24m x 0.2m (Fig. 7 Section 8). No bonding material was seen during investigations. This face of the wall was located c. 1.65m to the north-east of the present-day south causeway wall and was seen extending c. 8.6m in a north-westerly direction from the 18th-century truncation in the east to the modern service cut in the west. A width of 0.24m was recorded and the depth extended beyond the limit of excavation of 0.7m in Sondage 1.

7.2.4 Circa 1.37m to the north of and running parallel to [44] the inner face (north face) [40/41] was noted between 3.96m OD and 3.8m OD. Later truncations were noted impacting heavily upon this face. The masonry extended 6.5m from the 18th-century truncation (in the east) to where it was truncated by cast iron pipes in the west. A maximum width of 0.48m and height of 0.2m was recorded. The eastern portion of the masonry had an almost arch-like appearance, but this could be due to truncation. The fabric of [40/41] consisted of medieval yellow and pink/white bricks (fabrics TOL1; 3042nr303 1; 3101), which were comparable with Beauchamp Tower examples and were consistent with the known 1275-1285 date of structures, together with Reigate and Caenstone. These were bonded with a soft grey brown mortar.

7.2.5 The core [43] of the southern wall, which consisted of fragments of Kentish Ragstone and Reigate stone rubble, was seen between 3.86m OD and 3.76m OD. This measured 7.82m long by 1.2m wide (the base was not observed).

7.2.6 The northern wall [72] was located c. 3.6m to the north of and parallel to [40/41] at 4.24m OD. Only the inner face (south face) of the masonry was visible during the works. The masonry

- consisted of Ashlar blocks of Caen stone which measured c. 4.57m from west (the eastern gatepost at the moat entrance) to east (the 18th-century truncation). The faces of the Caen Stone blocks varied in size from 0.76m x 0.23m to 0.49m x 0.25m.
- 7.2.7 Between [40/41] and [72] the masonry foundation of the entrance roadway [39] was seen rising from 3.76m OD (c. 3.5m to the east of the Middle Tower) to 3.83m OD (toward the centre of the causeway). It was unclear which type of stone or stones were used, but they did form a regular almost even surface. The road had also suffered heavily from later impacts which left the visible remains measuring 7.86m long by 0.84m wide. The thickness was not determined due to excavation limits.
- 7.2.8 On the eastern half of the causeway remnants of the road foundations, the Byward Tower drawbridge pit, and sections of the north and south medieval causeway walls were the most notable features encountered.
- 7.2.9 Circa 11.1m to the east of [39] the remnant of road foundation [60] was seen at 4.05m OD in the west falling to 3.76m OD in the east (toward the Byward Tower). This shows that the road rose in level from the Middle Tower (to the west) then descended toward the Byward Tower (in the east). The road was truncated on all sides, to the south and west by the 18th-century remodelling works and to the north and east by modern services. Surviving masonry measured 4.1m in length by 1.4m wide and was similar in appearance to [39]. Due to the limitations of the excavation it was not possible to determine the fabric of [60].
- 7.2.10 The drawbridge pit [8/27/65] was a rectangular defensive structure located in front of the Byward Tower measuring internally 6.1m (E-W) x 3.1m (N-S) (Fig. 7 Sections 9 & 10; Plates 4 & 5). All four sides of the pit were noted during the works. Three of the four inner faces (east, west and south) of the masonry were partially exposed during the excavations and the top of the fourth (north) was noted. The eastern side of the drawbridge pit was seen directly beneath the *in-situ* portcullis at the entrance of the Byward Tower. The highest recorded level was noted at 3.88m OD in the north and the lowest at 3.63m OD in the east. A 1m x 1m x 1m sondage (Sondage 2) was excavated in the south-west corner of the pit to a depth of 0.7m to investigate the fabric of the surviving masonry. This was seen to be comprised of ashlar blocks of Caen stone (0.6m x 0.8m), Purbeck marble (1.7m x 0.88m) and one large ashlar block of Tufa (seen on the south face near to the Byward Tower). The limited excavation revealed the upper course to be of Caen stone. Purbeck marble formed the course below and the next was Caen stone, giving the exposed masonry a two-tone appearance. It is unknown whether this banding continued further into the pit.
- 7.2.11 The southern causeway wall [9/26] was noted at 5.30m OD, above the drawbridge pit [8/27/65] (Sondage 2) (Fig. 7 Sections 5 & 9). This portion of the wall measured 4.59m in length by c. 1.66m high and was only visible between the drawbridge pit and the Byward

Tower. The wall was constructed from ashlar blocks of Reigate stone, Kentish Ragstone and Chalk bonded with a brown sandy mortar (Type 4a). The sizes of the blocks varied from 250mm x 260mm to 498mm x 270mm.

- 7.2.12 Although the northern medieval wall was not encountered in the east, a deposit [70] of material similar to [43] (seen in the west of the causeway), was noted c. 2.2m to the north-west of [8/27/65] at 3.98m OD. This had the appearance of an infill deposit (possibly the remains of the rubble core of the northern causeway wall) and contained random, roughly hewn blocks of Kentish Ragstone, Reigate and Caen stone in a soft mortar. It was truncated to the south, east and west by modern services. To the north it extended under the later 18th-century wall.
- 7.2.13 In the area between the drawbridge pit and the eastern trench limit the masonry foundation of the Byward Tower [20] was recorded between 3.81m OD and 3.53m OD. This consisted of irregular blocks of chalk and Kentish ragstone which had been smoothed over to form either a surface or the hardened base for the entrance road. A brown sandy mortar (Type 4a) was seen bonding the stonework. During the investigations this was only seen in the southern half of the trench as the presence of live modern services prevented further investigations to the north. The visible masonry measured 6.04m (E-W) x 0.7m (N-S).
- 7.2.14 A layer of indurated, dark grey brown, silty sand [56] containing frequent small fragments of CBM and thin lenses of iron-panned sand was recorded above [20] at 3.63m OD. It is probable that this layer is at least in part the remains of a nearly metalled surface. Modern live services truncated the northern edge of the deposit. The surviving material was noted to be 6m (E-W) x 0.75m (N-S).

### 7.3 PHASE 2 – Post-Medieval, pre-1780 (Fig. 5)

- 7.3.1 This phase represents the post-medieval period prior to the remodeling of causeway in 1780. Only two features were noted from this period, wall [75] and wall [42].
- 7.3.2 Wall [75] was seen abutting the eastern edge of wall [72] from the previous phase at 4.07m OD. This followed on the same line as [72] and extended 2.85m beyond it to where the 18th-century construction cut truncated it. The masonry comprised a mixture of reused Reigate and Caen stone blocks, measuring 300mm x 150mm to 600mm x 300mm. A decrease in height to the east was noted, likely a result of the later truncation. The wall was spot-dated to 1400-1600+ by the presence of reused medieval stone types, Reigate and Caen.
- 7.3.3 Circa 4.6m to the south of [75] wall [42] was noted at 3.86m OD, measuring 1.3m (E-W) x 0.4m (N-S). Only one course of brickwork survived and this appeared to be truncated to the east by the 18th-century construction cut and to the west by an unidentified later truncation. The wall was situated between the outer and inner faces ([44] and [40/41]) of the south-west causeway wall and had a similar though slightly offset alignment to them. Probable re-used

bricks used in the Beauchamp Tower and large late medieval/early post-medieval bricks (Fabrics: 3033, 3042nr3031, 3101, 3199V) measuring 200mm x 100mm x 600mm, were noted. These were bonded with a soft, Reigate rich gravel shell light brown mortar.

#### 7.4 PHASE 3 – Post-Medieval, post-1780 (Fig. 5)

- 7.4.1 This phase represents the period when the causeway was remodelled during the late 18th century (1780) and took its present form (Keevill 2004, 164-165).
- 7.4.2 The most notable features of the remodelling were the northern [71] and southern causeway walls [76] and the arch [36] in the centre of the causeway.
- 7.4.3 The southern causeway wall [76] was recorded at its highest points between 5.32m OD and 5.29m OD and ran from the Middle Tower to the Byward Tower. It had an irregular linear shape and an overall length of 33.06m with a width of 0.61m. The maximum height of the inner masonry was 1.68m, the outer height was not noted during these investigations. At its south-west extent the wall was located c. 1.6m to the south of [44], effectively widening the causeway in this area. The wall was seen to be comprised of ashlar blocks of Portland stone of varying sizes.
- 7.4.4 The space between the remodelled southern wall [76] and the original southern wall [44] was backfilled with a sequence of dumped deposits [46/48/52], [53], [54]. The earliest of these was [54] which was seen in the base of Sondage 1 at 3.12m OD and contained CBM and stones pot dated 1664-1800.
- 7.4.5 The north causeway wall [71] was seen between 4.44m OD and 4.39m OD and also had an irregular linear shape, though somewhat less pronounced than [76]. The wall was noted extending 29.67m from the entrance to the Byward Tower to a point just short of the Middle Tower (where the later entrance gate to the moat is now located). A width of 0.61m was observed and the maximum recorded height of the exposed inner face of stonework was 0.70m. Ashlar blocks of re-used Reigate and Caen stone and fresh blocks of Portland stone comprised the fabric of the masonry.
- 7.4.6 A section of the central arch [36] was visible c. 0.84m to the north of [76] and c. 16.16m to the north-west of the Byward Tower entrance. This represented the upper portion of the western side of the arch. It was seen at a high point of 4.12m OD, toward the centre of the causeway, and sloped down to a low point of 3.85m OD (to the west). The exposed masonry measured 2.84m long by 0.86m wide; modern services and concrete had prevented further investigation. The fabric of the arch was seen to be ashlar blocks of Portland and Caen stone.
- 7.4.7 In the centre of the causeway what appeared to be two separate cuts [49/50] (fills [37/38], [58/59]) and [51] (fill [34]) were seen truncating the medieval deposits and earlier post-medieval masonry. These were in fact one large construction cut to facilitate the building of

arch[36]. In the west, cut[49/50] was recorded between 3.84m OD and 3.75m OD. The cut measured 5.56m (NE-SW) from wall[44] to where it truncated[75] on the south face of the northern causeway wall. In the east [51] was seen at 4.07m OD. Due to the impacts of modern services to the north and south only 1.4m (NE-SW) was visible. The total length (NW-SE) of the construction cut was 11.1m. The fills [34], [37/38], [58/59] were listed as deposits of mixed silts and sands with frequent small CBM, stone and mortar fragments and occasional charcoal flecks.

