

An Archaeological Watching Brief and Excavation on the Cascade and Lower Pond in Bushy Park Water Garden, Upper Lodge, Bushy Park, London Borough of Richmond.

Site Code: WBU 08

Central National Grid Reference: TQ 1462 7020

Written and Researched by Rebecca Lythe

Pre-Construct Archaeology Limited, March 2009

Project Manager: Tim Bradley

Commissioning Client: The Royal Parks

**Contractor: Pre-Construct Archaeology Limited
Unit 54 Brockley Cross Business Centre
96 Endwell Road
Brockley
London
SE4 2PD**

Tel: 020 7732 3925

Fax: 020 7639 9588

Email: tbradley@pre-construct.com

Website: www.pre-construct.com

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1 ABSTRACT

- 1.1 This report details the results and working methods of an archaeological watching brief and excavation, conducted on the cascade and lower pond in Bushy Park Water Garden, Upper Lodge, London Borough of Richmond. The project was undertaken by Pre-Construct Archaeology Ltd. and was commissioned by The Royal Parks.
- 1.2 The site is situated in the northwest corner of Bushy Park, centered on National Grid Reference TQ 1462 7020 (Figure 1). Its eastern, western and southern boundaries are formed by parkland, whilst the northern boundary is formed by the grounds of Upper Lodge. The site was assigned the code WBU 08.
- 1.3 The underlying drift geology consists of Thames river terrace gravel sealed by silty clay, henceforth termed "brickearth".
- 1.4 The investigations revealed the cascade to be a multiphase structure, partially rebuilt or modified on at least eight occasions between the early 18th and 20th centuries. Investigations were also carried out on the lower pond, which suggested the current feature is smaller and of a different shape to the original.

2 INTRODUCTION

2.1 Background

2.1.1 An archaeological excavation and subsequent watching brief were conducted on the cascade and lower pond in Bushy Park Water Garden, Upper Lodge, London Borough of Richmond. The work was undertaken on an intermittent basis between 4th February and 11th June 2008 as part of a restoration and renovation project. The archaeology uncovered indicated that the structure had been partially rebuilt or modified at least eight times, from its construction in the early 18th century to the present day. Vestiges of its earliest phase were identified, enabling its original form and subsequent history to be partially reconstructed.

2.1.2 The archaeological work was commissioned by The Royal Parks, project managed by Tim Bradley of Pre-Construct Archaeology Ltd. and supervised by the author. The work was monitored by Mark Stevenson of English Heritage Greater London Archaeology Advisory Service (GLAAS).

2.2 Aims and Objectives

2.2.1 The aim of the restoration project was to recreate the cascade's original, early 18th century form as accurately as was reasonably practicable given the constraints of the archaeological evidence. Pre-Construct Archaeology Ltd. was therefore contracted to undertake a series of three trial trenches prior to commencement of building work, in order to provide feedback to the design team. This was commissioned as a follow-up to an earlier archaeological assessment carried out by CKC Archaeology Ltd. in 2002 to 2004 (Currie, 2004). Whilst some findings of the former study were confirmed, the larger trenches excavated by Pre-Construct Archaeology Ltd. enabled a more thorough assessment of the structure's stratigraphy. The results of the earlier work could therefore be placed in a wider context, necessitating some reinterpretation. After the trial trenches were completed, necessary demolition and building work on the cascade began. This was monitored on an intermittent basis by Pre-Construct Archeology Ltd. as a watching brief. The renovation became a dynamic process, as the watching brief yielded further evidence that would become key to the structure's final design.

2.3 Research Questions

2.3.1 Several period renditions and descriptions of the earliest phase of the cascade exist. These suggest the structure once consisted of between four and five steps flanked by two symmetrical wing walls. A stoop basin was seemingly present on each wing wall, along with an alcove positioned further out. A "naturalistic" look may have been achieved by cladding the cascade and wing walls in roughly hewn rock and coral. The cascade also appears to have been decorated with between six and eight decorative metal spinnials. Decorative metal spikes or leaves may also have protruded from the waterline at the base of the wing walls. Water appears to have flowed from the Longford River to the west, into the upper pond, over the cascade steps and into the lower pond. A landscaped escarpment appears to have circumnavigated the entire circumference of the lower pond. This escarpment sloped down, levelled off to form a path leading into the alcoves, and descended into the pond. Work undertaken by CKC Archaeology Ltd. in 2002 to 2004 suggested that,

whilst the extant upper pond respected the shape if not size of its predecessor, the lower pond had been modified in terms of both size and shape. Unfortunately, the nature of the original could not be conclusively established during the project. The escarpment and path are also no longer extant, perhaps having been in-filled during later landscaping work.

2.3.2 Although paintings are inevitably subject to a degree of artistic licence and the contemporary descriptions are limited in their scope, it can be presumed that the elements detailed above were key parts of the cascade and pond design. The following research questions were therefore formulated, in order to facilitate reconstruction of the original lower pond and cascade:

1. What were the dimensions and form of the original cascade wing walls?
2. What were the dimensions and form of the original cascade steps?
3. What materials were used to construct the cascade and wing walls and were they clad in order to achieve a “naturalistic” finish?
4. What was the position, size and floor level of the alcoves?
5. What were the positions, sizes, forms and heights of the stoop basins?
6. What were the dimensions, inclination, height and location of the original lower pond and its associated escarpment and path and can the raw materials used to construct the path, banks and pond be identified?
6. What was the original water level in the lower pond?

2.3.3 In addition, later modifications to the cascade and wing walls were examined in order to undertake a full stratigraphic assessment of the structure and explore its subsequent life-history. The results of the archaeological survey undertaken by CKC Archaeology were also re-evaluated in light of the new information.

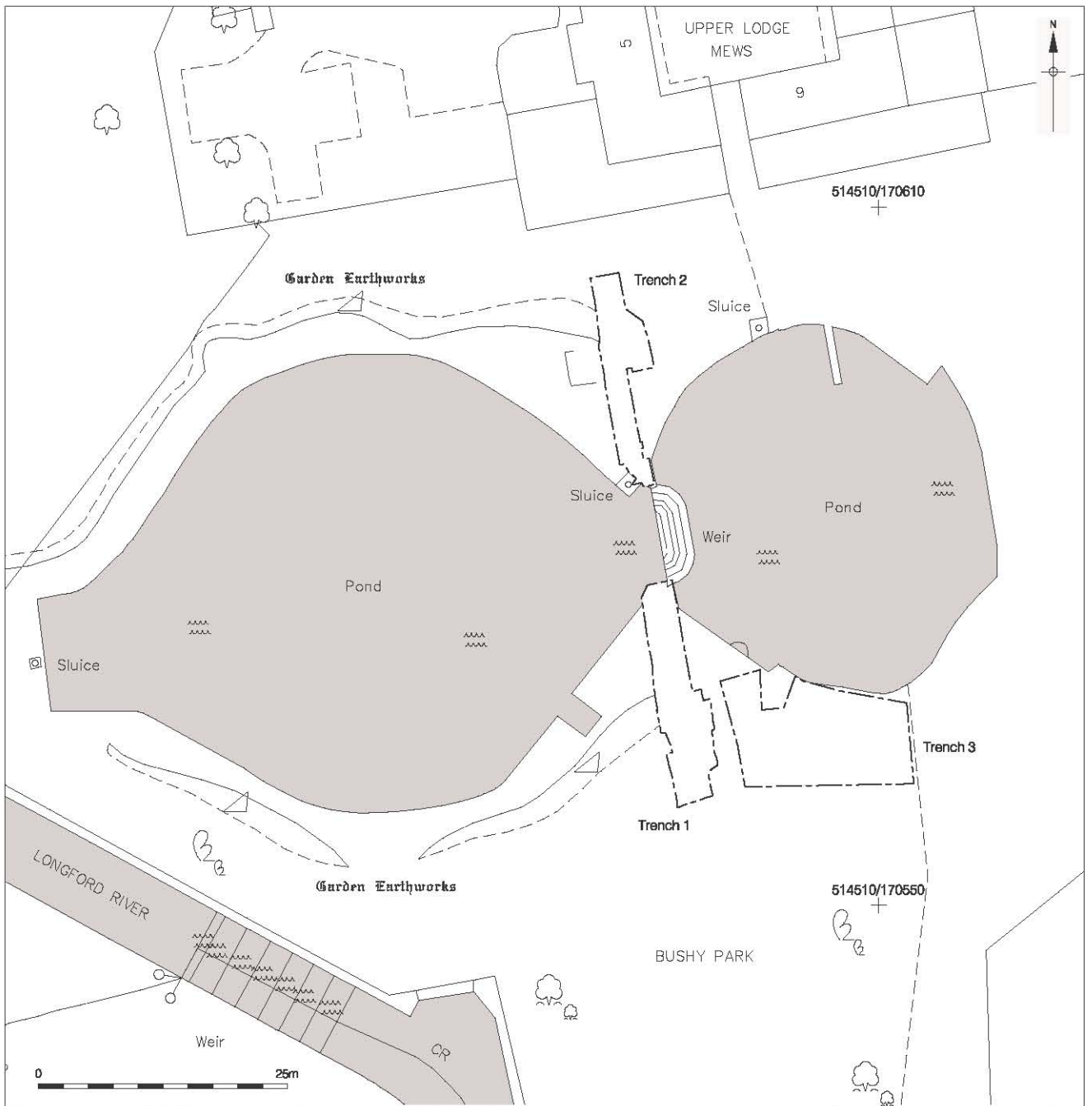
2.3.4 The presence or absence of any earlier archaeological features was assessed during the work. The nature of the underlying geology was also considered.



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Figure 1
Site Location
1:20,000 at A4



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Figure 2
Trench Location
1:625 at A4

3 GEOLOGY & TOPOGRAPHY

3.1 Geology

- 3.1.1 According to the British Geological Survey of England and Wales (Sheet 270), the underlying drift geology consists of Taplow Gravel, an Anglian to Flandrian Post-diversionary Thames River Terrace deposit. It is situated close to the boundary with the slightly later Kempton Park gravel, however, which outcrops to the immediate south.

3.2 Topography

- 3.2.1 The site was generally flat, at a level of 15.53m OD. The only exceptions were the ponds, located at the base of a terraced cut. The top of the silt in the upper pond was approximately 1.2m below modern ground level, whilst the top of the silt in the lower pond was approximately 1.8m below modern ground level.

4 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

4.1 Prehistoric

- 4.1.1 A search of the online records of the Archaeological Data Service suggests prehistoric activity in the vicinity of the site was limited. No remains were found within a 1km radius, although prehistoric flint artefacts were found at 2 Bevedere Cloot in Richmond (<http://ads.ahds.ac.uk/catalogue/search/fr.cfm?rcn=GLSMR-021143>) and in Teddington (<http://ads.ahds.ac.uk/catalogue/search/fr.cfm?rcn=GLSMR-021105>). It should be noted, however, that this apparent absence of evidence may be due to a lack of modern development in Bushy Park and the surrounding area, limiting opportunities for archaeological research.

4.2 Roman

- 4.2.1 Little evidence of Roman activity has been found in the vicinity, the only exception being a Roman find spot in Hampton Hill, Richmond (<http://ads.ahds.ac.uk/catalogue/search/fr.cfm?rcn=GLSMR-021039>). Again, the scarcity of evidence may be due to a dearth of recent development in the Bushy Park area rather than a genuine lack of Roman activity.

4.3 Saxon and Medieval

- 4.3.1 The place name "Hampton" is derived from the Saxon words used to describe the settlement, which translate as "the farm in the bend of the river" (Weinreb & Hibbert, 1993).
- 4.3.2 The Domesday Book of 1086 cites Earl Algar as the former owner of the manor, and Walter de St Valery as the new owner (Weinreb & Hibbert, 1993).
- 4.3.3 By 1236, the Manor of Hampton had been acquired by the Knights Hospitallers. It remained property of the order until 1514, when it was confiscated during the Reformation (Weinreb & Hibbert, 1993, Currie 2003, Currie 2004).

4.4 Post-Medieval

- 4.4.1 After the Dissolution of the Monasteries, the Manor of Hampton was leased by Thomas Wolsey. He was responsible for demolishing the earlier manor house owned by the Knights Hospitallers and commissioning the earliest phase of the palace that would soon become the Royal residence of Hampton Court (Weinreb & Hibbert, 1993). The land now occupied by Bushy Park was henceforth used as a deer park associated with the new palace. It was placed in the care of Thomas Heneage, who became the first individual to receive the newly created title of Ranger (Currie 2003, Currie 2004).
- 4.4.2 Archaeological and documentary sources indicate that a complex of buildings were constructed at Upper Lodge, to the immediate north of the cascade and ponds, after

their appropriation by the Crown. They had previously been occupied by an individual named John Field. Archaeological evidence suggests a structure “of some status” (Currie, 2004) had been constructed by the first half of the 17th century. This was replaced by a complex of lodge buildings, the evolution of which are illustrated in detail on a series of maps dating from 1709 onwards (Currie 2003, Currie 2004).

- 4.4.3 In 1709, Charles Montague, 1st Earl of Halifax, agreed to rebuild the Lodge, which was by then in “a ruinous condition”. In return, he was able to rent the estate from the Crown for a lease of three lives, commissioning the construction of the water garden and cascade soon after. A contemporary reference to Halifax’s improvements can be found in a letter dated September 30th 1710, in Jonathan Swift’s *Journal to Stella*. The letter describes a trip to Hampton Court, in which the author was detained by the Earl:

“I walked in the gardens, saw the cartoons of Raphael, and other things; and with great difficulty got from Lord Halifax, who would have kept me to-morrow to show me his house and park, and improvements” (Swift, 1738).

- 4.4.4 The water gardens were completed before Halifax’s death in 1715, as several descriptions concerning their beauty, coupled with artistic and cartographic depictions, were made whilst he was still alive. These primary sources are described below. They can be combined to give a reasonable image of what the cascade may have looked like, although certain aspects of them are contradictory.

- 4.4.5 The structure was depicted by several early 18th century artists, including Jacob Bogdani (1660-1724), Bernard Lens (1682-1740) and by an anonymous painter, sometimes referred to as the “Ricci” painting (Currie, 2004). It was also shown on a map of Hampton Court and its grounds, compiled in 1711 by Charles Bridgeman. The fountain is labeled “New Reservr. & Canal” and is of a lighter colour than the other water features, perhaps indicating it had not been constructed or completed at the time of the map’s composition (Currie, 2003).

- 4.4.6 The cascade and water garden featured in the book “*Introduction to a System of Hydrostatics and Hydraulicks*”, published in 1729, by the prominent 18th century writer and garden designer Stephen Switzer (1682-1745). Switzer worked on the gardens of several stately homes in the early 18th century, including the Stanway Baroque Watergarden, Castle Howard and Nostell Priory (http://www.gardenvisit.com/biography/stephen_switzer). He clearly saw the pond and cascade of being of some significance, describing it thus:

“Plate XXXIV [illustration of the cascade] is an Upright and Perspective of the Cascade at Bushy Park, the real Design (at least the approved one) of that great Maecenas of his Age, the late Earl of Halifax, whose true taste in rural and extensive Gardening, I have long ago took leave to celebrate.

This very handsome rural Design is supply’d by a Branch of the River Colne; which, though not affording a perpetual Current, yet is never wanting to give Spectators a peculiar Pleasure.

The design is so well known, that I need not expatiate or enlarge upon it; but is, however, of so rude an rustick a Manner that it may well serve as a Patten or Model to any that shall be disposed to make use of Water Works.

There is one thing observable in the Judgement of the Noble Lord before-mentioned, and which is not endeavouring to crowd much Wood about this Cascade, as the Italians and French do, inasmuch as it is in a Countrywhere there is not so much heat as there is in those first mentioned; and this Consideration it is, that has very justly been the Occasion of some modern and very great Designers in Gardening, to make their Designs more open and free from Cover; because Water, however, delightful it

is, is apt (especially in the shade, and not clear) to detract greatly from the Beauty of it" (Switzer 1734, p. 403).

- 4.4.7 In a letter dated 14th February 1713, the astronomer and politician Samuel Molyneux described the water garden:

From Hampton Court we went to see a lodgeing Park called Bushy Park belonging to the Palace which is now in the hands of my Lord Halifax as Ranger I believe of that Park, there was here little or nothing remarkable but the Cascade which was not very high, but little and yet very beautifully dispos'd so as to fall between two fine pieces of Grotto Work where are places left for Paintings representing two Caves in which little walks around the Basin of the Cascade end the Paintings are moveable so as to be taken away in Winter. (Molyneux, 1713, in Hunt & Willis, 1989)

- 4.4.8 These early 18th century descriptions and depictions therefore enable the design of the original cascade to be conceptualised. They suggest it consisted of a set of stairs flanked by two symmetrical wing walls, as shown in the paintings by Bogdani, Lens and "Ricci" and the illustration by Switzer. A stoop basin is also shown on each wing wall, along with an alcove further out, although the nature, dimensions and relative proportions of these vary.
- 4.4.9 The "Ricci", Lens and Switzer illustrations all suggest the cascade consisted of four steps, whilst the Bogdani painting shows five. Today, five steps are present, suggesting the water level in the lower pond may once have been higher, masking the lowest step.
- 4.4.10 The size and height of the grottos and length of the wing walls are different on each painting. This is not surprising, as the proportions have presumably been skewed due to artistic license. This is most striking in the "Ricci" painting, in which tiny figures are shown in the southern grotto. If this scale is believed, the top of the alcoves would have been over three times the height of the people shown inside them, which seems unlikely given the vertical extent of the surviving structure. It is also possible that the interior of the grottos shown in the "Ricci", Lens and Switzer illustrations may have been a partial illusion, as the letter by Molyneux suggests the impression of a deeper cave may have been created through the use of drawings.
- 4.4.11 The "Ricci" painting appears to show double tiered stoop basins with possible hoods crowned by "acanthus" type spinnials, along with a series of ornamental spikes at the base of the wing walls, protruding from the water. This is contradicted by the Lens drawing, which suggests the stoop basins were single rather than double and open topped, the spinnials being keyed into the cascade wall above the basins. The metal spikes at the base of the wing wall are also not shown. This arrangement is apparently confirmed by the Bogdani painting and Switzer's illustration, which also show single, open basins and a lack of metal spikes. The "Ricci" painting and the Switzer illustration also suggest an additional four spinnials were once located on top of the north and south grottos and on the wing walls to the immediate north and south of the cascade steps. This is confirmed by the Lens and Bogdani paintings, although they also depict a further two spinnials crowing the masonry at the end of both wing walls.
- 4.4.12 The structure appears to have been clad with roughly hewn, natural materials, as suggested in the depictions by "Ricci", Lens and Switzer. This is made more likely by the fact that "naturalistic" garden features became fashionable during the 18th century.