- 7.4.8 Cut[73] was seen truncating the west of medieval wall[70] at 3.98m OD. The purpose of this cut is uncertain but it may be related to construction cut [51]. The southern and western edges of the cut were obscured by modern services leaving the visible portion measuring 0.8m (N-S) x 1.1m (E-W). The fill [74] was a light to mid greyish brown sandy silt with occasional charcoal flecks.
- 7.4.9 A possible post-medieval levelling deposit [18] was seen covering medieval layer [56], in the Byward Tower (Fig. 7 Section 7). The layer was soft to compact, dark grey brown, silty sand with frequent CBM fragments, charcoal flecks and occasional lenses of iron-panned sand. It was truncated by live services to the north leaving the surviving material measuring 6.0m (E-W) x 0.2m (N-S). The highest level of the deposit was recorded at the eastern LOE at 3.89m OD.
- 7.4.10 Covering the western edge of the drawbridge pit [8/27/65] was a deposit of friable, mid-grey brown, silty sand [29], seen between 3.72m OD and 3.56m OD (Fig. 7 Section 9). This was truncated to the north and west by modern services. The remaining material measured 1.1m (N-S) x 2.0m (E-W).
- 7.4.11 A sequence of silts and sands [67], [68], [69] were noted covering the masonry of the northern side of the drawbridge pit (Fig. 7 Section 12). The earliest of these was [69] which was seen at 3.80m OD.
- 7.4.12 On the west of the causeway a layer of trampled material [25] was seen against the northern face of medieval wall [40/41] and above the roadway [39] between 3.92m OD and 3.81m OD. To the north and west this was truncated by modern services. The layer was described as a firm, mid grey brown, sandy silt with occasional fragments of CBM and charcoal flecks measuring 0.74m (N-S) x 5.1m (E-W) with a thickness of 0.16m.
- 7.4.13 To the east of [25] a layer of sandy charcoal material [24] was seen above upper fill [58/59] at 3.99m OD. This was also truncated to the north by the modern intrusions. The surviving deposit measured 0.88m (N-S) x 5.54m (E-W) and had a thickness of 0.2m.

## 7.5 PHASE 4 – 19th/20th Centuries

- 7.5.1 This period represents activities noted during the investigation dating from the 19th to 20th centuries.
- 7.5.2 This phase was dominated by the central concrete roadway [12] which was seen between the Middle and Byward Towers. The road was seen rising from a low point at 3.93m OD, near to the Byward Tower, to a high point of 4.16m OD, above the central arch, then falling to 4.04m OD at its western extent c. 3.0m from the Middle Tower. Modern pipe trenches and service ducts impacted heavily on [12]. The total length (E-W) of the road was 30.53m and the surviving width was c. 3.1m (N-S), the depth was 0.15m.
- 7.5.3 Two deposits [19], [23] of bedding material were noted below [12]. In the west of the study area a layer of greyish yellow, crushed stone and mortar [23] which measured 0.96m (N-S) x 1.6m (E-W) and 0.02m thick was seen above post-medieval dump [24] at 3.79m OD. In the east a layer of brown grey silty gravelly sand [19] was seen acting as the bedding deposit for the roadway [12]. This was seen at 3.78m OD measuring 1.1m (N-S) x 3.6m (E-W) and 0.2m deep.
- 7.5.4 To the north-east of [12] the construction cut [64] for a cast iron drainage pipe [61] and associated brickwork [62] was seen truncating the masonry of the drawbridge pit [8/27/65] at 3.79m OD. The pipe had a diameter of 0.1m and was seen to be 0.9m long. It was N-S aligned and disappeared into the fabric of the northern wall [71]. A modern service duct removed the southern end of the pipe. To the east of and parallel to pipe [61], one course of frogged brickwork [62] (Fabric 3032, 3101) was recorded at 3.79m OD measuring 0.6m (N-S) x 0.11m (E-W). A deposit of soft, mid grey brown, silty sand [63] was noted covering the pipe and brickwork.
- 7.5.5 Only the upper fills [6], [7], [55] of the drawbridge pit were encountered and these were mid to late 20th-century sands and silts (Fig. 7 Section 5). A single sherd of residual post-medieval pottery spot dated 1550-1900 and concrete fragments were recovered from [55].
- 7.5.6 A layer of brownish grey silty sand [31] was noted covering the [55] between 3.77m OD and 3.6m OD. This measured 1.1m (N-S) x 1.2m (E-W) and was truncated by modern services to the north and by a modern manhole to the west.
- 7.5.7 Above [31] similar deposits of crushed Caenstone [30], [32] were recorded at 3.53m OD and 3.52m OD respectively. Deposits of similar material [2], [5], [17], [66] were noted in the west, around the drawbridge pit and at the Byward Tower (Fig. 7 Sections 7 & 12). These were seen between 4.05m OD and 3.94m OD and were seen extending beyond the eastern trench limits. A layer [4] of loosely compacted degraded mortar was recorded sealing [5], in the south-east of the causeway.



- 7.5.8 In the west of the study area a layer of demolition material [21] was seen between 4.04m OD and 4.03m OD measuring 1.m (N-S) x 3.2m (E-W) covering backfill deposit [46/48/52]. CBM recovered from this was spot dated 1700- 1900.
- 7.5.9 Late 20th- century deposits associated with the entrance road were recorded across the causeway and at the Byward Tower. At the Byward Tower a sequence of bedding and make up deposits [14], [15], [16] for the granite setts of the former roadway were recorded (Fig. 7 Section 7) .
- 7.5.10 Masonry including York Stone slabs [10], concrete foundation [11] , [14] and [15], a granite block [1], concrete kerbs [3] and [13] associated with the former footpath were noted in the south-east of the causeway (Plate 7) .



Figure 4  
Phase 1: Medieval  
1:125 at A3



Figure 5  
Phases 2 & 3: Post Medieval  
1:125 at A3

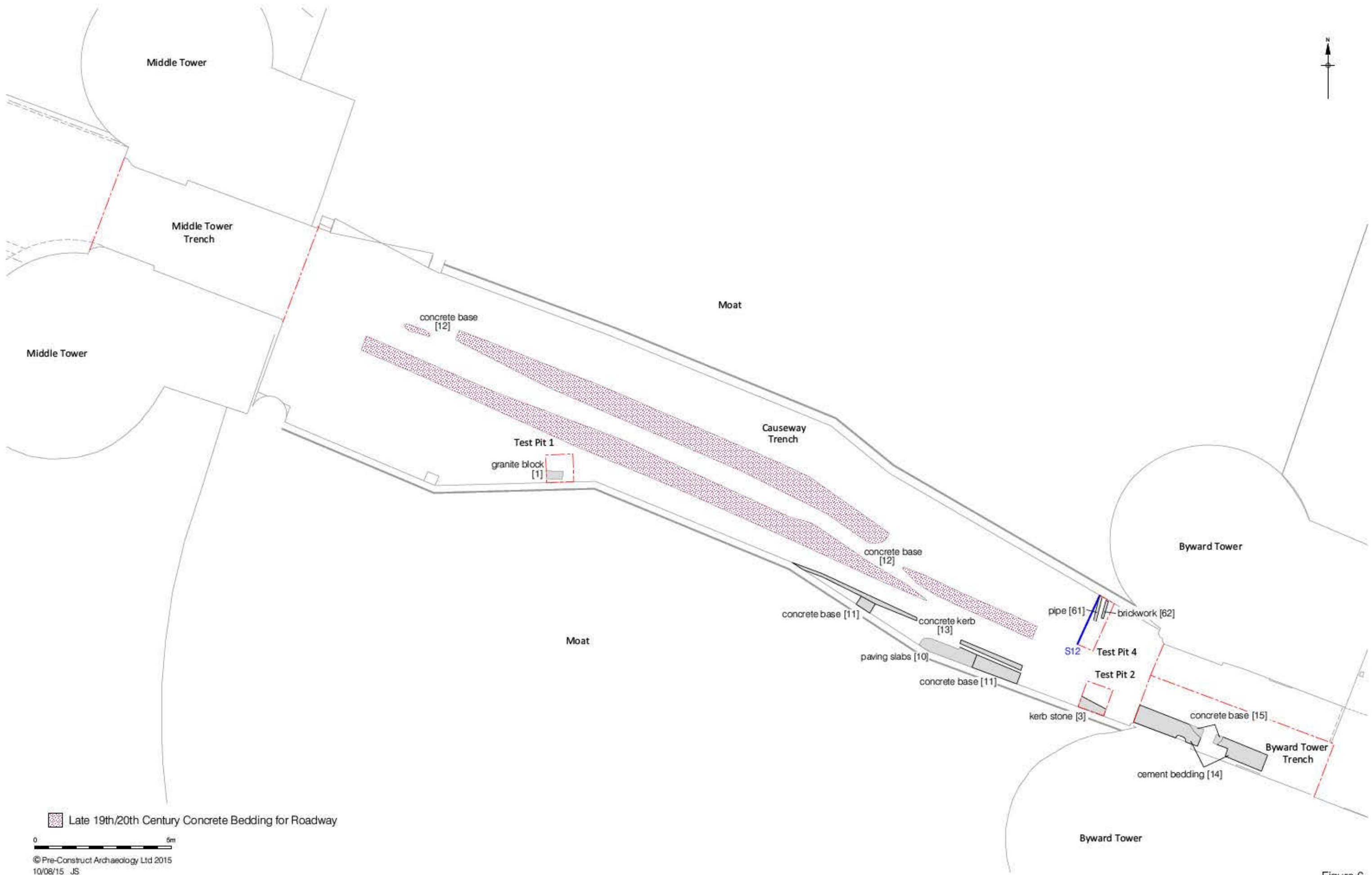
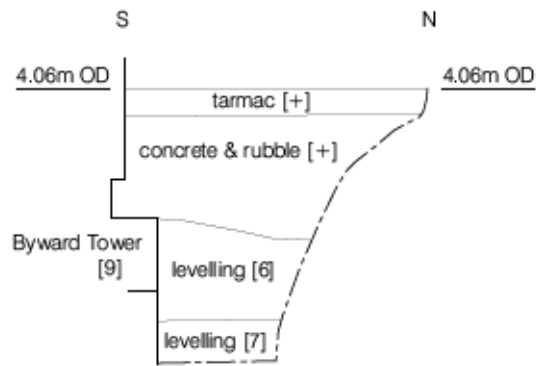
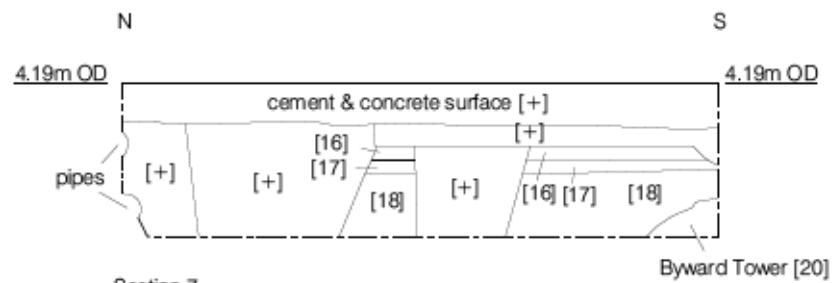


Figure 6  
Phase 4: 19th / 20th Centuries  
1:125 at A3



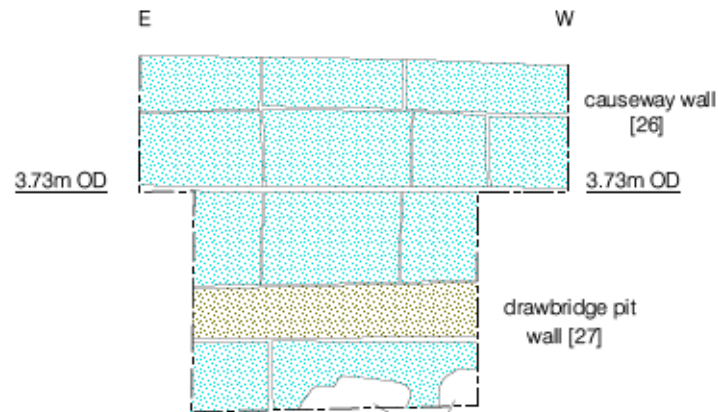
Section 5  
Test Pit 3  
East Facing



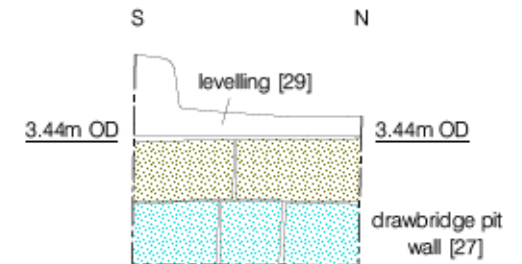
Section 7  
Byward Tower  
West Facing



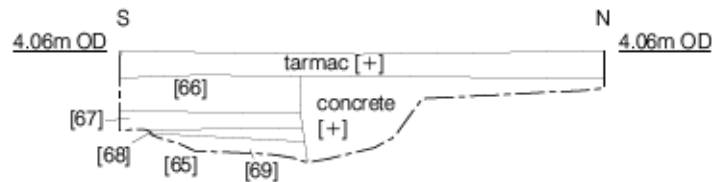
Section 8  
Causeway - Sondage 1  
South Facing




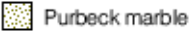

Section 9  
Causeway - Sondage 2  
North Facing



Section 10  
Causeway - Sondage 2  
East Facing



Section 12  
Test Pit 4  
East Facing

-  Caen stone
-  Purbeck marble
-  Ragstone

0 1m

Figure 7  
Sections  
1:25 at A4



## Plates



Plate 1: Causeway looking east towards Byward Tower, showing south wall [40/41], [43], [44] and foundation for road [39], with 2m scale.



Plate 2: Inner face of medieval southern causeway wall [40/41], looking south, showing medieval bricks and stone blocks and foundation for road [39].



Plate 3: Southern causeway wall [40/41], [43], [44], road foundation [39] and present causeway wall [76] in background looking southwest, 0.4m scale.



Plate 4: Southern and western walls [27] of drawbridge pit [8/27/65] under southern causeway wall [26], looking southwest, 0.4m scale





Plate 5: Eastern edge [8] of drawbridge pit [8/27/65] under outer port cullis slot, looking south east, 0.4m scale



Plate 6: Central Arch of the Causeway with the Byward Tower looking south from within the moat, 2m scale.



Plate 7: Concrete bedding for road [12], kerb [13], York Stone paving slabs [10] and bedding concrete [11], looking west, 0.4m scale

## 8 PHASE DISCUSSION

### 8.1 Summary of Phase 1

- 8.1.1 This phase is represented by structures relating to Edward I's phase of construction between 1275 and 1285 (Keevill 2004, 10-11).
- 8.1.2 In the west this was represented by the southern wall of the causeway, the foundation of the entrance road and the south face of the northern wall.
- 8.1.3 The southern wall had an outer face composed of ashlar blocks of Caen Stone, an inner face of medieval bricks, blocks of Reigate and Caen Stone and a rubble core. The different materials used on the inner face had widely differing colours. These ranged from the green of the Reigate Stone to the pinky yellow/white of the medieval bricks, suggesting these may once have formed a pattern, displaying the king's wealth to visitors. The eastern portion of [40/41] had the appearance of an arch, which could relate to one of the three sluices shown on the Haiward and Gascoyne map 1597 (Keevill 2004), or it could be the result of subsidence.
- 8.1.4 The inner face of the northern causeway wall consisted of ashlar blocks of Caen Stone. No brick or other material was noted during the investigation of the wall. This does not necessarily mean that the fabric of this wall was different from its southern counterpart as this wall had also suffered heavily from later impacts.
- 8.1.5 The regular almost even surface of the masonry foundation of the road, with no signs of weathering or cart-ruts, suggests that this had not been open to the air and would have been covered by make-up deposits suitable for a roadway.
- 8.1.6 On the east of the causeway another section of the road foundation [60] was noted. The position and alignment of the remains confirm that the original causeway was kinked, as shown on the early maps (Parnell 1993).
- 8.1.7 In the eastern part of the causeway a deposit similar to the inner core of the south-west wall was observed. Neither the outer nor inner face of the medieval wall was seen as past impacts had either removed or obscured them. A portion of the southern medieval causeway wall was visible capping the southern wall of the drawbridge pit for the Byward Tower.
- 8.1.8 The eastern edge of the drawbridge pit was located at the outer portcullis of the Byward Tower and extended c. 6.1m to the west. During the study all four sides of the drawbridge pit were encountered, but due to the limited scope of the investigation and the presence of modern services to the north only three of the four inner faces of the pit were revealed, the west, the east and the south. A Sondage excavated in the south-west corner of the pit showed the upper course of stonework to be predominately Caen Stone with a band of

Purbeck Marble underneath and another course of Caen Stone beneath that. This gave the masonry an appearance of alternating courses of yellow, grey and yellow stone and possibly suggests that this banding may continue to the base of the pit.