- 4.4.13 Switzer's description of the cascade details how water was channelled from the Longford River, fed by the "River Coln", into the upper pond, over the cascade steps and into the lower pond. The illustrations appear to confirm this. They also show a landscaped escarpment with a path at the base running around the lower pond, which lead into the alcoves. Whilst the upper pond is generally shown as octagonal rather than round, it appears to loosely resembles its modern successor in terms of size, if not shape (Currie, 2003). The lower pond is quite different, however. It appears to have been constructed in a geometric design, best described as "clover" or "floral" shaped, a layout loosely mirrored in all the paintings and clearly depicted on the later Rocque Map of 1744. It is shown as being circular in plan on the Bridgeman map of 1711, although this may have been drawn whilst the water garden was still a proposal, having been compiled before their creation or whilst they were under construction.
- 4.4.14 If Switzer's account is accurate, it appears as though the original cascade was positioned in relatively open land, free of trees. This is confirmed by all the illustrations. The Bogdani and "*Ricci*" paintings, the most naturalistic rather than diagrammatic depictions, suggest trees were set well away from the landscaped, grassy escarpments associated with the ponds.
- 4.4.15 In 1771, Upper Lodge became Crown property once more after the death of the Earl's descendent, George Montague Dunk. The fate of the water gardens is not well documented, although it is thought that they gradually fell into disrepair (Currey, 2004). This is supported by a watercolour dating to 1780, by the artist James Spyers. The illustration suggests that the southern wing wall had been demolished up to the grotto position, whilst the northern wing wall was in a state of dilapidation. Two large, mature willow-like trees are also shown immediately behind the wing walls, suggesting the cascade's open setting, so much appreciated by Switzer, did not last for long. The drawing also suggests the grottos were shallow and insubstantial or had been blocked up at a later date.

4.5 20th Century

- 4.5.1 The façade of the cascade was partially rebuilt in London stock bricks during the late 19th or early 20th century, presumably after a long period of neglect. The grottos were probably removed at this time, in order to increase the structure's stability and enable it to be reinforced with the stocks (Currie 2004).
- 4.5.2 Upper Lodge was unoccupied during World War I. It was then awarded to the Canadian Red Cross for use as a convalescent home. In the interwar period, it became a school, known as The Canadian School for Boys, before being requisitioned by the military at the beginning of World War II.
- 4.5.3 The house and grounds remained in the hands of the military until 1994, when ownership reverted back to the Crown Estates. Several buildings had been constructed by the Ministry of Defence in the intervening period. They were demolished between 1997 and 1999 in an attempt to restore the area to its former 18th century glory (Currie, 2004). The project, of which this study forms a part, is still ongoing.

5 ARCHAEOLOGICAL METHODOLOGY

5.1.1 Three archaeological trenches were excavated, termed Trenches 1, 2 and 3. Trench 1 was placed above the southern wing wall, Trench 2 was situated above the northern wing wall and Trench 3 was located to the immediate south of the southern edge of the lower pond. The trenches were arranged in order to obtain as much information as possible with regard to addressing the research questions outlined in section 2.3.2. Trenches 1 and 2 were therefore excavated in order to investigate the nature of the wing walls, grottos and stoop basins, whilst Trench 3 was dug in order to establish the original nature and shape of the lower pond, pathway and escarpment. The northeastern end of Trench 2 was also extended in order to further investigate the lower pond's nature and extent. The dimensions of the trenches were as follows:

Trench 1:	22.46m north-south x 5.20m east-west
Trench 2:	21.40m north-south x 10m east-west
Trench 3:	5.5m north-south x 6.5m east-west

5.1.2 After the archaeological trenches had been completed, unstable elements of the cascade began to be demolished by the contractors. This was monitored on an intermittent basis as a watching brief.

5.1.3 The site was excavated using a 360 type mechanical excavator fitted with a toothless ditching bucket, under archaeological supervision. Between 0.4m and 1m of topsoil, subsoil or dumped 19th century material was removed. Machining stopped when masonry structures, earlier archaeological deposits or natural gravel was encountered.

6.4 All recording systems adopted during the investigations were fully compatible with those most widely used elsewhere in London, that is those developed out of the Department of Urban Archaeology Site Manual, now published by the Museum of London Archaeology Service (MoLAS 1994). Individual descriptions of all archaeological strata and features excavated and exposed were entered onto pro-forma recording sheets. All plans and sections of archaeological deposits were recorded on polyester based drawing film, the plans being drawn at a scale of 1:20 and the sections at 1:10 or 1:20. The OD heights of all principal strata were calculated and indicated on the appropriate plans and sections. A full photographic record of the investigations was also prepared, including both black and white prints and colour transparencies on 35mm film.

5.1.4 All archaeological structures and deposits were hand cleaned prior to recording, some of which were subsequently removed during the excavation. Mortar samples were taken from all masonry contexts in order to provide dating evidence. Brick samples were also taken from structural elements that needed to be demolished as part of the restoration work. The entire structure was also inspected *in situ* by Pre-Construct Archaeology's in house brick specialist, Kevin Hayward, prior to any demolition work. It was also re-examined on three separate occasions during its demolition.

5.1.5 Levels were taken from a Temporary Bench Mark (TBM) with a value of 15.53m OD, located on the centre of the top step of the cascade. It was established on a spot height provided by the developer.

6 ARCHAEOLOGICAL PHASE DISCUSSION

6.1 PHASE 1: NATURAL

6.1.1 The earliest deposit identified during the excavation was a layer of compact, mid brownish red gravel, termed [55] in Trench 1, [51] in Trench 2 and [19] / [64] / [68] in Trench 3. It presumably forms part of the Taplow Terrace sequence, although it may be associated with the later Kempton Park formation, as the boundary between the two units is situated very close to the study site. The top of the gravel was found at a level of 14.57m OD at the northern end of the site and 14.42m OD at the southern end.

6.1.2 The terrace gravel was overlain by a deposit of mid brownish yellow clayey silt, termed context [54]. It presumably represents a deposit of Langley silt, henceforth termed "brickearth". The top of the deposit was found at a level of 15.07m OD in the northern end of the site and 14.74m OD in the southern end. It was not observed in Trench 3, presumably because it had been truncated by later intrusions in the form of two culverts and the original edge of the lower pond.

6.2 SUB-PHASE 2a: THE EARLY 18TH CENTURY

6.2.1 The cascade had been partially demolished and rebuilt on at least eight occasions from the 18th century to the 20th century. The earliest phase had therefore been altered severely. Remnants of the earliest masonry formed a central core within the later rebuilds, collectively termed structure [100] in Trench 1 and [101] in Trench 2. The back had seemingly been modified to a lesser extent than the front of the wing walls, whilst the central cascade appeared to have been completely rebuilt or encased in later masonry. The earliest phase of the structure had subsided in places and been badly bioturbated by large roots associated with trees formerly found on top of the feature. As a consequence, the surviving structure had developed several substantial cracks, bows and contortions.

6.2.2 The earliest phase was identified through an assessment of the stratigraphy encountered and the bricks and mortar used. The mortar played a key part in identifying these remnants. Dates obtained from brick samples, when taken in isolation, were misleading, as the majority of the bricks used in later 18th to 19th century rebuilds had been re-used from demolished portions of the original structure.

6.2.3 All elements of the earliest phase had been built with red fabric, stock moulded bricks of fabric type 3032, 3033 and 3032/3033 held together with friable light brown mortar with coarser inclusions of chalk and calcite. This mortar type is typically found in early 18th century structures. The use of brick fabric type 3032/3033 provides a tight date range, as it was produced between 1664 and 1725. This fits well with the proposed 1709 to 1715 construction date suggested by historical records. The bricks were held in place with a friable light brown mortar, which contained coarser inclusions of chalk and calcite. The mortar was termed Type 1 for the purposes of this report.

6.2.4 The cascade and wing walls had been built within a rectangular construction cut, context [59] / [130], which could be seen to the rear. It was between 2.5m and 1.8m wide, being slightly irregularly shaped along its western edge, and was over 1.80m

deep. It had been backfilled with a deposit of compact brownish yellow clay, context [58] / [131], the top of which was observed at a level of 14.74m OD to the south and 14.41m OD to the north.

6.2.5 The Northern Wing Wall: Structure [101]

- 6.2.5.1 The original core of the northern wing wall was unearthed in Trench 2 and assigned context [4] / [114] / [117]. It will henceforth be termed structure [101]. The excavation revealed that the wall extended at least 18.17m in a north-south direction from the bottom cascade step. It was therefore substantially longer than the earlier study undertaken by CKC archaeology suggested (Currie, 2004). The northern end appeared to have been truncated by a shallow sub-circular robber cut, context [46], which may once have contained a drain. The wing wall probably did not extend much further, however, due to the shallow nature of the foundations at this point, suggesting an insubstantial above-ground structure. The top of the masonry was found to be at a height of 15.76m OD at the southern end and 14.74m OD at the northern end.
- 6.2.5.2 The foundation design of the structure was observed during the watching brief. It consisted of two walls running parallel with one another, 12.18m in length, covered by a quarter barrel vault, termed context [37] (Figures 3 & 4). The eastern wall, which formed the structure's façade, was taller than the western wall, the top being at a height of 15.76m OD, whilst the top of the lower wall was present at a level of 14.88m OD.
- 6.2.5.3 The eastern side extended downwards for over 30 courses, the lowest being covered by later render. It was found to be over 2.87m deep in the location of the pool, at which point it became masked by a contemporary brick surface, described subsequently. The foundations appeared unchanged, until they reached the northern side of the proposed grotto location, at which point they became less substantial. They appeared to rise up from a depth lower than 12.89m OD to a height of 14.74m OD at the northern end, where they were a mere two courses deep (Figure 5). The foundations therefore appear to respect the slope of the escarpment shown in contemporary depictions of the structure.
- 6.2.5.4 The full vertical extent of the western side of the wall was not established during the work, although it exceeded 2m.
- 6.2.5.5 The quarter barrel vault appeared to have been reconstructed with later mortar and is therefore discussed in more detail during the next phase. A central void is presumed to be present below the vault, mirroring the layout observed during the partial demolition of the southern wing wall. The top of the vault was observed at a height of 14.96m OD.
- 6.2.5.6 The foundation design on the western side of the northern wing wall changes to the immediate north of the proposed grotto location. The quarter barrel vault stops at this point, although the void continues to the north, as demonstrated by a section through the structure, created by a modern pipe. One function of the quarter barrel may have been to add extra strength to the grotto and the main façade of the dam retaining wall. Depictions of the structure suggest that, north of the grotto position, the wing wall was purely ornamental and did not support a load as it was free standing. Consequently, it would have required less substantial below ground foundations.
- 6.2.5.7 Four buttresses were also identified, keyed into the western face of the structure (Figure 3). They had all been truncated horizontally, the top of the best preserved example being at a level of 14.55m OD. The buttresses were not evenly spaced, apparently having been arranged with respect to the grotto position and the stoop basin. One was located in the centre of the proposed grotto location, on the opposite side of the wing wall, one is offset to the south of the grotto and the other two are

situated in the vicinity of the stoop basin. They were probably arranged in this way in order to provide extra strength to the portions of the wing wall that supported the greatest load.

6.2.6 The Southern Wing Wall: Structure [100]

- 6.2.6.1 The original core of the southern wing wall was revealed in Trench 1 and assigned context numbers [36] / [44] / [93], henceforth termed structure [100] (Figures 3 & 4). Work undertaken by CKC archaeology stated that the surviving above-ground portion of the southern wing wall totalled 11.40m. Below ground investigations, undertaken as part of this study, demonstrated that it originally extended a further 4m or more to the south, before being fully truncated by later intrusions, discussed subsequently. The surviving portion therefore totalled 15.40m north-south, from the southern end to the first cascade step, although it presumably once extended further south. The top of the surviving masonry core was found to be at a maximum height of 15.26m OD at the northern end and 14.26m OD at the southern end.
- 6.2.6.2 The foundation design was similar to that observed on the northern wing wall. The eastern face also extended downwards to a depth of 2.87m or more in the location of the lower pool, before being abutted by the brick surface. They mirrored the northern wall, rising up from a depth lower than 12.89m OD to a height of 13.98m OD at the northern end, where they were truncated by a later intrusion (Figure 5).
- 6.2.6.3 Four buttresses were present below ground level on the western side, distributed in a roughly symmetrical way to those observed in the northern trench (Figure 4 & Figure 7). The foundations were formed by two walls, separated by a 0.40m wide void, braced together by the buttresses which ran through the void.
- 6.2.6.4 The exact function of the voids is uncertain at present, although it was clearly purposefully constructed and was not the result of subsidence or bioturbation. Presumably, it played a role in water management, perhaps serving to take away some of the pressure created by the water in the upper pond. The void's depth exceeded 0.77m, although its full vertical extent remains unknown as the remaining portion was blocked with tree roots that could not be removed without demolishing the structure further.
- 6.2.6.5 The void was covered by a quarter barrel vault, context [10] / [11] / [15] / [16] (Figure 7). Unlike its counterpart to the north, the vault was bonded together with mortar indicative of an early 18th century date, suggesting it formed part of the structure's earliest phase, although parts of it appeared to have been re-pointed or rebuilt during the mid to late 19th century. It was slightly shorter than the northern vault, being 10.52m in length. The top was found to be at a maximum height of 15.15m OD and the top of the underlying void at a level of 14.69m OD. It probably had a similar function to the northern quarter barrel vault, providing support for the load bearing section of the southern wing wall.
- 6.2.6.6 The foundation design of the southern wing wall also changed at the approximate position of the proposed southern grotto. At this point, the quarter barrel vault terminated and a rectangular buttress, termed context [38], began. The buttress effectively formed part of the earliest phase of structure 100, as it was bonded into context [4] / [114] / [117], indicating they had been constructed at the same time, during the same phase of building. The buttress was 2.55m long, 0.87m wide and over 0.61m deep. It was orientated north-south, the top being at a height of 14.79m OD. The buttress probably supported the grotto which, providing the above ground wing walls were mirror images of one another, would have been located in front of it. Why the foundation design of the northern and southern walls behind the grottos differs is open to question, as both appear to be composed of identical early 18th century bricks and mortar and appear stratigraphically in phase with one another. It

may be that the asymmetrical nature of the foundations did not concern the creators of the cascade as they were not visible.

- 6.2.6.7 The nature of the foundations changed once again to the south of the buttress, forming a crinkle-crankle type wall, the western side of which had been severely damaged by later intrusions (Figure 3 & Figure 6). It is thought that this structure forms the foundations of the southern ornamental arm of the wing-wall. As was the case with the corresponding section of the northern wing wall, it may be less substantial as it was not load bearing.

6.2.7 The Grotto Positions

- 6.2.7.1 The location of the northern grotto was identified on the east facing side of the northern wing wall, in Trench 2. Its southern edge was deemed to be 13.41m away from the centre of the cascade steps, a distance of exactly 44 feet.

- 6.2.7.2 The grotto was composed of two imposts, termed contexts [75] and [117], butting the earliest phase of the southern wing wall. They also appear to have been identified by CKC Archaeology, although the excavation did not reveal whether the buttress was keyed into the original structure or not (Currie, 2004). The results of the work undertaken by Pre-Construct Archaeology Ltd determined that both imposts butted the main wall of the cascade and were not keyed in. They were therefore both stratigraphically later than the main wing wall, although the mortar used in their construction suggests they were contemporary with it. The grotto was probably not substantial in size, as a large, free-standing structure would have been prone to collapse. Both plinths had been truncated horizontally, the top of the northern impost, context [117], being at a height of 13.90m OD and the top of its southern equivalent, context [8] / [75], being at a level of 14.94m OD (Section 15/3, Figure 5). Whilst the northern impost appeared to be in a better state of preservation, analysis of the mortar used in its creation suggested it had been built in two phases. The original early 18th century phase, termed context [75], appeared to have been truncated at some point before being rebuilt in the mid to late 19th century, when context [8] was added. The top of the earliest phase therefore survived to a height of 14.17m OD.

- 6.2.7.3 The two plinths protruded 0.52m eastwards to form an alcove, the interior width of which was 2.08m. The two were slightly different sizes, the northern being 0.8m wide whilst the southern was 1.5m wide at floor level. Neither appeared to have been truncated. The reasoning behind this asymmetrical layout remains uncertain. One possibility is that there was no need to make them identical as they may have been clad in a thick, decorative layer of roughly hewn rock and coral that would have masked the underlying shape and nature of the brickwork. This hypothesis is supported by the fact that the masonry used to construct them had been bonded in an irregular, untidy fashion and was therefore unlikely to have been visible.

- 6.2.7.4 Most of the structural evidence associated with the east facing façade of the southern grotto has been lost due to later modifications and truncations. However, it is possible that a plinth associated with the structure survives, in the form of context [42] (Figure 5). This consisted of a poorly coursed conglomeration of red fabric brick and flint blocks, abutting the wing wall to the west. It was held together with mortar identical to that used in the rest of the early 18th century masonry. The plinth was 0.69m wide, protruding 0.70m to the east. It had been horizontally truncated, the top of the surviving portion being at a level of 13.98m OD. The only problem with this hypothesis is that, if the plinth represents the southern impost of the southern grotto, it is situated approximately 1m closer to the centre of the cascade than its counterpart on the northern wing wall. It is not thought to represent the northern impost of the southern grotto, as its northern edge would then be approximately 2.5m further away from the centre of the cascade than its equivalent to the north.

Such a degree of asymmetry is deemed unlikely as all contemporary depictions of the structure suggest it appeared symmetrical. Consequently, it is possible that the plinth may represent either an internal support in the centre of the grotto or the southern impost. The latter interpretation seems more probable, despite the fact this would create an asymmetrical structure, as an internal support of this size would have blocked the internal section of the alcove in its virtual entirety. A more symmetrical appearance may therefore have been achieved through the use of a thick skin of decorative rubble, now removed. The removal of any other structural evidence once connected with the grotto has made interpretation of this context difficult and as a consequence this hypothesis remains unproven.