8.1.9 To the east of the drawbridge pit the upper portion of the foundation for the Byward Tower was seen. This consisted of irregular blocks of chalk and Kentish ragstone which had been smoothed over to form either a surface or the hardened base for the entrance road. This was covered by an indurated deposit of iron-panned sand, which was probably all that remained of a metal road.

## 8.2 Summary of Phase 2

8.2.1 This phase consisted of post-medieval activity prior to the remodelling work of 1780. Only two structures, [42] and [75], were noted in this phase and both were located on the western section of the causeway.

8.2.2 Wall [75] was seen abutting and following the same alignment as wall [72], from the previous phase. The re-used blocks of Caen and Reigate Stone noted in the fabric of the masonry suggests that this may have been a repair. In the east the wall was truncated by the construction cut of the central arch confirming that this repair would have taken place pre-1780.

8.2.3 The remains of a brick structure [42] were seen. 4.6m to the south of and almost parallel to [72]. Only one course of brickwork comprising re-used bricks as utilised in the Beauchamp Tower and late medieval/post-medieval bricks survived. It is uncertain as to the purpose of this structure but it does pre-date 1780 as it is also truncated to the east by the construction cut for the central arch.

## 8.3 Summary of Phase 3

8.3.1 This period saw major structural changes which took place on the causeway in 1780. The three arches/sluices seen on the earlier maps (Keevill 2004; Parnell 1993) were replaced by a single arch, the south-west end of the causeway was widened and the masonry substantially refaced.

8.3.2 Only a small section of the central arch was seen during the excavations. This was a portion just to the west of the centre point, the rest of the arch was either covered or truncated by modern concrete and services. The construction cuts for the arch were seen in the east and west of the causeway truncating the earlier masonry.

8.3.3 The north and south walls of the causeway were remodelled and refaced with Portland Stone during this period (Keevill 2004, 164-165; Parnell 1993, 84). The new southern wall [76] lay 1.6m to the south of the original wall [44] in the south-west end of the causeway and accommodated the entry box seen there today. Evidence from the investigations shows that

the new southern wall was substantially thinner than its predecessor, possibly reflecting a change in focus, away from the river, for defence. Deposits of demolition materials filled the space between the old and new walls and were probably the waste from these works.

8.3.4 Various make-up/levelling deposits were noted across the causeway and under the Byward Tower. These are likely the remnants of bedding deposits for the entrance road.

#### **8.4 Summary of Phase 4**

8.4.1 This phase was dominated by the concrete bases, kerbs and bedding deposits associated with the 20th -century road and footpath which were seen across the entrance causeway and under the Byward Tower.

8.4.2 Of noted during this period layers of crushed Caen Stone were observed across the study area acting as levelling/bedding deposits. This material is likely to be the waste materials from repairs to walls elsewhere in the Tower and seem to date from the second half of the 20th century.

## 9 RESEARCH QUESTIONS

### 9.1 ORIGINAL RESEARCH QUESTIONS

The excavation's aims and objectives as outlined in the Written Scheme of Investigation were as follows (Mayo 2015):

#### 9.1.1 To ascertain the level, nature and usage of previous surfaces beneath the existing.

The oldest surfaces encountered during the investigations date from the original Edward I build. These were the foundations of the entrance road on the causeway and the base of the road under the Byward Tower.

Two heavily truncated sections of the road foundation were encountered on the causeway, one to the west of the 18th-century central arch and one to the east. Both had regular almost even surfaces and appeared to rise toward a central point on the causeway. The eastern section was seen rising from a low point of 3.76m OD (in the east) to 4.05m in the west (toward the central point of the causeway). The western section rose from 3.76m OD in the west to 3.83m OD in the east. Due to the excavation limits it was not possible to ascertain what materials, other than stone and mortar, were used in their construction. No evidence of weathering or damage (such as pot-holes or cart ruts) was noted suggesting that they may have been covered by layers of make-up deposit for the road.

Inside the gateway of the Byward Tower the foundation of the road also had a regular almost even surface. This was recorded at 3.81m OD. Due to truncation by modern services the fabric of the foundation was revealed to be Kentish Ragstone and Chalk rubble in a brown sand mortar.

The late 19th/20th-century concrete bedding surfaces for the former road and footpath were recorded across the causeway. The bedding concrete for the road was recorded near to the Middle Tower at 4.04m OD rising to a high point of 4.16m OD, in the centre of the causeway, then falling to 3.93m OD toward the Byward Tower. This would have acted as a base for Granite Setts, which are still seen elsewhere at the Tower today.

The remnant of the former footpath was seen at 4.09m OD to the east of the Byward Tower. This consisted of fragments of York Stone Pavingslabs and sand on a concrete base.

#### 9.1.2 Were the remains of the possible drawbridge pit beneath the Byward Tower encountered during the investigations and if so where was it located and how was it constructed.

The remains of the drawbridge pit were located in front of the Byward Tower and extended 6.1m to the west from the base of the tower's outer portcullis (see Plates 4 & 5). A sondage excavated in the south-west corner of the pit revealed the inner faces of the masonry to be

ashlar blocks of Caen Stone and Purbeck Marble. These were laid in alternate courses giving the pit a yellow, grey, yellow banded effect which possibly continues to the base.

### 9.1.3 Were below ground structures encountered beneath the Middle and Byward Towers if so what were the nature of these what was the nature of these.

Only limited investigations were possible under the Middle Tower due to the presence of live services. No deposit earlier than the late 20th century were revealed in this area.

At the Byward Tower the remains of the drawbridge pit (see above) and the foundation of the Tower itself were seen. The foundation formed the base of the entrance road through the tower into the outer ward and lay under a sequence of medieval and post-medieval bedding layers.

## 9.2 REVISED RESEARCH QUESTIONS

After the archaeological investigation the following Research Questions might be posed:

### 9.2.1 Was there any evidence encountered of the three sluice gates shown on the Haiward and Gascoyne map 1597 ( Keevill 2004).

The masonry blocks, which were seen at the eastern end of the inner face of the medieval southern wall [40/41] (see Fig. 4, Plates 2 & 3), may be the remnant of one of them. These appeared to have a gentle curve suggestive of an arch but this could also be due to later subsidence possibly associated with the construction of the central arch during the late 18th century.

## 9.3 FURTHER RESEARCH QUESTIONS

Additional research questions arising out of the excavations areas follows:

Can any comparisons be drawn with any similar structures, elsewhere, known to date from Edward I's late 13th-century construction programme?

How does the size and fabric of the drawbridge pit of the Byward Tower compare to that of the Middle Tower?

Is there any documentary evidence of the three original sluices shown on the early maps of the Tower ( Keevill 2004; Parnell 1993) that could tie in with the findings of the archaeological investigation?



## 10 CONTENTS OF THE ARCHIVE

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### The Finds Archive

Pottery	1 bag
CBM/Stone	2 boxes
Animal Bone	1 bag

(Box – standard archive box = 0.46m x 0.19m x 0.13m)

## 11 IMPORTANCE OF THE RESULTS, FURTHER WORK AND PUBLICATION PROPOSAL

### 11.1 Importance of the Results

11.1.1 Because of the location and nature of the site, i.e. the South West Entrance Causeway of the Tower of London, a World Heritage Site, the results of the excavation are of local, regional and national importance. Four phases of activities were noted during the investigation these were: 1) Original late 13th- century causeway, 2) Pre- 1780 post -medieval structures, 3) Post - 1780 remodelling structures, 4) 19th/20th- century structures.

#### Original late 13th -century causeway

11.1.2 The most significant finds from the excavation were the surviving masonry structures associated with the entrance causeway and the Byward Tower. These included the upper courses of the drawbridge pit at the entrance to the Tower, sections of the original northern and southern walls and foundations for the central roadway that ran over the causeway and through the Byward Tower.

11.1.3 Of particular interest was the west section of the southern wall which comprised both inner and outer faces and the rubble core. The inner face of the southern wall contained large yellow and pink/white medieval bricks. These were comparable to examples used in the Beauchamp Tower and suggest that they may have formed a colourful pattern. The presence of this type of brick strongly suggests the wall is contemporary with the Beauchamp Tower, but this may need to be further refined at the analysis stage of the post -excavation process. On the outer face of the wall shlar blocks of Caen Stone dominated the fabric.

11.1.4 A possible colour pattern was also noted on the inner faces of the drawbridge pit, with shlar courses of yellow Caen Stone over and underlying blocks of grey Purbeck Marble.

11.1.5 Sections of the original road were recorded in the east and west parts of the causeway and inside the gateway of the Byward Tower. These consisted of the masonry foundations of the road. At the Byward Tower the foundation fabric was identified as Kentish Ragstone and Chalk rubble in a brown sandy mortar, with a smoothed surface. Due to excavation restrictions it was not possible to identify the fabric of the other sections of the road but it is likely to be of similar materials. It was confirmed that the kink in the causeway was original.

#### Pre-1780 post -medieval structures

11.1.6 The two walls noted in this phase were constructed using re-used materials, probably taken from elsewhere at the Tower. These walls have been interpreted as possible repairs and pre-

date the late 18th- century remodelling works as both have been truncated by the construction cut for the later central arch.