6.2.8 The Northern and Southern Stoop Basin Positions

- 6.2.8.1 The northern and southern stoop basins were virtually equidistant from the centre of the cascade steps, the centre of the northern stoop being 9.18m away whilst the centre of the southern stoop was 9.17m from the same point (Figures 3 & 4). The upper portion of the northern stoop basin had been removed and rebuilt at a later date, whilst the southern stoop had not been modified (Figure 5).
- 6.2.8.2 The original masonry found at the base of the northern stoop was assigned structure number [132], whilst the upper, later phase was assigned context [14]. The southern stoop was allocated one number, context [75], as it had not been rebuilt.
- 6.2.8.3 The earliest phase of the northern stoop basin, context [132], consisted of one large block of Bath stone capped by two smaller, roughly rectangular blocks of Portland stone, which intruded 1.02m into the body of the cascade and were 0.90m wide (Figure 5). The lowest block was over 0.14m deep, the base being masked by later render and stone cladding. Two smaller, roughly square blocks of Portland Stone were present above, sealed by a second large block of Portland stone. The upper southern corner had been truncated and the back of the stone hacked off, presumably when the stoop basin was modified in the mid to late 19th century. A large void, 0.28m wide and 0.14m deep, was present above the centre of the stone block, the top of the void being at a height of 14.68m OD. Evidence obtained from the better preserved southern stoop basin suggests a lead pipe may once have been present, which was probably removed when the stoop basin was modified in the mid to late 19th century.
- 6.2.8.4 The lower half of the southern stoop basin was a mirror image of its northern equivalent, although it was in a better state of preservation (Figure 5). Render had been removed from the base of the structure, exposing the full extent of the lowest block of bath stone, which was found to be 0.45m thick. A further course, composed of one small, square block and a longer rectangular block formed its base. The upper half of the stoop basin did not appear modified and is therefore thought to be original. It consisted of a large block of Portland stone, with a rectangular hole cut into the top at a level of 14.46m OD. This formed an opening through which water flowed, as a lead pipe was found immediately behind it (Figure 5 & Figure 6). The pipe protruded through the wall into the upper pond and would therefore have been capable of channelling water into the ornamental basin. The pipe and opening presumably correspond to the void observed in the broken Portland stone found at the top of context [132], created during the removal of the northern pipe.
- 6.2.9 The upper half of the southern stoop basin was wider than the base, at 1.82m. It consisted of two large, identically sized blocks of Portland stone with two smaller blocks of Bath stone at either side, which formed the top of the structure at a level of 15.54m OD. The Bath stones sealed two square metal lined grooves, found at a height of 15.21m OD, which could conceivably have been used to secure the stoop basin or to support an ornamental hood.

6.2.10 The Lower Pond, Landscaped Escarpment and Path

- 6.2.10.1 Traces of wooden edging were unearthed in Trench 2, to the north of the site (Figure 4). The edging appears to have been formed by horizontal planks, termed [109], and held in place by driven timber stakes [108] and [110]. A further three isolated timbers, thought to form part of the same structure, were also found, termed [111], [133] and [134]. The planks were laid “edge-on” and were 30mm wide by 100mm deep, whilst the vertically driven stakes had diameters of 150mm. Remnants of the edging ran from the southern edge of the northern grotto position in an east-west direction for a distance of 3.90m, before kinking to the northeast for a further 6m, at which point it was truncated by a modern intrusion. The top of the horizontal edging was found to be at a height of 13.80m OD, whilst the top of the best preserved timber was at a level of 13.87m OD.
- 6.2.10.2 The timbers probably represent the original edge of the lower pond as they roughly mirror the layout shown in 18th century depictions. They lead out of the grotto position, before swinging to the northeast to form the first “leaf” in the pond’s geometric “clover” or “floral” design. The lower pond was therefore presumably retained by the timbers, whilst a small path, approximately the same width as the grotto positions, was present to the north. Evidence for such a path was identified in Trenches 2 and 3 and will be discussed subsequently.
- 6.2.10.3 It has been hypothesised that the original water level in the lower pond was higher than it is today, perhaps having been flush with the bottom step of the cascade. This may be why the step is not always depicted on contemporary illustrations. If this was the case, the water would have been at an approximate level of 13.80m, the same height as the horizontal timbers that form the timber edging. This suggests the water level may have been slightly lower than the estimated 13.80m, as any slight variation in its height would cause the pond to overflow. A “freeboard” of 1 foot was usually given to prevent water from overflowing. Consequently, the top of the water in the pond was likely to have been no lower than 0.30m below the top of the surviving timbers, at a height of 13.50m OD. It should be remembered that the edging may originally have been higher, however, as the timbers are highly degraded. As a consequence, it can be concluded that the probable level of water in the lower pond was no lower than 13.50m OD and probably no higher than 13.80m OD.
- 6.2.10.4 Unlike the upper pond, which may have been lined with decorative flints and clay (Currie, 2003), no trace of a lining was found in the lower pond. This suggests either that the feature has been re-cut at a later date, removing the lining, or that the pond was never lined. The latter is a distinct possibility, as modern ground water alone was sufficient to fill the pond to a level between 13.00m OD and 13.40m OD, depending on rainfall, without assistance from any other source. Consequently, providing ground water levels were similar to those found today, a steady flow of water from the upper pond would probably have been sufficient to keep the pool topped up.
- 6.2.10.5 Vestiges of the landscaped escarpment and path were also found in Trenches 2 and 3 in the form of breaks of slope in the natural gravel. The cut was assigned the number [135] in Trench 2 and [136] in Trench 3 (Figure 4). In Trench 2, the cut extended 9.55m from the former edge of the lower pond, marked by the timber edging. The top at the northern end, was found to be at a level of 14.52m OD, sloping down over a distance of 4.55m to a height of 13.50m OD before levelling off in front of the grotto position. This was loosely mirrored in Trench 3, which produced a profile with very similar dimensions and levels (Figure 8).
- 6.2.10.6 Two distinct layers of crushed cockle shells, contexts [67] and [66], separated by a layer of peat like material, context [65], were found at the base of the cut for the landscaped escarpment in Trench 3, in the approximate position of the path that

once circled the pond. It is possible that the crushed shells may represent the top of the path, as this material was sometimes used as an ornamental surface during the early 18th century (Curry, 2003). If this was the case, the top of the path may once have been found at an approximate level of 13.72m OD, being represented by context [67].

6.2.10.7 It seems likely that the pond overflowed on a number of occasions, hence the formation of the thin peat-like layer observed in Trench 3. This is plausible, as the mechanism that powered the cascade was crude, being purely dependent on the rate of flow of the Longford River. A similar though stratigraphically later flood deposit, context [127], had accumulated in front of the grotto position in Trench 2, suggesting management of water may have been problematic. The second layer of crushed shell identified in Trench 3 may therefore represent an attempt to maintain the path, which may have been damaged or obscured by material deposited during episodes of flooding, hence the presence of peat-like layer [65]. If this was the case, the top of the repaired path would have been at a level of 13.76m OD.

6.2.10.8 A brick pavement, context [124], was unearthed within the lower pond. Wooden edging, similar in nature to the trim that once edged the lower pond, formed the structure's perimeter (Figure 4). The trim was assigned context [125]. At its lowest point, the top of the pavement was observed at 12.80m OD. After a distance of 6.62m either side of the centre of the cascade steps, it rose up to a maximum level of 13.10m OD. Whilst the central portion of the brick pavement was in good condition, it had been badly damaged to the north and south, where the masonry component had been destroyed. Remnants of the wooden edging did survive to the north, however, enabling its original size and shape to be estimated. Providing it was symmetrical, the structure would once have been approximately 27.40m long and 2.60m wide, being positioned between the grotto positions.

6.2.10.9 The function of the structure remains uncertain. Whilst it may have been ornamental, it seems unlikely that this would have been the primary reason for constructing it as the bulk of the pavement would have been between 0.70m and 1.00m below the water line, providing estimates of the original water level are approximately correct. As a consequence, it would not have been easy to observe the masonry, positioned directly below the turbulent water that flowed over the cascade and out of the stoop basins. It is possible that the structure may have had a more practical use, perhaps as a platform for maintaining the façade of the cascade, providing hard standing within the lower pond. It may also have helped prevent erosion by water that would have pounded the natural gravel base of the pond as it poured over the cascade steps.

6.2.10.10 An early 18th century drain, context [6], was observed at the base of a 2.92m long sondage in Trench 2, sloping from a height of 14.05m OD at the northern end to 13.50m OD at the southern end. The feature was constructed from over two courses of stretcher bonded bricks, which formed the sides, capped by a third course of header bonded bricks that formed its top and was 0.25m wide. It was situated to the immediate east of the northern wing wall and ran parallel with it. The drain had been built within a slightly wider construction cut, context [48], which had been backfilled within a dark grey deposit of silty sand, context [50]. The drain presumably transported ground water from the surrounding area into the lower pond.

6.3 PHASE 3: THE LATE 18th TO EARLY 19th CENTURY

6.3.1 It has been suggested that the cascade and water gardens fell into a state of disrepair in the late 18th to early 19th century. Whilst this may be the case, it does seem as though a series of running repairs were made to the structure to prevent its total collapse. It therefore presumably continued to have a decorative function,

although it seems as though a more rugged, naturalistic appearance was preferred, hence its preservation as a ruin. Such an interpretation is corroborated by the painting dating from 1780 by James Spyers, which suggests the southern cascade wing wall had been truncated up to the grotto position and the landscaped escarpment partially in-filled. Archaeological evidence unearthed during the excavation suggests Spyers' painting may have been a reasonable likeness of the structure at this time.

- 6.3.2 A large culvert, context [49], was observed in Trench 3, within construction cut [63] (Figure 4). Its backfill and construction cut were also observed in Trench 1, where they were termed contexts [56] and [57]. The structure was 1.20m wide and was orientated northeast-southwest, presumably connecting the lower pond with the Longford River. It probably once provided a means of returning water to the river after it had flowed over the cascade and into the lower pond. The culvert was constructed from bricks and Type 1 mortar indicative of an 18th century date which, when taken in isolation, suggested it may have been contemporary with the original phase of the cascade. This was deemed impossible, however, as the culvert was stratigraphically later. Its construction cut truncated the landscaped escarpment that once circumnavigated the earliest phase of the lower pond as well as the southern wing wall, just after the approximate position of the grotto. The top of the culvert, present at a level of 13.96m OD, would also have been unsightly, as it would have stood proud of the hypothesised original water line. It therefore seems that the culvert was built at a later date to facilitate the return of water to the Longford River. It may have been constructed as a response to the fact that the original pond may have been prone to overflowing.
- 6.3.3 The culvert appears to have been constructed before the landscaped escarpment was partially in-filled with dumped deposits [22], [23], [24], [74], [69], [71], [70] and [73] (Figure 8). These two episodes were probably not separated by a vast amount of time as the top of the culvert would otherwise have been visible.
- 6.3.4 A series of repairs appear to have been made to the cascade wing walls during the late 18th to early 19th century. The repairs were identified by the characteristic nature of the mortar used in their construction, termed Type 3 in this report, which was relatively hard and contained frequent angular inclusions of calcite. Brick fabrics could not be used to identify the rebuilds, as they were composed of reused early 18th century bricks from demolished portions of the original structure.
- 6.3.5 The most dramatic modification to the southern wing wall during the late 18th to early 19th century involved the reconstruction of the quarter barrel vault, context [37] (Figure 5). As its counterpart to the north was constructed with earlier mortar, it was initially assumed that the southern vault had been re-pointed during a later period. This was disproved during its demolition, as late 18th to early 19th century mortar was found under and between the bricks used in its construction along its entire length. It may have been reconstructed with harder mortar as the friable nature of the original may not have provided adequate support.
- 6.3.6 The upper half of the main body of the southern cascade wing wall, immediately behind the proposed grotto position, was also replaced with context [43]. A niche, termed context [60], was chiselled into the east-facing side of the rebuild, which may have formed an internal feature within the grotto (Figure 5). The niche was 0.36m wide, 0.34m deep and 0.38m high. It had a flat base, at a level of 14.59m OD.

- 6.3.7 A late 18th to early 19th century buttress, context [1], butted the western side of the southern wing wall, in the approximate position of the southern grotto (Figure 3). The dimensions of the structure were 0.70m north-south by 0.65m east-west with a depth of 0.65m, the top being at a height of 15.70m OD. The buttress was presumably constructed to add extra support to the section of wing wall that supported the grotto. It is possible that this may have been required as the wall may have been destabilised during its truncation by the large culvert.
- 6.3.8 A layer of plaster, 80mm thick, was found directly above the buttress and wing wall [44], termed context [40]. This was capped by a thin layer of silt, context [61], upon which a layer of rock coral, context [3], had been mortared into position with late 18th to early 19th century mortar (Figure 7). It is possible that the coral formed part of the cladding that once covered the entire structure. The cladding may have been partially removed in order to repair the cascade, before being cemented back into place.
- 6.3.9 Identical mortar was used to re-point the southern wing wall, termed context [92] / [87] on the eastern side and [41] on the western side. Rectangular buttress [39], on the western side of the southern wing wall, also appears to have been rendered with the same mortar, termed context [39].
- 6.3.10 The top of the southern wing wall also appears to have been rebuilt along its entire length with contexts [53] / [88] / [89] / [90] (Figures 3 & 4). The rebuild was between one and eleven courses deep, the top of the repair being between 15.81m OD and 14.81m OD.
- 6.3.11 Similar repairs were also found on the northern wing wall, the top of which had been partially rebuilt with context [9] / [112] and re-pointed in places with [31] / [99] (Figures 3, 4 & 7). The repairs were between one and seventeen courses deep, the top of the rebuilds being between 15.91m OD and 15.61m OD. Damage to the grotto position must have occurred during this building work, as context [9] was found immediately behind the upper half of the structure (Figures 5 & 7). Whether the grottos themselves were also modified is uncertain, as any evidence relating to such changes may have been removed by later work undertaken during the mid to late 19th century.
- 6.3.12 The presence of these repairs suggests the structure was maintained during the late 18th to early 19th century. Whilst the cascade may have superficially resembled a ruin, this may have been a deliberate attempt to create a relatively informal, rustic appearance. This may also be why the geometric design of the lower pond was lost and the landscaped escarpment in-filled. A water garden of this nature would have been more in keeping with “naturalistic” late 18th to early 19th century trends.

6.4 PHASE 4: MID TO LATE 19th CENTURY (1850 to 1899)

- 6.4.1 A series of repairs were undertaken during the mid to late 19th century, identified by mortar and brick fabric types. The stratigraphy encountered suggests at least five individual sub-phases of rebuilding occurred during this period, termed phases 4a to 4e, composed from four different mortars, termed Types 3, 8, 6 and 4. The stratigraphy encountered suggests Sub-Phase 4a was constructed first. This was sealed by masonry forming Sub-Phases 4c and 4d, although the chronological relationship between the latter two remains unproven. Masonry forming sub-phase

4c was in turn sealed by 4d, whilst 4b was sealed by 4e. The chronological relationship between sub-phases 4d and 4e are also unproven.

6.4.2 Sub-Phase 4a: Rebuilds with Type 3 Mortar

6.4.2.1 The four lowest cascade steps were clad or rebuilt with later materials at this time, whilst the upper cascade step had been clad or rebuilt in even later mortar (Figures 3 & 4). The lowest four, termed context [28], had been constructed from yellow and purple fabric stock moulded bricks of late 18th to 19th century date and some reused early 18th century bricks. They had been bonded with a dark yellowish brown indurated mortar with frequent inclusions of fine sand-sized chalk and quartz grains, along with fine fragments of crushed red fabric building material and coal. The mortar was indicative of a 19th century date. As this type of mortar was more commonly used in the later half of the century, it seems as though a mid to late 19th century date is more probable. The top of the highest cascade step was found to be at a height of 15.53m OD, whilst the top of the lowest was at a level of 13.80m OD. The dimensions of the rebuilt or clad cascade steps were as follows:

	Length (N-S)	Width (E-W)	DEPTH
First Cascade Step (highest step- context [25])	4.85m	0.84m	0.32m
Second Cascade Step (context [28])	6.10m	0.64m	0.35m
Third Cascade Step (context [28])	7.14m	0.53m	0.53m
Fourth Cascade Step (context [28])	8.65m	0.76m	0.48m
Fifth Cascade Step (lowest step- context [28])	10.21m	0.78m	0.86m

6.4.2.2 A layer of Type 3 mortar survived in patches on the second cascade step, termed context [30]. This suggests the cascade may have been rendered in the mid to late 19th century.

6.4.2.3 The northern end of the southern wing wall was partially rebuilt with identical mortar. The rebuild, context [52], was constructed from reused early 18th century bricks, intermingled with later machine-pressed yellow and purple fabric frogged bricks. The top of the rebuild was at a height of 15.81m OD. It was 0.56m wide and was roughly "L" shaped, being over 1.20m north-south by 1.22m east-west. The northern side of the rebuild butted the central cascade to the north (Figure 3).

6.4.2.4 The portion of the southern cascade wing wall that had been damaged by the large culvert appears to have been partially rebuilt at this time with six to seven rough courses of re-used bricks, termed context [45]. Very little mortar appears to have been used to cement them in place, which may be why they have been so severely bioturbated (Figure 5).

6.4.2.5 The eastern side of the northern and southern cascade wing walls were extensively rebuilt. The rebuild, termed context [76] / [95] / [96] / [113] / [115], was located between the cascade steps and the grotto positions (Figure 5). It was over 14 courses deep, the lowest being masked by later render. The top of the rebuild was at a level of 15.73m OD.

6.4.2.6 The eastern side of the northern wing wall was supported by a small buttress that had also been constructed during this phase of work. Termed context [121], the buttress was 0.46m north-south by 0.08m east-west, having been truncated to the east at a later date (Figure 5). It was over 0.37m deep, continuing beyond the

vertical limit of excavation, the top being at a height of 14.01m OD. The structure had been added onto the wing wall to the immediate south of the northern grotto. It is possible that the grotto had become unstable and required shoring up. This is supported by evidence from Sub-Phase 4b, which suggests it subsequently partially collapsed or was demolished.

- 6.4.2.7 The upper portion of the northern stoop basin, context [14], appears to have been partially rebuilt with Type 3 mortar (Figure 5). Its visible face was 0.64m long, intruding 1.02m into the body of the cascade, the top being at a level of 15.58m OD (Figure 4). The upper blocks were composed of two small blocks of Bath stone, which sealed a larger block of Portland stone. The structure was extensively discussed in the report by CKC Archaeology, which suggested water once flowed through the groove in the approximate centre of the Portland stone into the stoop basin and that the groove was then in-filled with mortar and tile (Currie, 2004). The results of this study suggest it is more likely that water entered the stoop basin at a lower level, as discussed in section 6.2.8.4. The stone blocks that form the upper half of the northern stoop basin were probably reused, re-cut and replaced during the mid to late 19th century, as indicated by the mortar used to bond them together and the fact that the upper halves of the northern and southern stoop basin supports are asymmetrical. The grooves on the block of Portland stone were therefore presumably filled in at this time as they were no longer needed after its reuse.
- 6.4.2.8 The top of the southern cascade wing wall had also been modified at this time. One layer of "soldier-coursed" bricks, termed context [35], bonded together with Type 3 mortar, ran along the top of the structure's eastern side. The context was 10.90m long, at a level of 15.93m OD. This was roughly mirrored on the northern cascade wing wall in the form of context [13] (Figure 3 & Figure 7).

6.4.3 Sub-Phase 4b: Rebuilds with Type 8 Mortar

- 6.4.3.1 The back wall of the cascade and the uppermost cascade step, termed context [25], had been clad or rebuilt with hard light grey mortar, resembling Portland cement (Figure 5). Whilst the bricks used in its construction had been manufactured during the early 18th century, the presence of Portland cement suggests modification in the latter half of the 19th century, when this material was widely used. The rebuild was between four and seventeen courses deep, the lowest being masked by the cascade steps. The top of the rebuild was found to be at a height of 15.53m OD. It was 9.61m long and a maximum of 0.84m wide in the location of the upper cascade step. The rebuild also encased four blocks of Portland Stone, arranged at the top of the cascade, possibly for decorative effect. The two outer stones were 850mm long and 215mm deep, whilst the two inner stones were 450mm long and 210mm deep. A further two stones were placed either side of the cascade step, 1.02m away from its edge. Their dimensions were 615mm in length and 380mm in depth. It is possible that the stones may have belonged to the structure's earliest 18th century phase, having been reused or encased within later rebuilds.
- 6.4.3.2 The uppermost course of the fourth cascade step's eastern edge had been partially rebuilt with yellow fabric stock bricks, termed context [26]. They were bonded with Portland cement, suggesting the fourth step had been repaired when the back of the cascade was rebuilt.
- 6.4.3.3 Context [104], composed of Type 8 mortar, had been poured down the back of the southern stoop basin (Figure 5, Section 14). It is possible that the weight of the basin may have made the structure subside, causing it to lean out over the lower pond. The mortar may therefore have been deposited in order to block the crack created by the subsidence.

6.4.3.4 In Trench 2, the top of the northern alcove impost, context [8], had been rebuilt with identical Portland cement, suggesting the feature may have partially collapsed or become unstable, necessitating its reconstruction (Sections 15 / 3, Figure 5). This is not surprising, as the original grotto supports were freestanding, not being bonded into the main body of the cascade, and were constructed from weak, friable lime mortar, perhaps causing the grotto to become structurally unsound. The back wall of the grotto had also been partially rebuilt during the late 18th to early 19th century, which may have further destabilised the structure. The fact that the grotto was repaired during the mid to late 19th century suggests it was still valued as a decorative feature at this time.

6.4.3.5 Further evidence in support of this was unearthed in front of the grotto position, in the form of a layer of debris termed context [122] / [105] (Figure 3). It contained frequent inclusions of red fabric bricks and lumps of coral and flint and was interpreted as the demolished or collapsed remains of the northern alcove. The layer does not relate to the structure's final demolition in the 20th century, as it was sealed by a later internal floor surface associated with the rebuilt 19th century grotto.

6.4.4 Sub-Phase 4c: Rebuilds with Type 6 Mortar

6.4.4.1 A layer of render, context [80], covered the upper face of the lowest cascade step. Patches of an identical layer, context [29], were also found on the second cascade step, suggesting they had all once been covered by the render. The deposit was 280mm thick. It was composed of dark brownish green mortar with very coarse inclusions of sand sized particles, a type used throughout the 19th century. It was termed Type 6 for the purposes of this report. As it sealed the lowest cascade step and an earlier layer of render on the second cascade step, it probably dates to the later half of the 19th century, being stratigraphically later than these mid to late 19th century components.

6.4.4.2 Type 6 mortar was also used to rebuild the face of large brick culvert [49], the earliest phase of which had been constructed during the late 18th to early 19th century (Figure 8, Section 13). The rebuild, termed context [81], was 2.44m long and 0.22m wide, being orientated northwest-southeast. It was over 1.10m deep and had been rendered with identical mortar, termed context [85]. This render was observed within the culvert, suggesting the internal faces had also been resurfaced at this time. An internal water-lain clayey silt fill, context [83], had accumulated within the culvert. It butted the internal mid to late 19th century render, suggesting the deposit had accumulated after the internal faces had been re-pointed. Any earlier fill had presumably been cleaned out in order to enable the interior to be rendered.

6.4.4.3 The exterior face of the culvert had been coated in a second layer of slightly darker Type 6 mortar, termed context [84], which sealed earlier render [85] and survived in patches.

6.4.4.4 The northern wing wall had been partially rebuilt with Type 6 mortar in the vicinity of the stoop basin. Termed context [17], the dimensions of the rebuild were 2.98m north-south by 0.46m east-west. Its maximum depth was 1.18m, the top being at a height of 15.85m OD (Section 7, Figure 6).

6.4.5 Sub-Phase 4d: Cladding and Render Composed of Type 3 Mortar

6.4.5.1 The eastern face of the structure had been extensively rendered in Type 3 mortar indicative of a 19th century date. As it sealed masonry associated with Sub-Phases

4b and 4c, both stratigraphically later than the Type 3 structure described previously, it was determined that the render must form a distinct, later sub-phase.

- 6.4.5.2 The eastern face of the northern and southern wing walls and the back wall of the cascade appear to have been rendered with Type 3 mortar [97] / [98]. This probably once covered the eastern face of the structure in its entirety (Sections 15 / 3, Figure 5).
- 6.4.5.3 The render was sealed by an extensive layer of cladding, context [7] / [128], which sealed the lower portion of the structure from a height of 13.94m down (Sections 15 / 3, Figure 5). The context was 27.01m long and 0.80m deep, butting against the cascade steps and the northern and southern wing walls, extending 0.80m to the east. Angular flint cobbles, rock coral, queen scallop shells, upturned abalone shells and 19th century blue glass slag were observed within the cladding, secured in place with Type 3 mortar indicative of a mid to late 19th century date. A series of twelve metal spikes protruded from the context within the confines of the lower pond, arranged symmetrically on either side of the cascade steps, the top of which were observed between heights of 13.35m OD and 13.29m OD (Figure 5, Section 3/15). Most had buckled under the weight of the sediment that had accumulated on top of them.
- 6.4.5.4 It is possible that some of the materials found in the 19th century cladding were re-used from the original early 18th century structure. This is made more probable by the fact that many original early 18th century bricks were reused in later rebuilds. Later material was included, however, illustrated by the presence of the 19th century blue glass slag.
- 6.4.5.5 It is also possible that the metal spikes may represent the “metal leaves” protruding through the surface of the lower pond on the “Ricci” painting. They may have been encased or reset within the later 19th century mortar.
- 6.4.5.6 At some point after the cladding had been created, a 0.11m thick layer of angular chalk cobbles, context [129], was dumped across brick paving [124], butting the cladding to the west. The top of the deposit was found to be at a height of 13.89m OD. It was sealed by a layer of silt, context [126], which accumulated within the lower pond.

6.4.6 Sub-Phase 4e: Rebuilds with Type 4 Mortar

- 6.4.6.1 A layer of dark bluish grey mortar was identified within the northern grotto position, termed context [116] / [118]. This is also thought to have been observed during the work undertaken by CKC Archaeology. It was originally interpreted as part of the original early 18th century grotto, having been plastered on the back of the structure to give the illusion of a dark cave (Currie, 2004). However, expert analysis suggested it was later, being composed of dark grey mortar containing fine inclusions of charcoal and quartz indicative of a mid to late 19th century date. It was also plastered over rebuild [9], constructed during the late 18th to early 19th century and therefore cannot be original (Sections 15 / 3, Figure 5). Although the mortar may have been deposited to give the illusion of a cave, this probably did not occur until the mid to late 19th century.
- 6.4.6.2 A plaster bedding layer, possibly for a robbed-out floor, was identified in the northern grotto position (Sections 15 / 3, Figure 5). Termed context [120], the top of the layer was found to be at a height of 13.91m OD. As it was also composed of Type 4 mortar it cannot have formed part of the original alcove floor and must represent a later modification to the structure.

- 6.4.7 A 0.19m thick deposit of humic rich silty sand, termed context [119], then accumulated within the grotto position on top of the bedding layer (Sections 15 / 3, Figure 5). It probably represents garden soil, suggesting plants may have grown within the alcove at some point during the late 19th century.
- 6.4.8 The garden soil was then sealed by a limestone slab, context [106], butted by a row of Dutch paving bricks (Figure 3 & Sections 15 / 3, Figure 5). The slab was 0.60m north-south by 0.50m east-west and was 0.05m thick, the top being at a height of 14.12m OD. It was presumably deposited in order to replace the floor within the alcove. The slab appears to represent the final modification to the grotto before its demolition in the 20th century. Whilst Dutch paving bricks were not manufactured after 1800, the stratigraphy encountered suggests the surface was built in the later half of the 19th century. The bricks were therefore probably reused.
- 6.4.9 A surface composed of irregularly sized slabs of Kentish Ragstone and Dutch paving bricks was also identified to the north of the grotto position, termed context [5] (Figure 3). Its dimensions were 2.20m north-south by 2.00m east-west, the top being at a level of 14.49m OD. The context appeared to form an external surface butting late 18th to early 19th century rebuild [9]. As it was also composed of Dutch paving bricks, it may be contemporary with internal surface [106].
- 6.4.10 A curvilinear cut was observed to the immediate north of the terminus of the northern wing wall, butting or truncating the very end of the structure (Figure 3). The cut, context [46], was 0.22m wide and 4.20m long as seen, continuing beyond the eastern and western limits of Trench 2. It was 0.20m deep and had been backfilled with a dark greyish brown deposit of silty sand. The feature was interpreted as the remains of a robber cut, possibly for a field drain. The fill did not contain dating evidence and as a result its true age remains enigmatic. It presumably post-dates the construction of the earliest phase of the cascade, which it appears to truncate.

6.5 Phase 5: 20th Century

- 6.5.1 The eastern faces of the northern and southern wing walls were partially faced with yellow, machine pressed stock bricks bonded with Portland cement, termed [33] on the southern wing wall and [18] / [12] on the northern wall (Figure 3). A gravelly concrete was then poured between the new façades and the earlier walls, termed [36] on the southern wall and [32] on the northern wall. Whilst this may have occurred during the late 19th century, a 20th century date is more probable given the nature of the concrete core. The southern façade was supported by a concrete base, context [103], which was 0.15m thick, the top being at 14.21m OD (Figure 4, Section 6). The façade was discussed at length in the report by CKC Archaeology, and as a result will not be further elaborated upon here.
- 6.5.2 The creation of the stock brick façades was probably the agent behind the southern grotto's final demolition, as the rebuild was located behind the hypothesised position of the feature. It also seems likely that the northern grotto was destroyed at a similar time. This may be represented archaeologically by demolition layer [126], which contained frequent inclusions of early 18th century red fabric bricks, flint cobbles, rock coral and 19th century blue glass slag, also observed *in situ* within cladding [7] / [128]. A fragment of red boarder ware, produced between the late 15th century and 1900, was also found, which may have been redeposited. It is therefore possible that the flint, rock coral and blue glass slag originally clad the grotto.

6.5.3 The entire circumferences of the upper and lower pools were edged in concrete, termed context [82]. The trim was probably put in place during the mid 20th century, when the site was owned by the Admiralty.

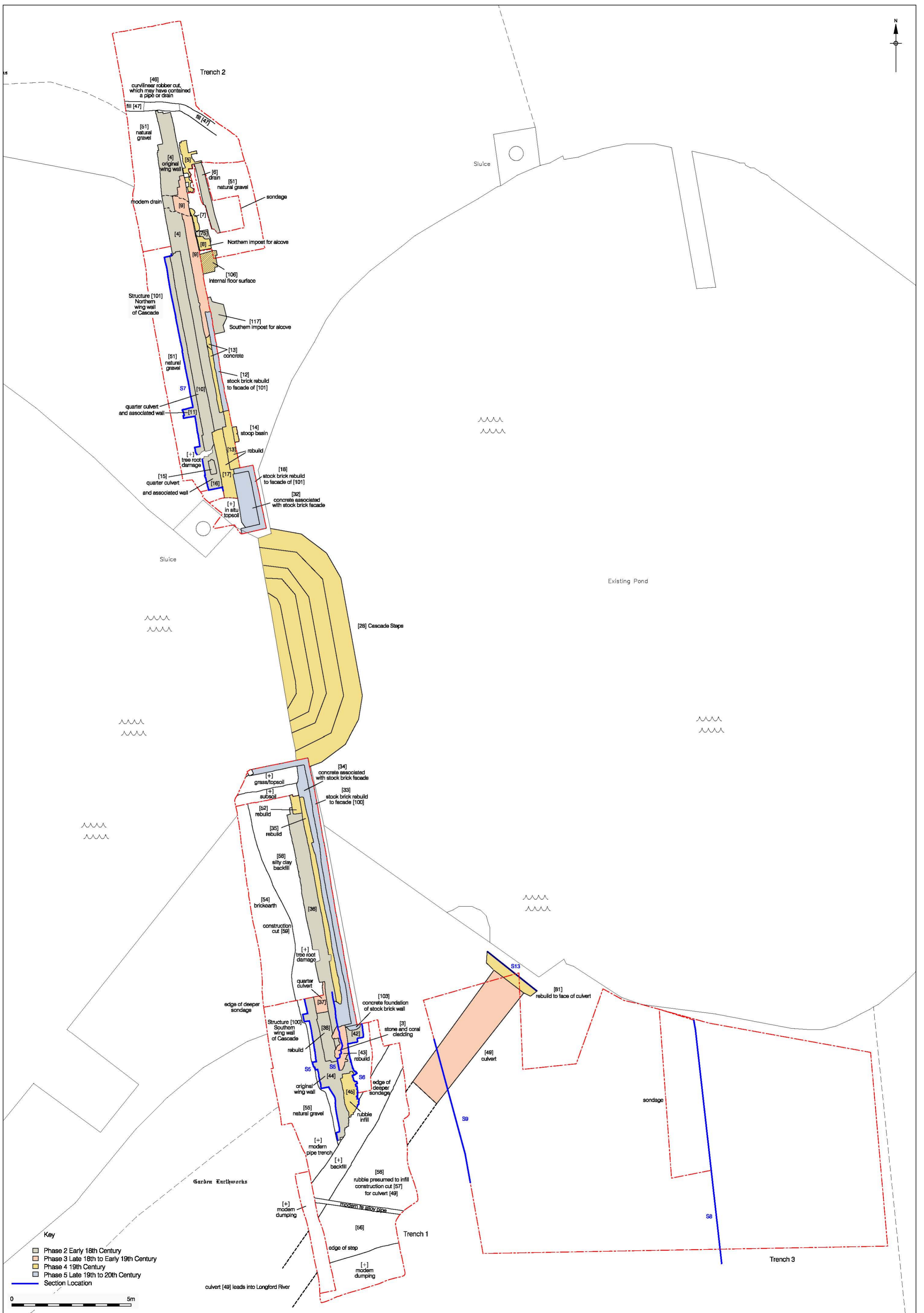


Figure 3
Multi-Context Pre-Excavation Plan of Cascade
1:100 at A2

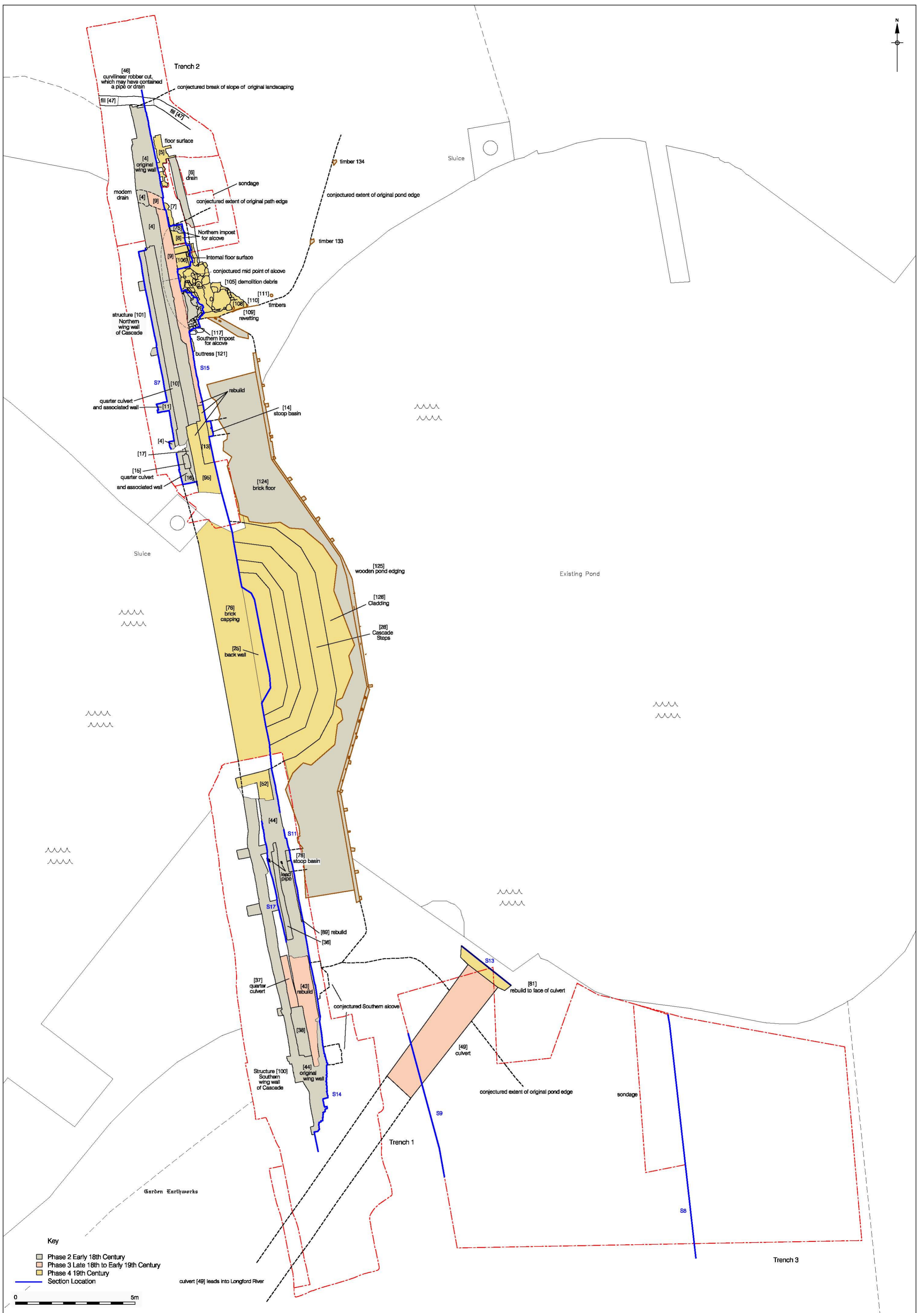
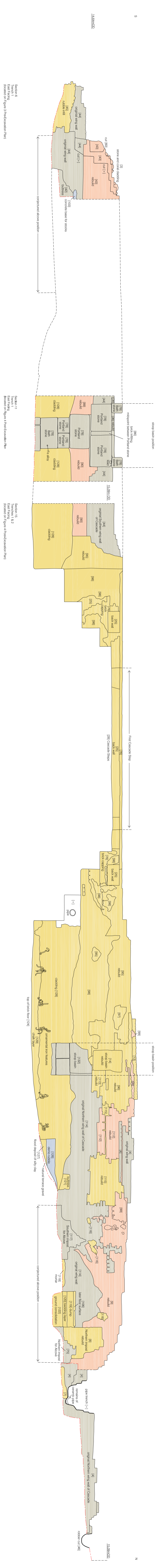