### **Post-1780 remodelling structures**

- 11.1.7 It was during the 1780 remodelling works that the causeway took on its present form. Evidence of these works were encountered during the investigations. The masonry of this phase was characterised by the use of Portland Stone, a rock type only widely available after the Great Fire (see Appendix 3). Construction cut/cuts for the central arch were seen truncating the earlier medieval/post-medieval masonry structures in the centre of the study area. The south-west section of causeway was widened at this time and incorporated the sentry box, seen today.

### **19th/20th-century structures**

- 11.1.8 Bedding deposits for the late 19th/20th- century cobbled road and footpath were seen across the investigation area.

## **11.2 Further Work**

### **General**

- 11.2.1 An attempt will be made to refine the dating of the causeway by further analysis of the construction materials. Documentary research will be undertaken to see if any further records pertaining to the entrance causeway and its construction and remodelling. The structure could be compared with the entrances of Edward I's Welsh castles, Conwy, Harlech, Caernarfon and Beaumaris which also date from the late 13th century.

### **Pottery**

- 11.2.2 There are no recommendations for further work.

### **Ceramic Building Material**

- 11.2.3 The stone and the brick used to construct the Causeway is comparable with other construction projects associated with Edward I's late 13th- century building programme, such as the Beauchamp Tower, and deserves further comment and work. Of significance could be the use of RHX rehydroxylation technique on small samples of the early bricks used in the Causeway to verify a date in the second half of the 13th century. This aspect of the excavation merits publication and further research.

### **Animal Bone**

- 11.2.4 There are no recommendations for further work.

## **11.3 Publication Proposal**

11.3.1 The South-west Entrance Causeway site will be published as an article in London Archaeologist. The format the publication will follow is that of a typical publication report and will focus on the drawbridge pit of the Byward Tower and the different phases of construction of the causeway :

- Introduction
- Archaeological and historical background
- Archaeological evidence, by phase
- Discussion

The illustrations will include:

- Location plans
- Phase plans
- Sections
- Photographs

## 12 ACKNOWLEDGEMENTS

- 12.1 Pre-Construct Archaeology Ltd would like to thank Historic Royal Palaces for funding the archaeological work. Thanks to Alexandra Attelsey of Historic Royal Palaces for commissioning the work on their behalf and for her help and advice during the project, also to Guy Arnall of HRP.
- 12.2 Pre-Construct Archaeology Ltd also thanks Graham Keevill and Fiona Keith-Lucas, Assistant Curator; Archaeology and Historic Buildings for Historic Royal Palaces for their specialist input and advice, and Jane Sidel, Ancient Monuments Inspector Historic England for monitoring the site.
- 12.3 The author would like to thank Jennifer Simonson for the illustrations; Strehon Duckering for the photography; Richard Archer for the surveying; Chris Mayo for the project management; Jon Butler for the post-excavation management and editing; Chris Jarrett for assessing the pottery; Kevin Hayward for assessing the stone and building materials; Kevin Rieilly for assessing the animal bone; Chris Cooper for technical and logistical support.
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## APPENDIX 1 : CONTEXT INDEX

Context No.	Phase	Location	Plan	Section	Type	Description	Highest Level	Lowest Level	N-S (width)	E-W (length)	Thickness/ Depth
1	4	TP1	TP1	2	Masonry	Granite block	4.06mOD		0.30m	0.60m	0.20m
2	4	TP1	TP1	1,2	Layer	Mid yellow greystone rubble			1.00m	1.00m	N/A
3	4	TP2	TP2	3	Masonry	Kerbstone	3.97mOD		N/A	1.00m	N/A
4	4	TP2	TP2	3,4	Layer	Post-medieval levelling			0.64m	1.00m	0.14m
5	4	TP2	TP2	3,4	Layer	Crushed Caens tone levelling			0.60m	0.48m	N/A
6	4	TP3	N/A	5	Layer	Levelling deposit/p possible drawbridge backfill			N/A	N/A	0.33m
7	4	TP3	TP3	5	Layer	Levelling deposit/p possible drawbridge backfill			N/A	N/A	0.14m
8	1	TP3	TP3	6	Masonry	Possible Drawbridge pit edge			0.60m	0.10m	>0.22m
9	1	TP3	TP3	5,6	Masonry	Stone block			0.15m	0.45m	0.25m
10	4	Causeway	1:50 multi	N/A	Masonry	Pavements labs	4.09mOD	N/A	0.50m	2.00m	0.08m
11	4	Causeway	1:50 multi	N/A	Masonry	Concrete base for [10]	4.02mOD	N/A	0.65m	12.5m	N/A
12	4	Causeway	1:50 multi	N/A	Masonry	Concrete base for roadway	4.16mOD	3.93mOD		30.53m	0.15m
13	4	Causeway	1:50 multi	N/A	Masonry	Concrete kerb	4.14mOD	4.13mOD	0.18m	14.30m	0.20m
14	4	Byward Tower	14	N/A	Masonry	Cement bedding for Setts	4.08mOD	N/A	0.65m	5.00m	0.02m
15	4	Byward Tower	14	7	Masonry	Concrete base for [14]	4.06mOD	4.04mOD	0.65m	5.00m	0.08m
16	4	Byward Tower	N/A	7	Layer	Post-medieval levelling	3.99mOD	N/A	0.25m	>1.8m	0.05m
17	4	Byward Tower	N/A	7	Layer	Crushed Caen stone levelling	3.94mOD	N/A	0.25m	>1.8m	0.05m
18	3	Byward Tower	N/A	7	Layer	Post-medieval levelling	3.89mOD	N/A	0.76m	6.00m	0.20m
19	4	Causeway	N/A	N/A	Layer	Trample layer, East=[31]	3.78mOD	N/A	0.88m	5.54m	0.20m
20	1	Byward Tower	20,56	7	Masonry	Byward Tower	3.81mOD	3.53mOD	0.70m	6.04m	N/A
21	4	Causeway	N/A	N/A	Layer	19th/20th Century demo	4.04mOD	4.03mOD	1.10m	3.20m	

						deposit, West					
22	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID
23	4	Causeway	23	N/A	Layer	Crushed mortar layer, West	4.00mOD	3.97mOD	0.96m	1.60m	0.02m
24	3	Causeway	24	N/A	Layer	Charcoal rich layer	3.99mOD	N/A	0.48m	0.60m	0.16m
25	3	Causeway	25	N/A	Layer	Backfill/trample layer, West	3.92mOD	3.81mOD	0.74m	5.10m	0.16m
26	1	Causeway	1:20 Multi	9	Masonry	Medieval south Causeway wall (east)	5.30mOD	3.73mOD	4.59m	0.61m	1.57m
27	1	Causeway	56, 1:20 Multi	9, 10	Masonry	Drawbridge pit walls	3.73mOD	N/A	3.10m	6.10m	N/A
28	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID
29	3	Causeway	1:20 Multi	10	Layer	Post-medieval levelling	3.72mOD	3.56mOD	1.10m	2.00m	N/A
30	4	Causeway	1:20 Multi	N/A	Layer	Crushed Caenstone levelling	3.53mOD	N/A	0.20m	0.40m	N/A
31	4	Causeway	1:20 Multi	N/A	Layer	Dumplayer	3.77mOD	3.60mOD	1.10m	3.60m	N/A
32	4	Causeway	1:20 Multi	N/A	Layer	Same as [30]	3.52mOD	N/A	0.80m	0.40m	N/A
33	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID
34	3	Causeway	1:20 Multi	N/A	Fill	Rubble fill of [51]	4.07mOD	4.05mOD	1.40m	2.20m	N/A
35	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID
36	3	Causeway	1:20 Multi	N/A	Masonry	Central arch	4.12mOD	3.85mOD	>0.86m	>2.84m	N/A
37	3	Causeway	1:20 Multi	N/A	Fill	Fill of [50]	3.75mOD	N/A	0.50m	0.30m	N/A
38	3	Causeway	1:20 Multi	N/A	Fill	Fill of [49]	3.84mOD	N/A	1.00m	0.40m	N/A
39	1	Causeway	1:20 Multi	N/A	Masonry	Original causeway road (west)	3.83mOD	3.76mOD	0.84m	7.86m	N/A
40	1	Causeway	1:20 Multi	N/A	Masonry	Original Arch?	3.92mOD	N/A	0.48m	1.20m	N/A
41	1	Causeway	1:20 Multi	N/A	Masonry	Inner face of original wall	3.96mOD	3.80mOD	0.39m	6.50m	0.20m
42	2	Causeway	1:20 Multi	N/A	Masonry	Post-medieval brick wall	3.86mOD	N/A	0.40m	1.30m	N/A
43	1	Causeway	1:20 Multi	N/A	Masonry	Rubble core of south wall	3.86mOD	3.76mOD	1.20m	7.82m	N/A
44	1	Causeway	1:20 Multi	8	Masonry	Outer face of south wall	3.87mOD	3.84mOD	0.24m	8.60m	N/A
45	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID
46	3	Causeway	1:20 Multi	N/A	Fill	18th-century backfill	3.87mOD	3.70mOD	1.70m	5.34m	N/A
47	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID