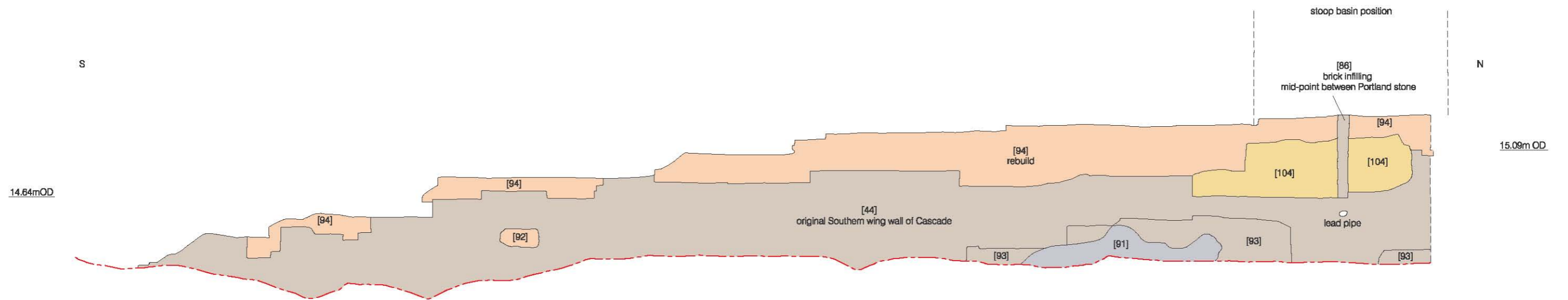
Figure 4
Multi-Context Post-Excavation Plan of Cascade
1:100 at A2



Key

- Rooms 18th to 19th Century
- Rooms 19th to 20th Century
- Rooms 20th to 21st Century

Figure 5
Sections 1, 2 & 3
East Wing sections showing North and
South Wing Walls and Cascade Steps
1-10-2020



Section 14
Trench 1
East facing
(located on Figure 4 Post-Excavation Plan)

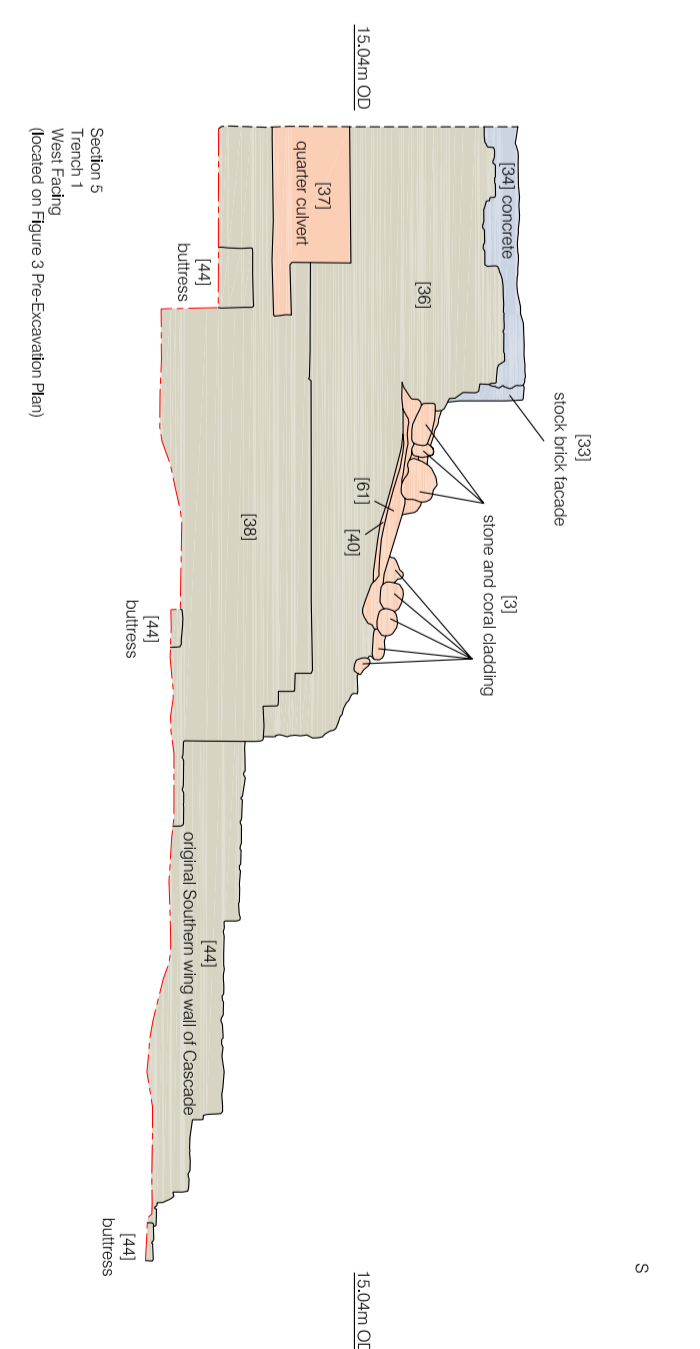
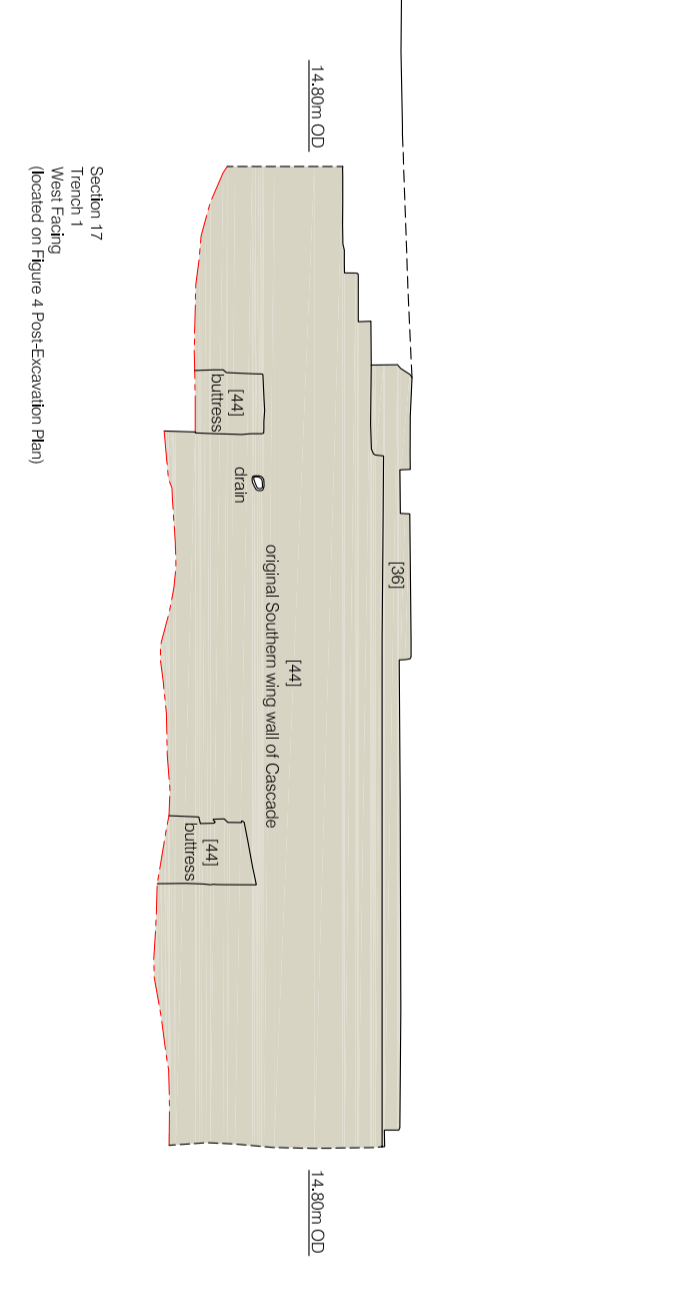
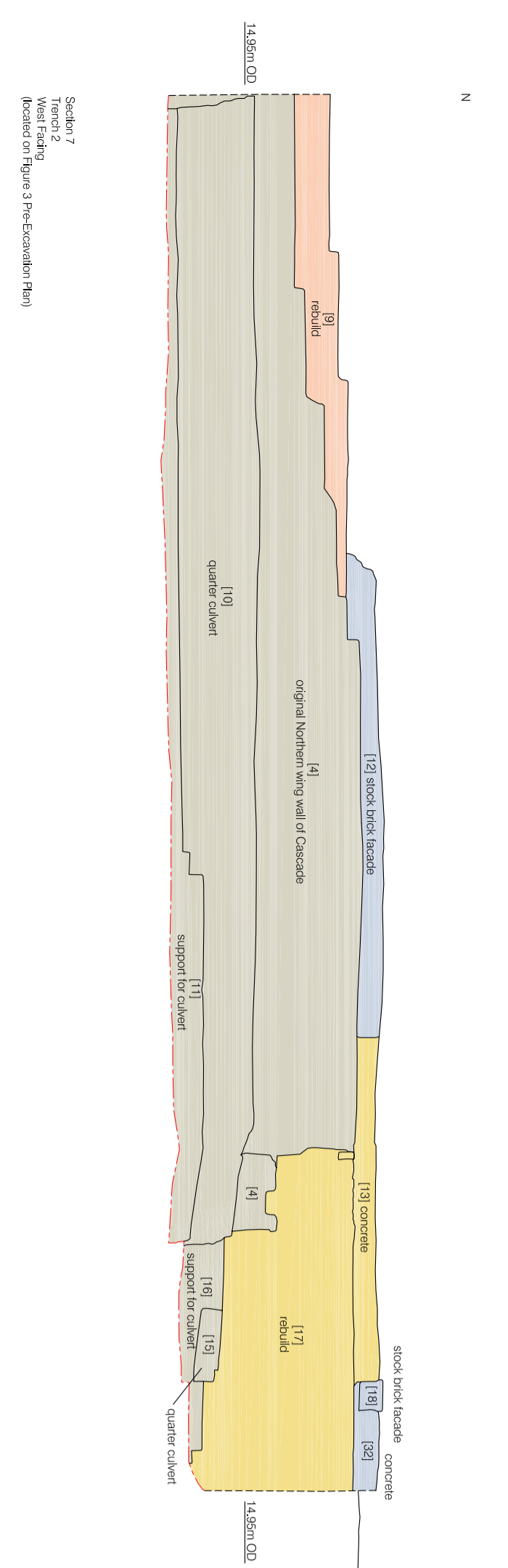
Key

- Phase 2 Early 18th Century
- Phase 3 Late 18th to Early 19th Century
- Phase 4 19th Century
- Phase 5 Late 19th to 20th Century



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Figure 6
Section 14
East facing section showing South Wing Wall
1:40 at A3



Key
 15th Century
 18th Century
 19th Century
 0 2m
 0 2m
 0 2m

Figure 7
 Sections 5, 6 & 7
 West facing sections showing foundation
 design of North and South Wing Walls
 1:40 at A0

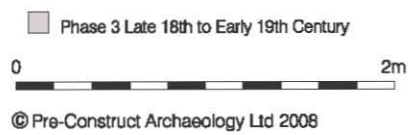
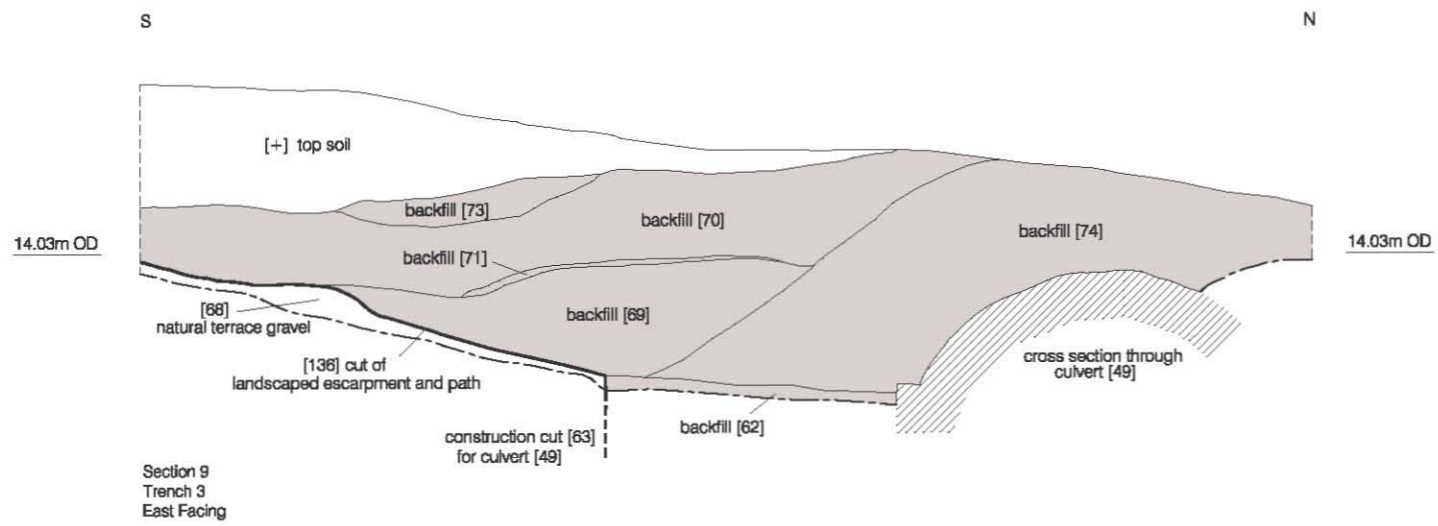
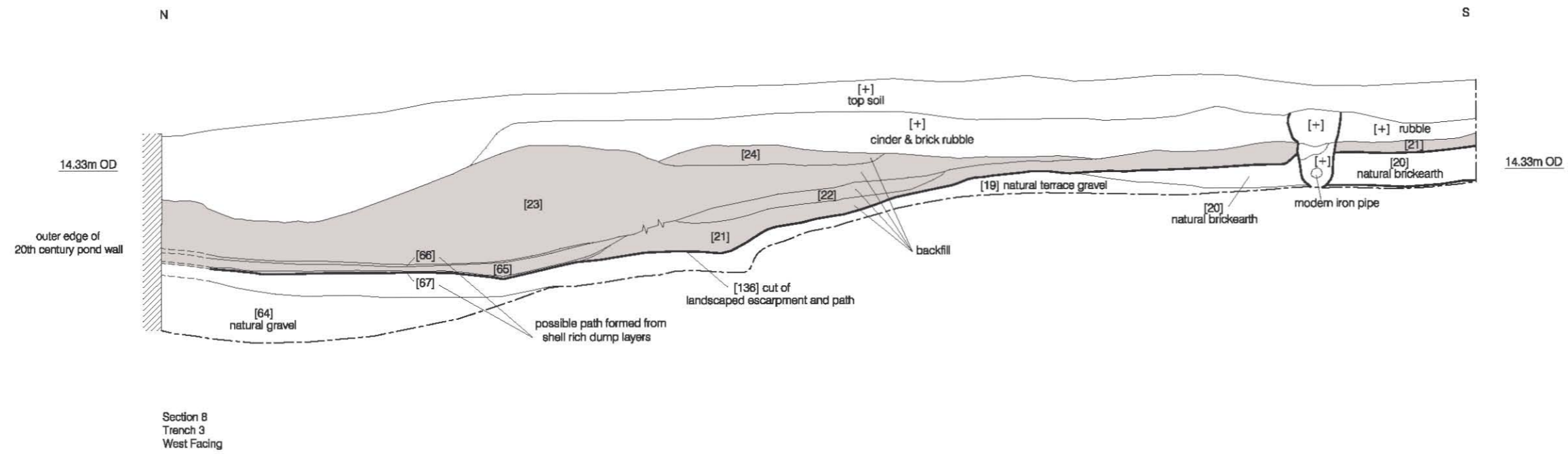
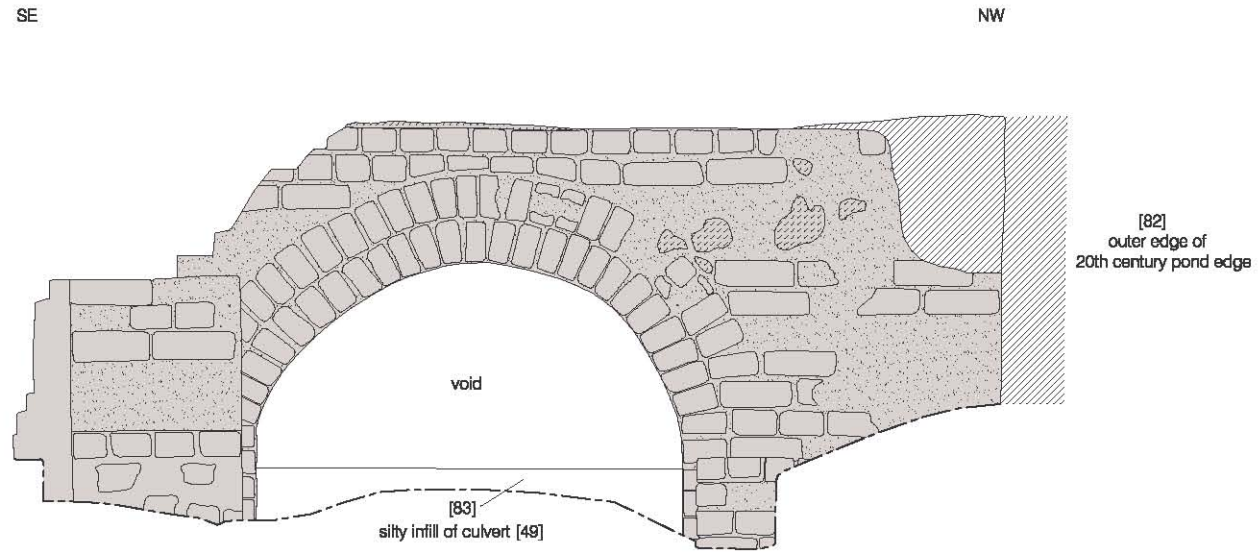


Figure 8
Sections 8 & 9
Showing infilling of landscaped escarpment
1:40 at A3



Section 13
Trench 3
North East facing

- [81] Rebuild to face of culvert [49]
- [85] Earlier Render
- [84] Later Render



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Figure 9
Section 13
Showing entrance to brick culvert [49] from lower pond
1:20 at A4

7 INTERPRETATIONS AND CONCLUSIONS

7.1 The principal objectives of the archaeological excavation and watching brief were to establish the nature of the underlying geology, demonstrate the presence or absence of any archaeology pre-dating the earliest phase of the cascade, to assess the life history of the cascade and lower pool and establish their original forms in order to facilitate their reconstruction. These objectives were achieved in full or in part and the results are summarised below.

7.2 Natural terrace gravel was found to underlie the entire site, sealed by a deposit of brickearth.

7.3 No archaeology pre-dating the early 18th century was found.

7.4 Masonry forming the earliest phase of the cascade was identified. Research questions relating to the structure are addressed below:

7.5 What were the dimensions and form of the original cascade wing walls?

7.5.1 The northern wing wall extended at least 18.17m in a north-south direction from the bottom cascade step. Whilst the northern end appeared to have been truncated, it probably did not extend much further due to the shallow nature of the foundations at this point, which were only two courses deep. It also did not restart at the northern side of the truncation, suggesting it could not have been any longer than 18.49m. The surviving portion of the southern wing wall had been truncated and as a result measured 15.40m from the southern end to the first cascade step. It was presumably originally between 18.17m and 18.49m in length, mirroring the northern wall.

7.5.2 The foundation design of the wing walls changed either side of the proposed grotto positions, becoming shallower towards the periphery of the structure. This suggests the grottos marked the point where the large, load bearing wing walls responsible for holding back the water in the upper pond became the purely ornamental, free-standing, non-load bearing follies depicted at either end on 18th century paintings.

7.6 What were the dimensions and form of the original cascade steps?

7.6.1 The exact dimensions of the original cascade steps remain unknown, as those extant today have either been clad or rebuilt in the mid to late 19th century, removing or masking the original brickwork. It is therefore impossible to gain any evidence concerning the originals without the demolition of their successors. It is likely that the extant steps roughly respect their predecessors in terms of size and height. They will remain *in situ* throughout the restoration work and will be reused in the subsequent cascade design.

7.7 What materials were used to construct the original cascade and wing walls and were they clad in order to achieve a “naturalistic” finish?

7.7.1 The structure was originally constructed from red fabric, stock moulded bricks of fabric type 3032, 3033 and 3032/3033 held together with friable light brown mortar

with coarser inclusions of chalk and calcite. The use of brick fabric type 3032/3033 suggests the structure was built between 1664 and 1725, which fits with the proposed 1709 to 1715 construction date suggested by historical records.

7.7.2 The earliest evidence to suggest the structure was clad dates between the late 18th to early 19th centuries. The cladding consisted of angular cobble to boulder sized flints and lumps of rock coral, cemented in place with mortar indicative of such a date. More extensive evidence of cladding was found at the base of the structure, below modern ground level. This consisted of flint, rock coral, queen scallop shells and abalone shells, upturned so the mother of pearl on the inner shell could be seen. The mortar used to secure the cladding was indicative of a late 19th century date. Blue glass slag of 19th century date was also observed *in situ*, within the cladding.

7.7.3 Whilst no trace of any original cladding was found, it is possible that some materials within the later render were reused. This was certainly the case for the majority of bricks in later rebuilds. Whilst some were more recent, most dated to the early 18th century.

7.8 What was the position, size and floor level of the alcoves?

7.8.1 For the purpose of reconstruction, it is proposed that the northern and southern grottos should be positioned at equal distances from the centre of the cascade as all pictorial representations suggest the above ground structure was symmetrical to the human eye. This distance should be based on the northern grotto, the position of which is clearly demonstrated by the archaeology encountered. The location of the southern grotto is not so obvious or well understood; whilst context [42] was probably associated with it, the function of the plinth is unclear and as a result may provide misleading data. Based on the northern grotto position, the structures should begin 13.41m away from the centre of the cascade steps, a distance of 44 feet.

7.8.2 The nature of the northern alcove suggests that the grottos protruded 0.52m eastwards, forming a structure with an interior width of 2.08m. The two imposts used to support the roof were slightly differently sized, the northern being 0.8m wide and the southern being 1.5m wide at floor level. This unevenness may have been masked by roughly hewn cladding in the form of rock and coral.

7.8.3 The original floor of the alcove did not survive and as a result its height remains unknown. If later 19th century floor surfaces respected the level of the original, it may have been between 13.91m OD and 14.12m OD. The top of the path that lead into the grotto may have been identified in Trench 3. It may therefore have been at a height of 13.72m OD, if the floor and the path were at the same height. Due to a lack of firm evidence, this remains open to speculation.

7.9 What were the positions, sizes, forms and heights of the stoop basins?

7.9.1 It is likely that the stoop basins were approximate mirror images of one another, the centre of the northern stoop being 9.18m away from the centre of the cascade and the centre of the southern stoop being 9.17m from the same point.

- 7.9.2 The better preserved southern stoop basin suggests the stone supports for the features were originally 0.90m wide at the base, widening to 1.82m at the top, with a total depth of 2.65m, the top being at a height of 15.54m OD.
- 7.9.3 Water appears to have entered the basin from the upper pond through a metal pipe, at a height of 14.46m OD. Two square, metal lined grooves, found at a height of 15.21m OD, may have played a part in securing the basins to their stone supports. Alternatively, they may have propped up an ornamental hood.
- 7.9.4 The stoop basin supports were composed from Portland and Bath stone. Whilst these two fabrics may have been deliberately chosen for decorative effect, it should be remembered that they may originally have been masked by stone cladding.

7.10 What was the original water level in the lower pond?

- 7.10.1 The top of the timbers that once formed the edge of the lower pond were found at a level of 13.80m OD. If a “freeboard” of 1 foot is assumed in order to prevent overflow, the top of the water in the pond was likely to have been no lower than 13.50m OD. It should be remembered that the edging may originally have been higher, however, as the timbers are highly degraded. It has been previously hypothesised that the water may have been flush with the lowest cascade step, which may be why it is not shown in some contemporary depictions of the structure. If this was the case, the top of the water may have been at an approximate level of 13.80m OD. It therefore seems likely that the original water line was no lower than 13.50m OD and probably no higher than 13.80m OD.

7.11 What were the dimensions, inclination, height and location of the original lower pond and its associated escarpment and path and can the raw materials used to construct the path, banks and pond be identified?

- 7.11.1 The evidence uncovered suggests the lower pool was once edged with timbers. These timbers ran from the southern edge of the northern grotto position in an east-west direction for a distance of 3.90m, before kinking to the northeast for a further 6m. They presumably once continued, but had subsequently been destroyed by later modern ground works. The orientation of the timbers suggests the lower pool was once shaped in a more geometric fashion. Whilst their trajectory can be used to aid reconstruction of the lower pool, this will be open to a degree of interpretation as it remains unknown as to how far the edging once continued to the northeast, before swinging back to form the “clover” or “floral” shapes shown on contemporary early 18th century illustrations of the feature. As a consequence, the exact shape and size of the original pool remains speculative and open to a degree of interpretation.
- 7.11.2 The cut for the escarpment was identified in Trenches 2 and 3. It extended 9.55m from the former edge of the lower pond, marked by the timber, the top being at an approximate height of 14.52m OD. It sloped down over a distance of 4.55m before levelling off to form a path that once circled the lower pond. The path may have been formed from crushed cockle shells, the top originally being at a height of 13.72m OD. No evidence was found to suggest the escarpment was composed of anything other than a layer of turf, as illustrations of the structure suggest.

- 7.11.3 No trace of a lining within the lower pool was found. It is therefore hypothesised that it may have relied on a combination of a naturally high water table and a steady flow of water from the upper pool. Such a crude method of water management may have caused the pond to overflow during periods of heavy rainfall. Evidence for this was found in the form of water lain deposits of silts and clays around the periphery of the feature.
- 7.11.4 An early 18th century brick pavement was identified within the lower pond, in front of the cascade. The function of the pavement is currently open to speculation, as it would have been submerged. It is possible that it may have been visible as a decorative feature, if the level of the lower pond was lower than the speculated 13.50m OD. It is also possible and slightly more probable that the pavement was predominantly functional. It may have provided a solid platform that could have been used for maintaining the façade of the cascade and wing walls. It may also have prevented the water that once flowed over the cascade steps and out of the stoop basins from eroding the natural gravel found below.

7.12 What was the subsequent life-history of the cascade?

- 7.12.1 The southern cascade wing wall appears to have been partially demolished during the late 18th century, when a large culvert was constructed between the lower pond and the Longford River. The culvert may have been created in order to remedy water management problems involving overspill, caused by the original design. The landscaped escarpment was also partially in-filled at this time, destroying the geometric shape of the lower pond and covering the path. The stratigraphy encountered is corroborated by James Spyers' watercolour, painted in 1780, which depicts the southern wing wall as having been partially truncated and the landscaped escarpment as partially in-filled.
- 7.12.2 A series of rebuilds were made to the cascade wing walls during this period, in order to maintain them. This therefore suggests that, whilst the structure had lost its original formal design, it continued to fulfil a decorative role and was deemed important enough to preserve. Its "ruinous state" may therefore have been the result of a concerted attempt to comply with the less formal, more naturalistic fashions of the late 18th to early 19th century rather than resulting from neglect.
- 7.12.3 The cascade also appears to have been maintained in some form throughout the mid to late 19th century, suggesting it continued to be valued as a garden feature.
- 7.12.4 The final modification occurred during the 20th century, when a stock brick façade was added to east facing side, presumably in order to prevent its collapse. The cascade had been severely bioturbated by tree roots causing the structure to bow, which may have been why the façade was required. This presumably led to the final demolition of the grotto positions.

8 CONTENTS OF THE ARCHIVE

8.1 The contents of the archive are:

8.1.1 The Paper Archive:

	Scale	Number of Drawings	Number of Sheets
Context Sheets	N/A	N/A	136
Other Notes	N/A	N/A	11
Plans	1:20	8	30
Sections	1:10	18	69
Timber Drawings	1:10	3	3

8.1.2 The Photographic Archive:

Black and white print film:	217 exposures
Colour slide film:	288 exposures
Black and white medium format:	30 exposures
Colour medium format:	30 exposures
Digital photographs:	146 exposures

8.1.3 The Finds Archive:

Pottery:	Less than 1 box
Glass:	Less than 1 box
Brick Samples:	31
Mortar Samples:	70
Shell:	Less than 1 box
Timbers:	2
Small Finds:	
Iron:	Less than 1 box

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<http://www.twickenham-museum.org.uk/bpwgtimeline.asp>

The Twickenham Museum: Upper Lodge, Bushy Park
<http://www.twickenham-museum.org.uk/detail.asp?ContentID=363>

Web Gallery of Art: a virtual museum and searchable database of European painting and sculpture
<http://www.wga.hu/>

Appendix 1: Context Index

Context No.	Type	Trench No.	Plan	Section / Elevation	Structure No.	Description	E-W	Dimensions N-S	Depth	Highest Level (m OD)	Lowest Level (m OD)	Sample No.	Date	Phase
1	Masonry	Trench 1	1	1	100	Rectangular masonry structure butting southern cascade wall to east, probably forming a buttress	0.65m	0.70m	0.56m	15.7	15.37	N/A	19th Century	4
2	N/A	N/A	N/A	N/A	N/A	NOT USED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	Masonry	Trench 1	3	N/A	100	Stone and coral cladding partially sealing buttress [1]	0.24m	1.65m	0.25m	15.48	15.15	N/A	Late 18th to Early 19th Century	3
4	Masonry	Trench 2	Trench 2 Pre-Ex	3, 7	101	Brick wall aligned north-south forming part of northern cascade wing wall	13.55m	0.60m	1.00m	15.76m	14.64m	N/A	Early 18th Century	2
5	Masonry	Trench 2	Trench 2 Pre-Ex	N/A	N/A	Kentish Ragstone slabs mixed with Dutch Paving Bricks, forming a probable exterior floor surface to the immediate east of cascade wing wall [101]	0.70m	2.20m	0.11m	14.49	14.25	N/A	19th Century, possibly mid to late	4
6	Masonry	Trench 2	Trench 2 Pre-Ex	N/A	N/A	Drain running parallel with cascade wing wall [101], to immediate east, below floor surface [5]	0.25m	2.92m	0.25m	14.05	13.5	N/A	Early 18th Century	2
7	Masonry	Trench 2	Trench 2 Pre-Ex	N/A	N/A	Kentish Ragstone cobbles butting [101] to west	0.80m	2.15m	0.20m	13.85	13.67	N/A	19th Century	4

8	Masonry	Trench 2	Trench 2 Pre-Ex	3	101	Rectangular masonry structure butting northern cascade wall to west, forming a later rebuild to the northern alcove's northern impost	0.52m	0.78m	0.52m	14.94	14.94	N/A	Mid 19th Century onwards	4
9	Masonry	Trench 2	Trench 2 Pre-Ex	3	101	Later rebuild to main body of northern cascade wall [101]	0.38m	4.42m	0.48m	15.61	14.77	N/A	Late 18th to Early 19th Century	3
10	Masonry	Trench 2	Trench 2 Pre-Ex	7	101	Quarter-culvert-like addition to the eastern face of [101], perhaps functioning as a support	9.10m	0.45m	0.55m	15.15	14.81	N/A	Early 18th Century	2
11	Masonry	Trench 2	Trench 2 Pre-Ex	7	101	Wall associated with support [10]	8.40m	0.22m	0.22m	14.85	14.37	N/A	Early 18th Century	2
12	Masonry	Trench 2	Trench 2 Pre-Ex	3	101	Yellow stock brick façade partially covering eastern face of [101]	4.01m	0.22m	0.53m	15.92	15.92	N/A	Mid / Late 19th to 20th Century	5
13	Masonry	Trench 2	Trench 2 Pre-Ex	3	101	Concrete associated with stock brick façade [101]	2.29m	0.68m	0.17m	15.7	15.7	N/A	19th Century	4
14	Masonry	Trench 2	Trench 2 Pre-Ex	3	101	Stone forming rebuild to stoop basin [101]. Consists of two smaller rectangular blocks of Bath Stone sealing a larger block of Portland Stone. May have functioned as a support for the northern stoop basin	0.18m	0.64m	0.88m	15.58	15.58	N/A	Mid to Late 19th Century	4

15	Masonry	Trench 2	Trench 2 Pre-Ex	7	101	Quarter-culvert-like addition to the eastern face of [101], perhaps functioning as a support. A latter addition or rebuild to the southern end of [10]	0.35m	0.58m	0.38m	14.77	14.44	N/A	Early 18th Century	2
16	Masonry	Trench 2	Trench 2 Pre-Ex	7	101	Wall supporting context [15]	0.50m	1.36m	0.20m	14.64	14.52	N/A	Early 18th Century	2
17	Masonry	Trench 2	Trench 2 Pre-Ex	7	101	Rebuild to main wall of northern cascade wing-wall, context [117]	0.46m	2.98m	1.18m	15.85	15.68	N/A	19th Century	4
18	Masonry	Trench 2	Trench 2 Pre-Ex	N/A	101	Yellow stock brick façade partially covering eastern face of [101]	1.04m	2.68m	2.03m	15.91	15.91	N/A	Mid to Late 19th Century	5
19	Layer	Trench 3	N/A	8	N/A	Natural Terrace Gravel	N/A	10.25m	0.20m	14.33	13.02	N/A	Natural	1
20	Layer	Trench 3	N/A	8	N/A	Natural Brickearth	N/A	3.06m	0.25m	14.5	14.18	N/A	Natural	1
21	Layer	Trench 3	N/A	8	N/A	Dump layer	N/A	5.90m	0.17m	14.51	14.33	N/A	Late 18th to Early 19th Century	3
22	Layer	Trench 3	N/A	8	N/A	Gravelly silt	N/A	6.30m	2.15m	14.33	13.93	N/A	Late 18th to Early 19th Century	3
23	Layer	Trench 3	N/A	8	N/A	Gravelly silt	N/A	7.00m	1.00m	14.53	13.63	N/A	Late 18th to Early 19th Century	3
24	Layer	Trench 3	N/A	8	N/A	Lens of gravel	N/A	1.71m	1.50m	14.53	14.38	N/A	Late 18th to Early 19th Century	3