48	3	Causeway	1:20 Multi	N/A	Fill	Same as [46]	3.62m OD	N/A	1.60m	2.20m	N/A
49	3	Causeway	1:20 Multi	N/A	Cut	West cut for central Arch [36]	3.84m OD	N/A	1.00m	0.40m	N/A
50	3	Causeway	1:20 Multi	N/A	Cut	Same as [49]	3.75m OD	N/A	0.64m OD	0.30m	N/A
51	3	Causeway	1:20 Multi	N/A	Cut	East cut of [36]	4.07m OD	N/A	1.40m	>2.20m	N/A
52	3	Causeway	1:20 Multi	N/A	Fill	Same as [46]	3.70m OD	N/A	>1.00m	>0.80m	0.38m
53	3	Causeway	1:20 Multi	N/A	Fill	Backfill under [52]	3.32m OD	N/A	>1.00m	>0.80m	0.20m
54	3	Causeway	1:20 Multi	N/A	Fill	Backfill under [53]	3.12m OD	N/A	>1.00m	>0.80m	>0.80m
55	4	Causeway	1:20 Multi	N/A	Fill	Drawbridge pit backfill	3.61m OD	N/A	>1.00m	>0.96m	N/A
56	1	Byward Tower	56	N/A	Layer	Remnant of metal ed surface	3.63m OD	3.61m OD	0.75m	6.00m	0.30m
57	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID	VOID
58	3	Causeway	1:20 Multi	N/A	Fill	Fill of [49]	3.86m OD	N/A	1.04m	0.94m	N/A
59	3	Causeway	1:20 Multi	N/A	Fill	Fill of [50]	3.83m OD	N/A	0.62m	1.08m	N/A
60	1	Causeway	1:20 Multi	N/A	Masonry	Original causeway road (east)	4.05m OD	3.76m OD	1.40m	4.10m	N/A
61	4	Causeway	TP4, 65	N/A	Pipe	Cast iron pipe	3.79m OD	3.73m OD	0.90m	0.10m	0.10m
62	4	Causeway	65	N/A	Masonry	Brickwork for [61]	3.79m OD	3.78m OD	0.60m	0.11m	N/A
63	4	Causeway	65	N/A	Fill	Backfill of pipe [61]	3.79m OD	N/A	0.84m	0.26m	N/A
64	4	Causeway	65	N/A	Cut	Cut for pipe [61]	3.79m OD	3.73m OD	0.90m	0.60m	N/A
65	1	Causeway	65	12	Masonry	Drawbridge pit wall	3.88m OD	3.78m OD	0.76m	3.00m	N/A
66	4	Causeway	N/A	12	Layer	Crushed Caen stone levelling	4.05m OD	N/A	0.58m	N/A	0.12m
67	3	Causeway	67	12	Layer	Dumplayer	3.93m OD	N/A	0.54m	1.92m	0.08m
68	3	Causeway	68	12	Layer	Charcoal lens	3.85m OD	N/A	0.52m	0.24m	0.05m
69	3	Causeway	69	N/A	Layer	Layer above masonry [65]	3.80m OD	N/A	0.54m	0.74m	0.05m
70	1	Causeway	65	N/A	Masonry	Rubble infill like [43], north wall	3.98m OD	3.87m OD	0.74m	2.20m	N/A
71	3	Causeway	65	N/A	Masonry	Post-medieval causeway wall, north	4.44m OD	4.39m OD	0.61m	29.67m	>0.70m
72	1	Causeway	3dsurvey	N/A	Masonry	Possible medieval wall	4.24m OD	N/A	N/A	4.57m	>0.25m

						under[71], north -west					
73	3	Causeway	65	N/A	Cut	Cut	3.98mOD	N/A	>0.80m	>1.10m	N/A
74	3	Causeway	65	N/A	Fill	Fill of [51]	3.98mOD	N/A	0.80m	>1.10m	N/A
75	2	Causeway	Multi 1:50	N/A	Masonry	Inner face of origin al north wall	4.07mOD	N/A	N/A	2.85m	N/A
76	3	Causeway	1:20 Multi	N/A	Masonry	Southern wall post-medieval	5.32mOD	5.29mOD	0.61m	33.06m	N/A

## **APPENDIX 2 : POTTERY ASSESSMENT**

Chris Jarrett

A single sherd of post-medieval pottery was recovered from the archaeological intervention and found in context [55]. The pottery consists of a basal sherd of a vessel made in Surrey Hampshire border redware (RBOR), dated 1550-1900. The pottery has no significance at a local level, being of a type frequently recorded in the London area. Its only potential is to date the context it was recovered from. There are no recommendations for further work on the sherd of pottery.

## APPENDIX 3: BUILDING MATERIALS ASSESSMENT

Kevin Hayward

### Introduction and Aims

1 shoe box of brick, and seven bags of stone, brick and mortar were retained from the excavations from the South- West Entrance Causeway, Tower of London. This small sized assemblage (23 examples 45.6kg), was assessed in order to:

- Identify (under binocular microscope) the fabric and forms of the medieval and post-medieval ceramic building material and mortar used in the construction of the Causeway.
- Identify the geological character and source of the worked and unworked stone objects recovered from the excavations and used in the construction of the Causeway.
- Compilation of a database (TOL147.mdb).
- Make recommendations for further study.

### Methodology

Given the Grade 1 status assigned to the Tower of London Causeway and consequently the minimal amount of intrusive impact and sampling allowed, then much of the extant fabric was examined *in situ* by non-destructive visual analysis. A number of site visits were conducted between February and March 2015 to investigate the geological character and source of the extant stone using a hand lens (Gowland x10). These observations were recorded on the context sheet and included in the review of the brick and stone contained in this report.

For the limited amount of material retained from the excavation, the application of a 1kg mason's hammer and sharp chisel to each example ensured that a small fresh fabric surface was exposed. The fabric was examined at x20 magnification using a long arm stereomicroscope or hand lens (Gowland x10) and compared with the PCA building materials reference collection and allocated the appropriate Museum of London fabric code.

### Ceramic Building Material 17 Examples 14.2kg

Not surprisingly, all of the ceramic building material retained from the South- West Causeway consisted either of medieval and post-medieval structural and paving brick and mortar. Most were recovered from the unstratified uppermost level of the causeway, with medieval [41] and post-medieval [42] examples recovered from the inner face of the causeway.

### Medieval Brick 3 Examples 1.6kg

*Yellow TOL1* (1270s/1280s)

*Pink and white Streaky 3042nr3031* (1270s/1280s)

Unique to the medieval inner face of the 13th-century causeway [41] and the probable early post-medieval reuse in the adjacent walled structure [42] are a group of red and bright yellow bricks that have fabrics characteristic of medieval construction. The first, a bright yellow (*TOL1*) fabric is different to the common late medieval brick fabric *3031* (1350-1450) used in ecclesiastical drainage and decoration in two aspects. First, the brick from the Causeway has a much brighter yellow hue than the white *3031*; and is comparable in colour albeit to the much later post-medieval London stock manufactured in the Medway, *3035*. Second these yellow causeway bricks contain what look to be small estuarine shells. Together these factors suggest that the brick was manufactured from estuarine clays (London Clay), possibly from the Medway and/or Thames Estuary.

The second type of brick has a pink-red hue with laminae of white-yellow clay streaks, hollowed out black charcoal inclusions and resembles aspects of the medieval brick fabrics *3042* and *3031* hence fabric code *3042nr3031*.

In terms of their form, all the bricks have an uneven surface, are exceptionally wide (130mm) and shallow (41-53mm). Bricks from the nearby Beauchamp Tower, one of the earliest, large scale uses of medieval brick in the British Isles and certainly for London constructed between 1275 and 1285, have comparable fabrics and forms (K. Hayward pers. obs.).

### Transitional Bricks 2 examples 5.5kg

*Red sandy 3033* (1450-1700)

Along with reused medieval bricks *3042nr3031* from the later walled structure [42] are two examples of wide and large (237mm x 110mm x 51mm) red sandy bricks comparable in fabric and form to the common early post-medieval *3033* (1450-1700). It is possible, however, that these could even be earlier 15th century (1420) as examples of these red bricks have turned up at Billingsgate. Once again, as with the use of different stone colours, the medieval and early post-medieval causeway appears to have been made from alternating bright red (and yellow bricks), designed to be seen from a distance.

### Post-Medieval Bricks

#### Early Post -Medieval 1 example 2.7kg

Maroon *3032nr3033* (1664-1725)

One example of a late 17th to early 18th-century intermediate brick 3032nr3033 combining facets of both early post-medieval red sand post Great Fire purple was recovered from post-medieval draw bridge pit fill [54].

#### Later Post -Medieval Construction Brick 4 examples 2.7kg

3032 (1664-1900) Post Great Fire purple clinker fabric

3035 (1780-1940) Yellow large machine made Medway bricks

Victorian Red 3033 (1800-1900) bright red

From the unstratified layers beneath the Tarmac of the causeway and Victorian made-ground repairs [21] are examples of purple post Great Fire bricks, yellow late 18th century -mid 20th-century estuarine bricks and well-made red Victorian sandy bricks. Some have sharp prisms suggesting possible machine manufacture.

#### Later Post -Medieval Paving Bricks

3036 (1600-1800)

3047 (1690-1900)

As well as construction bricks it was not surprising to find later post-medieval paving bricks, such as the yellow-green small Dutch pavers 3036 and red paving bricks 3047 in the unstratified layers. They, along with granite and basalt cobbles and setts, would have formed the later post-medieval vehicular and pedestrian path and road surface along the causeway.