25	Masonry	Trench 4	N/A	N/A	102	Back wall of cascade and uppermost cascade step	0.42m	9.61m	1.66m	15.53	15.44	N/A	Mid 19th Century onwards	4
26	Masonry	Trench 4	N/A	N/A	102	Yellow stock brick rebuild to cascade	0.14m	0.78m	0.13m	13.8	13.8	N/A	Late 18th to Early 19th Century	4
27	N/A	N/A	N/A	N/A	N/A	NOT USED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
28	Masonry	Trench 4	N/A	N/A	102	Yellow and purple fabric brick rebuild to cascade	1.35m	10.21m	2.33m	15.21	15.21	N/A	19th Century	4
29	Masonry	Trench 4	N/A	N/A	102	Later resurfacing of cascade steps	1.35m	0.96m	0.28m	14.83	14.83	N/A	19th Century	4
30	Masonry	Trench 4	N/A	N/A	102	Earlier resurfacing of cascade steps	2.67m	10.21m	0.01m	14.83	13.58	N/A	19th Century, possibly mid to late	4
31	Masonry	Trench 2	Trench 2 Pre-Ex	N/A	101	Repointing on wall [4]	1.25m	14.00m	1.00m	15.76	14.44	N/A	Late 18th to Early 19th Century	3
32	Masonry	Trench 2	Trench 2 Pre-Ex	7	101	Concrete surface forming part of a later modification to the northern cascade wing wall	0.63m	2.27m	0.14m	15.91	15.91	N/A	Late 19th to 20th Century	5
33	Masonry	Trench 1	Trench 1 Pre-Ex	N/A	100	Stock brick façade to southern wing wall	0.22m	11.36m	1.70m	15.91	15.89	N/A	Late 19th to 20th Century	5
34	Masonry	Trench 1	Trench 1 Pre-Ex	4, 5	100	Poured concrete and rubble core to concrete wall [33]	0.50m	10.90m	0.72m	15.93	15.9	N/A	Late 19th to 20th Century	5

35	Masonry	Trench 1	Trench 1 Pre-Ex	4, 5	100	Rebuild to southern cascade wall	0.23m	8.90m	0.12m	15.92	15.91	N/A	19th Century, possibly mid to late	4
36	Masonry	Trench 1	Trench 1 Pre-Ex	4	100	Part of [44]	0.58m	9.62m	0.78m	15.8	14.5	N/A	Early 18th Century	2
37	Masonry	Trench 1	Trench 1 Pre-Ex	4	100	Quarter-culvert-like addition to the eastern face of [100], perhaps functioning as a support.	0.52m	0.68m	0.27m	14.96	14.96	N/A	Late 18th to Early 19th Century	3
38	Masonry	Trench 1	Trench 1 Pre-Ex	4	100	Rebuild to southern cascade wall	0.87m	2.55m	0.61m	14.79	14.78	N/A	Early 18th Century	2
39	Masonry	Trench 1	Trench 1 Pre-Ex	N/A	100	Mortar surface sealing wall [38]	0.35m	1.71m	0.01m	14.79	14.79	N/A	Late 18th to Early 19th Century	3
40	Masonry	Trench 1	Trench 1 Pre-Ex	4	100	Mortar surface associated with the rebuild to the southern alcove location	0.30m	1.38m	0.08m	15.15	15.15	N/A	Late 18th to Early 19th Century	3
41	Masonry	Trench 1	Trench 1 Pre-Ex	4, 5, 6	100	Repointing on southern cascade wing wall	0.65m	11.00m	1.00m	15.15	14.79	N/A	Late 18th to Early 19th Century	3
42	Masonry	Trench 1	Trench 1 Pre-Ex	N/A	100	Later addition to southern cascade wing wall, possibly as a support for the southern alcove	0.69m	0.70m	0.70m	13.98	13.98	N/A	Early 18th Century	2
43	Masonry	Trench 1	Trench 1 Pre-Ex	5, 6	100	Later addition to southern cascade wing wall	0.45m	0.90m	0.80m	15.11	14.58	N/A	Late 18th to Early 19th Century	3

44	Masonry	Trench 1	Trench 1 Pre-Ex	5, 6	100	"Crinkle-crinkle" style wall, forming part of earliest phase of southern cascade wing wall	0.84m	2.70m	0.52m	15.21	14.12	N/A	Early 18th Century	2
45	Masonry	Trench 1	Trench 1 Pre-Ex	6	100	Loosely coursed infilling / rebuilding of [44] in southern end of southern cascade wing wall	0.55m	1.74m	0.49m	14.21	13.88	N/A	19th Century, possibly mid to late	4
46	Cut	Trench 2	Trench 2 Pre-Ex	3	N/A	Curvilinear ditch, possibly representing a rob cut for a drain	4.20m	0.22m	0.20m	14.57	14.38	N/A	19th Century	4
47	Fill	Trench 2	Trench 2 Pre-Ex	3	N/A	Dumped fill of [46]	4.20m	0.22m	0.20m	14.57	14.57	N/A	19th Century	4
48	Cut	Trench 2	Trench 2 Pre-Ex	N/A	N/A	Construction cut associated with paving [5]	1.38m	1.10m	N/A	14.39	14.39	N/A	Early 18th Century	2
49	Masonry	Trench 3	N/A	9	N/A	Brick culvert that presumably channelled water from the lower pond to the Longford River	2.50m	1.20m	over 1.05m	13.96	13.3	N/A	Late 18th to Early 19th Century	3
50	Masonry	Trench 3	Trench 2 Pre-Ex	N/A	N/A	Fill of [48]; bedding layer for paving [5]	1.38m	1.10m	N/A	14.39	14.39	N/A	Early 18th Century	2
51	Layer	Trench 2	Trench 2 Pre-Ex	N/A	N/A	Natural Terrace Gravel	2.90m	21.00m	N/A	14.57	13.5	N/A	Natural	1
52	Masonry	Trench 1	Trench 1 Pre-Ex	7	100	Masonry rebuild to southern cascade wall	0.36m	0.80m	0.18m	15.81	15.74	N/A	19th Century	4
53	Masonry	Trench 1	Trench 1 Pre-Ex	7	100	Masonry rebuild to southern cascade wall	0.36m	5.08m	0.14m	15.88	15.26	N/A	Late 18th to Early 19th Century	3
54	Layer	Trench 1	Trench 1 Pre-Ex	N/A	N/A	Natural Brickearth	1.5m	16.00m	0.45m	14.74	14.37	N/A	Natural	1

55	Layer	Trench 1	Trench 1 Pre-Ex	N/A	N/A	Natural Terrace Gravel	1.5m	16.00m	over 0.30m	14.42	14.21	N/A	Natural	1
56	Fill	Trench 1	Trench 1 Pre-Ex	N/A	N/A	Dumped backfill of [57]	over 6.00m	over 2.5m	N/A	13.91	13.7	N/A	Late 18th to Early 19th Century	3
57	Cut	Trench 1	Trench 1 Pre-Ex	N/A	N/A	Unexcavated continuation of construction cut [62], which contained masonry culvert [49] in Trench 3	over 6.00m	over 2.5m	N/A	13.91	13.7	N/A	Late 18th to Early 19th Century	3
58	Fill	Trench 1	Trench 1 Pre-Ex	N/A	N/A	Sandy silty clay backfill of construction cut [59]	1.80m	14.80m	N/A	14.74	14.37	N/A	Early 18th Century	2
59	Cut	Trench 1	Trench 1 Pre-Ex	N/A	N/A	Construction cut for southern cascade wing wall, structure [100]	14.80m	1.80m	1.80m	14.74	12.94	N/A	Early 18th Century	2
60	Cut	Trench 1	Trench 1 Pre-Ex	6	N/A	Cut through upper part of southern end of southern cascade wing wall [100], in approximate location of southern alcove, creating a small niche	0.36m	0.34m	0.38m	15.02	14.59	N/A	Late 18th to Early 19th Century	3
61	Layer	Trench 1	Trench 1 Pre-Ex	5	N/A	Layer of silty clay in approximate location of southern alcove, sealing mortar layer [3]	0.20m	1.44m	0.08m	15.3	15.16	N/A	Late 18th to Early 19th Century	3
62	Fill	Trench 3	N/A	9	N/A	Fill of [63], construction cut for brick culvert	over 2.5m	1.30m	N/A	13.36	13.36	N/A	Late 18th to Early 19th Century	3
63	Cut	Trench 3	N/A	9	N/A	Construction cut for brick culvert [49]	over 2.5m	1.30m	N/A	13.36	13.36	N/A	Late 18th to Early 19th Century	3

64	Layer	Trench 3	N/A	8	N/A	Layer of natural gravel, stained dark blue-grey by ground water	N/A	2.86m	0.30m	12.47	12.35	N/A	Natural	1
65	Layer	Trench 3	N/A	8	N/A	Thin reddish brown silty clay layer	N/A	3.42	0.10m	13.83	13.6	N/A	Late 18th to Early 19th Century	3
66	Layer	Trench 3	N/A	8	N/A	Shell-rich dump layer, similar to [67]	N/A	3.04m	0.06m	13.76	13.62	2	Late 18th to Early 19th Century	3
67	Layer	Trench 3	N/A	8	N/A	Shell-rich dump layer, similar to [66]	N/A	3.19m	0.05m	13.72	13.56	1	Late 18th to Early 19th Century	3
68	Layer	Trench 3	N/A	9	N/A	Natural Terrace Gravel	N/A		over 0.15m	13.99	13.39	N/A	Natural	1
69	Layer	Trench 3	N/A	9	N/A	Layer of silty sand	N/A	2.40m	0.60m	13.87	14.02	N/A	Late 18th to Early 19th Century	3
70	Layer	Trench 3	N/A	9	N/A	Layer of silty sand	N/A	4.50m	0.40m	14.57	14.33	N/A	Late 18th to Early 19th Century	3
71	Layer	Trench 3	N/A	9	N/A	Layer of silty sand	N/A	1.80m	0.04m	14.02	13.93	N/A	Late 18th to Early 19th Century	3
72	N/A	N/A	N/A	N/A	N/A	NOT USED	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
73	Layer	Trench 3	N/A	9	N/A	Layer of sandy gravel	N/A	1.30m	0.16m	14.45	14.26	N/A	Late 18th to Early 19th Century	3

74	Layer	Trench 3	N/A	9	N/A	Dump layer sealing culvert [49]	N/A	3.50m	1.20m	14.53	13.39	N/A	Late 18th to Early 19th Century	3
75	Masonry	Trench 2	Trench 2 Pre-Ex	3, 15	101	Rectangular masonry structure butting northern cascade wall to west, forming the northern alcove's northern impost	0.52	0.55	1.30m	14.17	13.99	N/A	Early 18th Century	2
76	Masonry	Trench 4	N/A	N/A	102	Rebuild to cascade wall [25]	0.42m	9.61m	0.71m	15.52	15.51	N/A	19th Century, possibly mid to late	4
77	Masonry	Trench 4	N/A	N/A	102	Concrete capping to [76]	0.94m	7.60m	0.27m	15.53	15.54	N/A	Mid to Late 19th Century	4
78	Masonry	Trench 1	100, Trench 2 Pre-Ex	N/A	100	Bath and Portland stone in southern cascade wing wall forming a probable support for the southern stoop basin	0.51m	1.94m	over 1.55m	15.53	15.21	N/A	Early 18th Century	2
79	Masonry	Trench 4	N/A	N/A	102	Second lowest (4th) cascade step	0.76m	8.65m	0.37m	14.28	14.28	N/A	19th Century	4
80	Masonry	Trench 4	N/A	N/A	102	Render obscuring lowest (5th) cascade step	0.78m	10.21m	0.86m	15.21	14.35	N/A	19th Century	4
81	Masonry	Trench 3	N/A	13	N/A	Rebuild to the face of brick culvert [49], which presumably once formed part of the lower pond edging.	2.44m	0.22m	Over 1.10m	13.45	13.03	N/A	19th Century	4
82	Masonry	Trench 3	N/A	N/A	N/A	Concrete edging around the lower pond, which sealed [81]	see TST plan	see TST plan	over 2.00m	14.61	14.61	N/A	19th Century	4

83	Fill	Trench 3	N/A	15	N/A	Internal fill of brick culvert [49]	12.54	12.53	0.18m	12.54	12.53	N/A	19th Century	4
84	Masonry	Trench 3	N/A	13	N/A	Rendering on [81]	0.60m	0.50m	0.01m	13.35	13.03	N/A	19th Century	4
85	Masonry	Trench 3	N/A	15	N/A	Mortar rendering on brick culvert [49] / [81]	6.20m	2.44m	0.01m	13.34m	13.03	N/A	19th Century	4
86	Masonry	Trench 1	100	14, 11	100	Red fabric brick infilling between Portland stones [78]	0.38m	0.11m	0.84m	15.17	14.63	N/A	Early 18th Century	2
87	Masonry	Trench 1	100	N/A	100	Mortar rendering sealing [44]	0.15m	0.67m	0.12m	15.26	15.26	N/A	Late 18th to Early 19th Century	3
88	Masonry	Trench 1	100	N/A	100	Later rebuild to main body of southern cascade wing wall [100]	0.74m	0.11m	0.08m	15.3	15.3	N/A	Late 18th to Early 19th Century	3
89	Masonry	Trench 1	100	N/A	100	Later rebuild to main body of southern cascade wing wall [100]	0.11m	1.03m	0.08m	15.3	15.3	N/A	Late 18th to Early 19th Century	3
90	Masonry	Trench 1	N/A	11	100	Later rebuild to main body of southern cascade wing wall [100]	0.11m	over 1.66m	over 0.76m	14.81	14.57	N/A	Late 18th to Early 19th Century	3
91	Masonry	Trench 1	N/A	14	100	Cement-like layer sealing [93]	N/A	1.70m	0.30m	14.26	14.13	N/A	Mid 19th Century onwards	5
92	Masonry	Trench 1	N/A	14	100	Mortar on face of southern cascade wing wall [100]	N/A	0.30m	0.20m	14.34	14.36	N/A	Late 18th to Early 19th Century	3
93	Masonry	Trench 1	N/A	14	100	Mortar on face of southern cascade wing wall [100]	0.02m	1.42m	N/A	14.46	14.34	N/A	Early 18th Century	2

94	Masonry	Trench 1	N/A	14	100	Later rebuild to main body of southern cascade wing wall [100]	N/A	10m	0.70m	15.42	14.9	N/A	Late 18th to Early 19th Century	3
95	Masonry	Trench 2	N/A	15	101	Later rebuild to main body of northern cascade wing wall [101]	N/A	0.82m	0.69m	15.73	15.73	N/A	19th Century, possibly mid to late	4
96	Masonry	Trench 2	N/A	15	101	Later rebuild to main body of northern cascade wing wall [101]	N/A	2.36m	0.94m	15.82	15.68	N/A	19th Century, possibly mid to late	4
97	Masonry	Trench 2	N/A	15	101	Render on eastern face of northern cascade wing wall [101], to immediate south of probable stoop basin position	0.02m	0.40m	0.24m	15.52	15.52	N/A	19th Century, possibly mid to late	4
98	Masonry	Trench 2	N/A	15	101	Mortar forming rendering and repointing and / or a phase of rebuilding below stoop basin position on northern cascade wing wall [101]	N/A	1.44m	0.92m	15.05	15.05	N/A	19th Century, possibly mid to late	4
99	Masonry	Trench 2	N/A	15	101	Indurated light grey mortar above probable stoop basin position on northern alcove	0.02m	2.25m	0.14m	15.91	15.91	N/A	Late 18th to Early 19th Century	3
100	Structure	Trench 1	100	1, 2, 4, 5, 6, 11, 12, 14, 15, 16, 17	N/A	Structure number for southern cascade wing wall	2.14m	15.40m	over 3.02m	15.91	12.89	N/A	Multi-Phase	2 to 5

101	Structure	Trench 2	N/A	3, 7, 10, 15, 18	N/A	Structure number for northern cascade wing wall	1.74m	18.17m	over 3.01m	15.91	12.9	N/A	Multi-Phase	2 to 5
102	Structure	Trench 4	TST	15	N/A	Structure number for cascade steps	4.55m	10.4	2.64m	15.53	12.89	N/A	Multi-Phase	2 to 4
103	Masonry	Trench 1	N/A	6	100	Concrete base of stock brick rebuild	0.22m	over 0.5m	0.15m	14.21	14.2	N/A	N/A	N/A
104	Masonry	Trench 1	N/A	14	100	Later rebuild to main body of southern cascade wing wall [100]	N/A	0.89m	0.56m	15.21	15.16	N/A	19th Century	4
105	Layer	Trench 2	105	N/A	N/A	Demolition debris	3.00m	3.60m	N/A	13.81	13.62	N/A	19th Century	4
106	Masonry	Trench 2	105	N/A	N/A	Two flagstones forming a possible internal surface within the northern alcove position. Composed of Kentish Ragstone	0.62m	0.90m	0.06m	14.12	14.06	N/A	19th Century	4
107	Structure	Trench 2	105	N/A	N/A	Timber revetment forming original edge of lower pond	1.90m	0.18m	over 0.10m	13.88	13.52	N/A	19th Century	4
108	Timber	Trench 2	105	N/A	107	Vertically driven timber post forming part of pond edging, structure [107]	0.10m	0.10m	N/A	13.84	13.84	N/A	Early 18th Century	2
109	Timber	Trench 2	105	N/A	107	Horizontal timber forming part of pond edging, structure [107]	0.70m	0.03m	0.10m	13.8	13.69	N/A	Early 18th Century	2
110	Timber	Trench 2	105	N/A	107	Vertically driven timber post forming part of pond edging, structure [107]	0.75m	0.75m	0.58m	13.87	13.52	N/A	Early 18th Century	2
111	Timber	Trench 2	105	N/A	107	Vertically driven timber post forming part of pond edging, structure [107]	0.10m	0.10m	N/A	13.84	13.84	N/A	Early 18th Century	2