#### Mortar Types

Bonding the brick as well as the stone walls of the inner and outer faces of the north and Thames facing walls of the Causeway and consolidating the surfaces are a series of mortar and concrete types whose character and occurrence from TOL 147 are summarised below (Table 1).

Mortar/Concrete Type	Description	Use at TOL 147
Type 1 Light grey clinker mortar	Light grey clinker mortar lots of large coal fragments up to 1cm across and shell fragments	1800-1900 Associated with later post-medieval and Victorian bricks unstratified; York paving slabs [10] and brick work for cast iron pipe [62]
Type 2 Hard lime sandy mortar	Hard lime sandy mortar	1850+ associated with reused post Great Fire bricks unstratified only
Type 3 Quartz and brick rich pink mortar	Quartz and brick rich pink mortar hard with flecks of coal	1850s+ associated with reused red paving bricks
Type 4 grey-brown loose mortar	Grey-brown loose mortar	Late 13th century Associated with Beauchamp bricks from Inner

		Causeway Wall [41]
<i>Type 4 generic brown sandy gravel mortar</i>	Generic brown sandy gravel mortar	Early post-medieval Course of wall running along south side of bridge above drawbridge pit [26] with Caen; Reigate and Ragstone also possibly [36] and [71]
<i>Type 5 Gravelly, shelly brown mortar with Reigate fragments</i>	Gravelly, shelly brown mortar with Reigate fragments	Later medieval early post-medieval associated with large Tudor brick from [42]
<i>Type 6 Ragstone concretionary mortar</i>	Hard grey concretionary matrix with large 10cm angular chunk of Kentish ragstone, 4cm flint and 2cm red brick	From [55] layer below draw bridge 18th-19th-century protoconcrete
<i>Type 7 red brick concretionary mortar</i>	Dark grey gravel sandy mortar; wood chips; coal lumps red brick lumps up to 30mm	From [54] 18th- 19th-century protoconcrete

Table 1 Listing of Mortar and Concrete types including distribution and use at TOL 147

Mortar types can be divided into medieval soft brown -grey recipes (Type 4) with occasional flecks of shell but also Reigate (Type 5) and are associated with the primary builds including the inner causeway wall [41] [42]. Then there are the loose brown mortars (Type 4a) characteristic of the 17th- and 18th- century builds of the archway [26] [71] [36] and proto concrete mortars (Types 6 and 7) associated with levelling and strengthening of the causeway. Finally there is a group (Types 1-3) associated with 19th- century brick pavers [10] [62]

#### Stone 6 Examples 32kg

Understandably the material choice for the rubble foundation and a ashlar from the northern and Thames-side outer face walls [26] [44] [65] and later post-medieval wall builds, [71], of the Causeway and pit for counterweights and drawbridge, [27], was governed by the need for robust durable defensive materials.

The geological type, source and use of the nine lithotypes identified from these excavations are summarised below (Table 2).

Geological Type and source	Description	Use at TOL -147
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Kentish Ragstone Lower Greensand (Hythe Bed) quarries along the Medway at Maidstone 3105	Very hard dark grey sandy limestone	The main rubble stone medieval foundation material from the earliest phases [20] and [43] occasionally used as ashlar for masonry walling [26]
Reigate stone Upper Greensand, Upper Cretaceous, Reigate-Mertsham (East Surrey) 3107	Fine-grained lime-green (glaucopitic) limestone	Common ashlar material from the earliest medieval causeway wall [65] Reused in later post-medieval causewayed wall [26] [71] and [75]
Yorkstone Upper Carboniferous South Yorkshire 3108	Hard olive green banded micaceous siltstone	Used as late post-medieval paving slabs [10]
Portland Whitbed (Portland stone), Portlandian, Upper Jurassic, Isle of Portland, Dorset 3110 PM	Hard light grey, fine grained oolitic grainstone	17th-19th-century ashlar used in later post-medieval causewayed wall [71] and arch [36]
Purbeck marble 3112 Purbeck Group, Durlston Formation (Lower Cretaceous), Swanage-Langton Matravers, Isle of Purbeck, Dorset.	Fine dark grey sparry limestone packed full of small 10mm complete freshwater nautilus <i>Paludinacarinifera</i>	Large crisply dressed ashlar Alternating with yellow Caen stone from the stone pit [27] for counterweights and drawbridge mechanism Byward Tower
Chalk Upper Cretaceous Thames Valley 3116	Fine white powdery limestone	Another rubble stone material for medieval foundation ramp [20] sometimes seen as ashlar in original causeway wall [65]
Calcareous Tufa – Holocene nearest outcrops chalk outcrops Thames Estuary or Medway 3118	White nodular low-density calcareous stone	Medieval 13th century One block of large ashlar in upper course of stone pit [27] for counterweights and drawbridge mechanism Byward Tower
Caen Stone Middle Jurassic (Bathonian) Caen, Department Calvados 3119	Fine condensed cream, yellow or yellow brown limestone (packstone)	Medieval 13th century + The most common crisply dressed ashlar stone material from the Causeway – alternating with dark Purbeck marble in stone pit [27] for drawbridge mechanism Byward Tower. Also external course of wall running [44] and north [65] and later post-medieval walling [26] [71] and [75] and dumps [54]
Purbeck limestone Purbeck limestone Upper Jurassic (Purbeckian) Isle of Portland	Hard light grey limestone with numerous	Paving slab [54] from a large post-medieval masonry layer may



Purbeck 3126	black and white oyster shells Bioclastic grainstone	have derived from the flooring/pathway of the original causeway
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Table 2 Listing of rock types, geological source, distribution and use at TOL 147

With the exception of Taynton stone all the main medieval freestone and walling stone materials for London are present in the construction of the Causeway (Caen stone; Reigate stone; Purbeck marble; Kentish Ragstone). Reigate stone apart, these are robust dense materials. The survivability of crisp dressed Purbeck marble ashlar in the drawbridge pit [27] lies merely in the fact that it was buried at depth and was immune to chemical and physical weathering. Indeed it is a feature of the walling from [27] and primary 13th-century outer causeway [26][44][65] that so much of the Caen stone is still crisply dressed. Clearly a great deal of time and effort had been put into extracting and working large 50cm to 1 metre rectangular ashlar blocks of Caen and Purbeck marble.

The feature of the drawbridge pit is the alternating yellow, grey, yellow of large Caen, Purbeck Marble and Caen stone ashlar blocks. Colour wise designed to impress though the great density of Purbeck marble may have served as a functional use too.

One other item of interest is the identification of Tufa from the area of the drawbridge pit [27] near to the Byward Tower, a rock normally associated with the 11th-12th-century development of the Tower, e.g. White Tower (Sanderson & Worssam 1998).

## Phase Summary

### Primary Late 13th-century Medieval Build

Some of the most crisply dressed ashlar blocks were used in the external course of the causeway wall running along the south side of bridge [44] and the north side [65] and the drawbridge pit [27]. These relate to a major phase of building works by Edward I between 1275 and 1285. These consisted primarily of yellow Caen stone exploited from Normandy and grey Purbeck marble from Dorset some of which alternate as in the drawbridge pit [27] to create an impressive decorative effect.

The yellow and red bricks recorded from the inner facing wall of the causeway [41] are almost certainly the same fabrics as those used in the construction of the 1275 to 1285 Beauchamp Tower. The bricks from the causeway may have formed part of an enormous documented consignment of some 243,000 examples from 1276-78 (Impey & Parnell 2011, 38) used for the Beauchamp Tower. Inevitably with a consignment of that size and scale some may have been put to use in other contemporary building projects in the Tower, such as the south-west entrance causeway, and

examples also turn up in repairs to the external facing of the adjacent late 12th-century Bell Tower (K. Hayward pers. obs.).

The rubblestone materials used in the foundation of the causeway [20] [43] include the ubiquitous chalk and Kentish ragstone; these features and the inner and outer facing causeway wall are bonded in earthy, sandy mortars (Types 4; and 5), typical of medieval use in the Tower.

Improvements to the inner facing of the causeway [42] may also date to the very late medieval/ 16th century. These are made from very large red Tudor bricks fabric 3033 (with a date of manufacture of between 1420 and 1700).

### Post-Medieval Activity

Broadly, the post-medieval activity can be divided up in to the 18th-century structural improvements including the archway [36] and walls [71] and [76] characterised by the use of Portland stone ashlar, a rock type only widely available after the Great Fire and a brown sandy mortar Type 4a. Red brick concrete Types 6 and 7 may form some type of proto hydraulic concrete recipe in use for the late 18th-century defensive projects.

Finally there are the 19th-century materials used to pave the surface of the causeway and path; most, like the small Dutch Paving brick 3036 and the red paving brick 3047, are unstratified. No Granite and Basalt setts were observed, though almost inevitably these too would have been used as cobblestone materials. Post Great Fire and Yellow Estuarine bricks were also used bonded in hard coal rich grey and white mortars (Types 1-3).

### Distribution

Structures in bold (field observations in *italic*). Other contexts only where building material sampled

Context	Fabric	Form	Size	Date range of material		Latest dated material		Spot date	Spot date with mortar
0	3047; 3036; 3032; 3046; 3035; 3101	Paving bricks red and Dutch; Victorian red yellow and post Great Fire construction bricks three post-medieval mortar types T1; T2; T3	8	1600	1940	1780	1940	1900+	1850+
<b>10</b>	<b><i>3108; 3101</i></b>	<b><i>York stone paving</i></b>	<b>1</b>	<b><i>1700</i></b>	<b><i>1950</i></b>	<b><i>1700</i></b>	<b><i>1950</i></b>	<b><i>1800-1900</i></b>	<b><i>1800-1900</i></b>

Context	Fabric	Form	Size	Date range of material		Latest dated material		Spot date	Spot date with mortar
		<i>slabs T 1 mortar</i>							
11	3101	Bedding Concrete	1						1850-1950+
12	3101	Bedding Concrete	1						1850-1950+
13	3101	Bedding Concrete	1						1850-1950+
14	3101	Bedding Concrete	1						1850-1950+
15	3101	Bedding Concrete	1						1850-1950+
20	3105; 3116; 3101	Kentish ragstone and chalk with T4a brown sandy mortar	1	50	1600	50	1600	1100-1600	1100-1500
21	3032	Post Great Fire brick	1	1664	1900	1664	1900	1700-1900	No mortar
26	3107; 3119; 3105; 3101	Reigate stone; Caen stone; Ragstone ashlar and generic Type 4a brown sandy mortar	4	50	1600	1060	1600	1200-1500	1100-1500
27	3119; 3112M; 3118	Caen stone; Purbeck marble alternate (grey and yellow) large ashlar Tufa block	3	50	1600	1150	1600	1150-1300	No mortar
36	3110PM; 3119	Portland stone ashlar and Caen stone ashlar	2	1060	1950	1630	1950	1630-1800+	No mortar
41	TOL1; 3042nr3031; 3101	Medieval yellow and pink/white brick fabrics comparable with Beauchamp Tower examples; soft grey brown mortar T4	2	1275	1285	1275	1285	1275-1285	1100-1600
42	3033; 3042nr3031; 3101; 3119V	Probable reused Beauchamp Tower brick; large late medieval early	3	1060	1700	1420	1700	1420-1600	1300-1600

Context	Fabric	Form	Size	Date range of material		Latest dated material		Spot date	Spot date with mortar
43	3105; 3107	post-medieval red bricks; Reigate rich gravel shell light grey brown soft mortar T5; Sparry Caen stone <i>Kentish ragstone and Reigate rubble salvaged from Tower.</i>	2	50	1600	1060	1600	1200-1600	No mortar
44	3119	<i>Large Caen stone ashlar similar to 27</i>	1	1060	1600	1060	1600	1200-1500	No mortar
54	3032nr3033; 3126; 3105; 3107	Early post Great Fire brick; large paving slab of Purbeck limestone; Reigate stone ashlar and Kentish Ragstone ashlar	5	50	1900	1100	1900	1664-1800	No mortar
55	3105; 3101	Kentish ragstone rubble and brick concrete	3	50	1900	50	1900	1600-1900	1750-1900
56	3101	Brick Concrete	1						1750-1900
62	3032; 3101	<i>Frogged post Great Fire brick T1 clinker mortar</i>	1	1664	1900	1664	1900	1850-1900	1800-1900
65	3117; 3107; 3119	<i>Chalk, Reigate, Caen ashlar</i>	3	50	1600	1060	1600	1100-1300	No mortar
70	3105; 3107; 3119	<i>Kent ragstone, Reigate and Caen stone rubble infill</i>	3	50	1600	1060	1600	1100-1300	No mortar
71	3107; 3119; 3110PM	<i>Reused Reigate and Caen stone fresh Portland stone ashlar</i>	3	1060	1950	1630	1950	1700-1900	No mortar

Context	Fabric	Form	Size	Date range of material		Latest dated material		Spot date	Spot date with mortar
75	3119; 3107; 3101	Reused Reigate and Caen stone undefined mortar but not typical medieval	2	1060	1600	1060	1600	1400-1600+	1500-1800?

### Recommendations/Potential

Analysis of the *in-situ* stone and brick, as well as retained examples from the South-west Causeway has identified fabrics characteristic of the earliest Edward I build of the Causeway in the late 13th century. The Drawbridge pit [27] and external walls [44] [65] use primarily crisply dressed yellow Caen ashlar fragments often in conjunction with very large, dense blocks of grey Purbeck marble, creating a decorative striped effect of alternating bands of Caen and Purbeck marble. The amount of effort required to dress so precisely these hard materials would indicate a major investment in building materials using the best quality stone masons. The identification of red and bright yellow Beauchamp Tower type bricks in the inner causeway wall [41] is significant as inevitably parts of the enormous consignment of bricks used in the 1276-8 Beauchamp Tower would have been used in other contemporary projects in the Tower associated with Edward I extension in the late 13th century. One such project would have been the construction of the new South-west Causeway.

This petrographic and fabric link in the Causeway with other construction projects associated with Edward I's late 13th-century building programme deserves further comment and work. Of significance could be the use of RHX rehydroxylation technique (Wilson 2009) on small samples of these early bricks to verify a date in the second half of the 13th century. This aspect of the excavation alone merits publication and further research.

### Bibliography

- Impey, E. & Parnell, G., 2011. *The Tower of London*. Historic Royal Palaces, Merrell, London.
- Wilson, M.A., 2009. Dating fired-clay ceramics using long-term power law rehydroxylation kinetics. *Proceedings of the Royal Society A* 465 (2108), 2407–241
- Worssam, B.C. & Sanderson, R.W., 1998. *Geology of the White Tower South Elevation, H.M. Tower of London*. Unpublished petrological assessment.

## **APPENDIX 4: ANIMAL BONE ASSESSMENT**

Kevin Rielly

There were just 8 bone fragments taken from an unstratified deposit. These consist of a cattle astragalus, a sheep scapula, a pair of goose tarsometatarsals and then 3 cattle-size and 2 sheep-size ribs. The astragalus was heavily abraded/smoothed, most probably redeposited from a riverine deposit. Otherwise the bones were very well preserved. The goose foot bones clearly derived from a large domestic bird.

## APPENDIX 5: OASIS FORM

OASIS ID: preconst1 -219999

### Project details

Project name	South-west Entrance Causeway, Tower of London
Short description of the project	An archaeological excavation was conducted on the south-west entrance causeway at the Tower of London between 19th January and 2nd March 2015. Four phases of archaeological activity were noted, they were from the late 13th century, pre-1780, post-medieval, post-1780, post-medieval and the late 19th/20th century. During the excavations sections of the original late 13th-century masonry of the causeway and the upper portions of the Byward Tower drawbridge pit were recorded. These date from the major phase of building works conducted at the Tower of London by Edward I between 1275 and 1285. Two small sections of wall containing re-used brick and stone provided evidence of later repair work. Evidence of the 1780 remodelling of the causeway was seen in the form of construction cuts for the Portland Stone central arch and outer walls (as seen today). Bedding deposits for the former late 19th/20th-century road were seen across the causeway.
Project dates	Start: 10-12-2014 End: 02-03-2015
Previous/future work	No/Not known
Any associated project reference codes	TOL 147 - Site code
Type of project	Recording project
Site status	Scheduled Monument (SM)
Site status	World Heritage Site
Current Land use	Other 11 - Thoroughfare
Monument type	WALL Medieval
Monument type	WALL Post Medieval
Monument type	ROAD Medieval
Monument type	ROAD Post Medieval
Monument type	LAYER Medieval
Monument type	LAYER Post Medieval
Monument type	DRAW BRIDGE PIT Medieval
Significant Finds	BRICK Medieval
Significant Finds	STONE Medieval



Investigation type	"Part Excavation"
Prompt	Scheduled Monument Consent

### Project location

Country	England
Site location	GREATER LONDON TOWER HAMLETS TOWER HAMLETS Southwest Entrance Causeway, Tower of London
Postcode	EC3N4AB
Study area	271.00 Square metres
Site coordinates	TQ 533474 180521 50.94091628380.182931 158431 50 56 27 N 000 10 58 E Point

### Project creators

Name of Organisation	of	Historic Royal Palaces
Project originator	brief	Historic Royal Palaces
Project originator	design	Chris Mayo
Project director/manager		Chris Mayo
Project supervisor		Shane Maher

### Project archives

Physical recipient	Archive	Historic Royal Palaces
Physical Contents		"Animal Bones", "Ceramics", "Worked stone/lithics"
Digital recipient	Archive	Historic Royal Palaces
Digital Contents		"Animal Bones", "Ceramics", "Stratigraphic"
Digital available	Media	"Images raster/digital photography", "Spreadsheets", "Survey", "Text"
Paper recipient	Archive	Historic Royal Palaces
Paper Contents		"Animal Bones", "Ceramics", "Worked stone/lithics"
Paper available	Media	"Context sheet", "Diary", "Map"

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**Project  
bibliography1**

Publication type	Grey literature (unpublished document/manuscript)
Title	An Assessment of an Archaeological Investigation at South-west Entrance Causeway Project, Tower of London, Tower Hill, London Borough of Tower Hamlets EC3N4AB
Author(s)/Editor(s)	Maier, S.
Date	2015
Issuer or publisher	Pre-Construct Archaeology
Place of issue or publication	Brockley
Description	A4 grey literature report

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