112	Timber	Trench 2	N/A	15	101	Later rebuild to main body of northern cascade wing wall [101]	N/A	1.75m	1.04m	15.88	15.44	N/A	Late 18th to Early 19th Century	3
113	Masonry	Trench 2	N/A	15	101	Later rebuild to main body of northern cascade wing wall [101]	N/A	0.50m	0.81m	15.04	14.79	N/A	19th Century, possibly mid to late	4
114	Masonry	Trench 2	N/A	15	101	Brick wall forming part of earliest phase of northern cascade wing wall, context [101]	N/A	13.55m	1.00m	15.52	14.58	N/A	Early 18th Century	2
115	Masonry	Trench 2	N/A	15	101	Later rebuild to main body of northern cascade wing wall [101]	N/A	3.07m	0.97m	15.52	15.05	N/A	19th Century, possibly mid to late	4
116	Masonry	Trench 2	N/A	15	101	Dark greyish blue mortar found within northern alcove location	N/A	3.20m	1.60m	15.64	16.54	N/A	19th Century, possibly mid to late	4
117	Masonry	Trench 2	N/A	15	101	Rectangular masonry structure butting northern cascade wall to west, forming the northern alcove's southern impost	0.62m	1.58m	0.81m	15.97	14.75	N/A	Early 18th Century	2
118	Masonry	Trench 2	N/A	15	101	Mortar facing to [114]	0.18m	0.79m	Over 0.08m	13.87	13.84	N/A	19th Century, possibly mid to late	4
119	Layer	Trench 2	N/A	15	N/A	Humic rich deposit resembling soil	0.62m	1.03m	0.19m	14.1	14.09	N/A	19th Century	4

120	Layer	Trench 2	N/A	15	101	Mortar-like layer, which may have functioned as a bedding layer for a floor surface	0.62m	1.03m	0.12m	13.91	13.09	N/A	Mid to Late 19th Century	4
121	Masonry	Trench 2	105	15	101	Buttress supporting [114], forming part of northern alcove	0.08m	0.46m	0.37m	14.01	14	N/A	19th Century, possibly mid to late	4
122	Layer	Trench 2	N/A	15	N/A	Dump layer; possible ground consolidation layer	0.62m	1.03m	0.29m	14.79	14.77	N/A	19th Century	4
123	Structure	Trench 4	TST	15	N/A	Structure Number for brick and timber floor	2.60m	24.51m	0.11m	13.89	12.8	N/A	Multi-Phase	2 to 4
124	Masonry	Trench 4	TST	N/A	123	Brick floor within lower pond	2.60m	24.51m	0.11m	13.89	12.8	N/A	Early 18th Century	2
125	Timber	Trench 4	TST	N/A	123	Edging for brick floor surface [124]	0.18m	2.37m	0.07m	12.94	12.82	N/A	Early 18th Century	2
126	Layer	Trench 4	N/A	N/A	N/A	Demolition debris	0.95m	0.35m	0.25m	14.24	14.13	N/A	Late 19th to 20th Century	5
127	Layer	Trench 2	N/A	15	N/A	Flood deposit of silty clay	2.5m	3.00m	0.25m	13.32	13.29	N/A	Mid to Late 19th Century	4
128	Masonry	Trench 1 Trench 2	N/A	15	N/A	Flint, coral, chalk and brick cladding, found on lower half of eastern face of wing walls 100 and 101 and on lowest step of cascade 102	1.02m	27.01m	0.80m	13.94	13.26	N/A	19th Century, possibly mid to late	4
129	Layer	Trench 2	N/A	15	N/A	Deposit containing frequent pebble to cobble sized angular fragments of chalk and shell. Seals brick pavement [123]	2.5m	15m	0.30m	14.19	14.1	N/A	19th Century	4

130	Cut	Trench 2	101	N/A	N/A	Construction cut for [101]	1.80m	18.17m	over 1.35m	14.41	13.06	N/A	Early 18th Century	2
131	Fill	Trench 2	101	N/A	N/A	Backfill of [130]	1.80m	18.17m	over 1.35m	14.41	14.35	N/A	Early 18th Century	2
132	Masonry	Trench 2	N/A	15	101	Stoop Basin	1.02m	0.71m	over 1.20m	14.7	14.7	N/A	Early 18th Century	2
133	Timber	Trench 2	TST	N/A	N/A	Timber revetment forming original edge of lower pond	0.15m	0.15m	over 0.15m	13.87	13.52	N/A	Early 18th Century	2
134	Timber	Trench 2	TST	N/A	N/A	Timber revetment forming original edge of lower pond	0.15m	0.15m	over 0.15m	13.84	13.84	N/A	Early 18th Century	2
135	Cut	Trench 2	TST	N/A	N/A	Cut of escarpment and path	over 7.40m	9.55m	0.92m	14.52	13.5	N/A	Early 18th Century	2
136	Cut	Trench 3	N/A	8	N/A	Cut of escarpment and path	over 6.20m	over 6.20m	0.95m	14.33	13.49	N/A	Early 18th Century	2

Appendix 2: Site Matrix

Appendix 3: OASIS

OASIS ID: preconst1-45757

Project details

Project name	An Archaeological Watching Brief and Excavation on the Cascade and Lower Pond in Bushy Park Water Garden
Short description of the project	An archaeological excavation and evaluation was undertaken on the cascade in Bushy Park Water Garden, in advance and during restoration work. The aim of the restoration project was to recreate the cascade's original, early 18th century form as accurately as was reasonably practicable given the constraints of the archaeological evidence. Pre-Construct Archaeology Ltd. was therefore contracted to undertake a series trial trenches prior to commencement of building work, in order to provide feedback to the design team. After the trial trenches were completed, demolition and building work on the cascade began. This was monitored on an intermittent basis by Pre-Construct Archaeology Ltd. as a watching brief. The renovation became a dynamic process, as the watching brief yielded further evidence that would become key to the structure's final design.
Project dates	Start: 04-02-2008 End: 11-06-2008
Previous/future work	Yes / No
Type of project	Recording project
Current Land use	Open Fresh Water 2 - Standing water
Current Land use	Other 5 - Garden
Monument type	CASCADE Post Medieval
Monument type	POND Post Medieval
Significant Finds	BRICK Post Medieval
Significant Finds	POTTERY Post Medieval
Significant Finds	MARINE MOLLUSC REMAINS Post Medieval

Significant Finds	SLAG Post Medieval
Significant Finds	CORAL Post Medieval
Significant Finds	STONE Post Medieval
Investigation type	'Field observation', 'Part Excavation', 'Watching Brief'
Prompt	Research

Project location

Country	England
Site location	GREATER LONDON RICHMOND UPON THAMES TEDDINGTON AND HAMPTON Bushy Park Water Garden
Postcode	TW12 1NE
Study area	960.00 Square metres
Site coordinates	TQ 1462 7020 51.4187099755 -0.351439641989 51 25 07 N 000 21 05 W Point
Height OD	Min: 14.74m Max: 15.07m

Project creators

Name of Organisation	Pre-Construct Archaeology Ltd
Project brief originator	Pre-Construct Archaeology
Project design originator	Tim Bradley
Project director/manager	Tim Bradley
Project supervisor	Rebecca Lythe
Type of sponsor/funding	The Royal Parks

body

Name of sponsor/funding body The Royal Parks

Project bibliography 1

Publication type Grey literature (unpublished document/manuscript)

Title An Archaeological Watching Brief and Excavation on the Cascade and Lower Pond in Bushy Park Water Garden, Upper Lodge, Bushy Park, London Borough of Richmond.

Author(s)/Editor(s) Lythe, R.

Date 2008

Issuer or publisher Pre-Construct Archaeology

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Entered by Rebecca Lythe (rlythe@pre-construct.com)

Entered on 20 July 2008

Appendix 4: Pottery Assessment

Pottery assessment (WBU08)

Chris Jarrett

Introduction

A small sized assemblage of pottery was recovered from the site (one box). Very few sherds show evidence for abrasion, but the assemblage is mostly fragmentary and therefore secondary and tertiary deposition is probably represented. Despite the fragmentary nature of the pottery there is an identifiable form. Pottery was recovered from one context and individual deposits produced small groups of pottery (under 30 sherds).

All the pottery (two sherds and none are unstratified) was examined macroscopically and microscopically using a binocular microscope (x20), and recorded in an ACCESS database, by fabric, form, decoration, sherd count and estimated number of vessels. The classification of the pottery types is according to the Museum of London Archaeological Service. All the pottery is post-medieval in date and is discussed by types and its distribution.

THE POTTERY TYPES

10.1 Local coarse red earthenware

London-area post-medieval redware (PMR), 1580-1900, one sherd, form: flowerpot.

10.2 Stonewares

London stoneware (LONS), 1670-1930, one sherd, form: closed.

10.2.1 DISTRIBUTION

The pottery comes from a single context; [126] and dates it to between c.1670-1900.

SIGNIFICANCE, POTENTIAL AND RECOMMENDATIONS FOR FURTHER WORK

The pottery has no significance at a local, national or international level. The pottery types are common to the London area during the post-medieval period. The only potential of the pottery is to date the context it was found in. There are no recommendations for further work and any information on the pottery for a publication should be taken from this report.

Appendix 5: Building Material

Compiled by Dr Kevin Hayward

Introduction & Aims

This assessment of the building material assemblage from Bushy Park Water Garden Cascade (WBU 08) TQ 1462 7020 combines the results of three site visits undertaken between February and June 2008, stone (19 examples - 171kg) and brick (47 examples – 90kg) retained¹ from excavation (T1-T3) and 72 mortar samples. A catalogue summarises the retained building material assemblage at Bushy Park (Bushyparkbm)

The aims of this report are as follows:

- **The identification (under binocular microscope) of the fabrics and forms of the brick assemblage retained from Bushy Park Water Garden.**
- **The identification of the mortar fabric associated with the brickwork from the cascade.**
- **The identification of the geological character and (where possible) the geological source of the stone used within the cascade.**
- **The compilation of a stone catalogue (Bushyparkbm) that accompanies this assessment.**

For the conclusion one of the specific objectives of the building material assessment has already been set out in the introduction (2.3) to the main assessment report for WBU 08.

- **What materials were used to construct the original cascade, stoop basins, alcoves and wing walls?**

Methodology

The building materials were examined using the London system of classification with a fabric number allocated to each object. The application of a 1kg masons hammer and sharp chisel to each example ensured that a fresh fabric surface was exposed. The fabric was examined at x20 magnification using a long arm stereomicroscope or hand lens (Gowland x10). Where possible, comparison was then made with the Pre-Construct Archaeology Building Material reference collection in order to provide a match. All material was retained. Reference was also made to the building material identified from earlier excavations at Bushy Park (Currie 2003; 2004).

Brick Form and Fabric

Introduction

Starting with medieval bricks followed by post-medieval bricks, an overview of the whole brick assemblage at Bushy Park by fabric and form serves to quantify and describe the common

¹ Most of the retained brick was recorded at Pre-Construct Archaeology Ltd whilst the larger examples of stone ashlar were recorded on the site visits.

types and highlight the presence of any unusual or interesting fabrics and forms that may provide valuable dating evidence in the phase summary.

Only the bricks used in the Period 2 cascade have any chronological value at Bushy Park as these same bricks are consistently reused during periods 3, 4 and 5. The exception to this is the introduction of machine frogged bricks during Periods 4 and 5.

Medieval Construction Bricks

3031

A solitary example of a small reused white medieval brick, fabric *3031*, from the period 2 eastern face of the north wing cascade wall [10] was identified. This brick was used in London between 1350 and 1450 and evidently comes from an early masonry structure in the region.

Early Post-Medieval Construction Brick

early 3033

Two wide, flat red bricks fabric *3033* (1450-1700) were found together reused in the northern cascade wing wall [4]. These are much wider than the red and purple bricks used in the Period 2 construction and were probably salvaged from any earlier building nearby, for example the complex of buildings associated with John Field during the first half of the seventeenth century. The other possibility is that they were extras obtained from Hampton Court.

Post-Medieval Construction Bricks – Fabrics

3032; 3032nr 3033; 3033; 3034; 3035; 3036; 3039

An assessment of the post-medieval brick assemblage was made from a representative selection of retained post-medieval construction bricks (47 examples) from the various parts and phases of the cascade structure along with on-site observation of the entire structure.

The most common fabrics to be used in the construction of the Period 2 cascade are the transitional fine maroon *3032nr3033* and the post-great fire clinker-rich bricks *3032 and 3034*. The former have a narrow date range of 1664 and 1725 that fits neatly in with the construction of the Earl of Halifax construction of the cascade between 1710 and 1715. Furthermore, fabrics *3032 and 3034* come into common use during the early part of the eighteenth century. Far less common is another transitional brick fabric *3039* a late variety of the red *3033*, with white silty inclusions. Finally, there are examples of red *3033* as well but these form less than 5% of the overall period 2 structure. Both are the red *3033* fabrics that form about 5% of the overall period 2-cascade structure. Both of these types still remain in common use at the of the start eighteenth century, particularly away from the centre of London. Red bricks there reached their peak between 1450 and 1700. All of these brick fabrics are stock-moulded,

narrow, relatively thin (58-62mm) and unfrogged – many with an uneven surface. Again, these features are typical of earlier eighteenth century bricks. All these fabrics are present in the north e.g. [4] [10] and south cascade wing walls, the plinth of the grotto [42]

The use of yellow London stock bricks fabrics 3032nr3035 and 3035 begins during the Period 4 alterations to the cascade steps (Phase 4a) during the second half of the nineteenth century (1850-1900). However, stock moulded yellow 3035 bricks, which date from 1770 to 1850, are found here [28] which may indicate alterations even before 1850. The use of machined (post 18500 pressed frogged 3035 to strengthen the cascade walls [12] [18] [35] of the entire structure provide evidence for the latest use of brick at Bushy Park during period 5. The machined fogged 3032 fabric used in the repair to the face of the period 4c culvert [81] is the only other modern brick to be used at Bushy Park.

Finally, the widespread use of 20 Dutch paving bricks in the period 4 (post 1850) exterior floor surface [5] and cobbles [7] to the northern wing wall can only be explained by reuse. These bricks are in common use between 1600 and 1800 and it would seem likely that these belong to an earlier phase of floor decoration at Bushy Park possibly with its original construction.

Mortar Type 3101M 72 examples 1.1kg

The following table summarises the use and character of 6² key mortar types at Bushy Park based upon a representative group of 72 mortar samples. Along with the stratigraphy forms the basis for the phasing at Bushy Park. Samples kept for future reference.

Mortar Type	Mortar Type	Contexts Found	Phase
1	Friable loose mortar fawn brown sand lumps of chalk and light brown septaria and very small grey quartz lumps	4,10-11,14-16, 36,38,42,44,49, 75,78,86,114, 117	Phase 2 1710-1715
2	Harder light fawn-brown with chunks of angular calcite 2-3mm across set amongst fawn (quartz rich) grey abundant; red/brown fairly spread black scattered specks	3,9,31,36-39, 41, 43, 52-53,75, 87-90, 92, 94,99, 112	Phase 3 L18/E19 Roman type Cement patented after 1796
3	Dark yellow earthy brown tiny scattering of chalk quartz small but abundant very usually grey occasionally orange (sometimes coal as with 115). Little patches of black but most revealing of all tiny scattering of fragments of red/orange cbm some are coarser scattered fossil shells x2 visible variant of 3 which is also a little coarser these calcareous inclusions may come from tufa	7, 13, 28, 30, 35, 45, 52, 76, 95, 98, 113, 115, 118, 121, 128-129	Sub-Phase 4a and d 1850-1899 Probably 19 th century possibly mid-late 19th
4	Black/grey mortar charred friable scattering of charcoal and quartz scattered	116, 120	Sub-Phase 4e 1850-1899
6	Hard coarse hollowed dark fawn/green gravel cement medium-very coarse angular sand set within chalk with hollow structure reminiscent of a tufa structure. set within fine Portland matrix greyer	17, 29, 40, 79-81, 84-85, 104	Sub-Type 4c 1850-1899 as gravel inclusions after 1850
8	Light grey hard homogenous cement –Portland brick inclusions	8, 12, 18, 25,33, 91	Sub-Type 4b 1850-1940 Portland Cement patented after 1830

² Where context has two different mortar types then this provides evidence for reuse.

Tile

2276

Two examples of the common peg tile fabric 2276 (1480-1900) [+] [5] provide little chronological information for the site.

Stone

3105; 3107; 3109; 3110; 3117; 3119; 3120; 3126

Kentish ragstone, Lower Greensand, Lower Cretaceous, Maidstone Region, Kent

[+] [7]

4.5kg

Reigate stone, Upper Greensand, Lower Cretaceous, Mertsam-Reigate area Surrey

[+]

6kg

Taynton stone, Bathonian Middle Jurassic, West Oxfordshire 3109 [+] [1]

([14] [75] [78] [132] - recorded only)

49.4kg

Combe Down Oolite, Bathonian, Middle Jurassic, Bath-Box Region Avon 3109 [+]

54kg

Portland Whit Bed –Portlandian (Upper Jurassic) 3110 ([14] [75] [78] [132] -recorded only)

100+kg es

Flint – Chalk (Upper Cretaceous) southern England probably local 3117 [3]

9.5kg

Caen stone, Bathonian, Middle Jurassic, Normandy, North France 3119 [+]

0.5kg

York stone, Upper Carboniferous – South Yorkshire 3120 [+]

10kg

Sussex (Petworth) marble, Wealden, Lower Cretaceous Kent-West Sussex 3120 [+]

8kg

Purbeck Limestone, Purbeckian Upper Jurassic Isle of Purbeck 3126

16.3kg

As many as ten rock types were identified for use within the fabric of the cascade. Most of the material appears to have been freshly quarried for the project the exceptions being unstratified examples of Reigate stone rubble from Surrey and Caen stone rubble from Normandy. As both materials were used extensively during the medieval period in monasteries and palaces throughout London and the south-east they must derive from the demolition of a pre-1710 structure in the vicinity or further downstream via the Thames.

The uses of large blocks of ashlar are a particular feature of the areas supporting the stoop basins [14] [78] [132] and grottoes [8] [75] [117] and buttress [1] on the northern and southern

wing walls. Two rocks were identified in-situ, Portland Whit Bed from Dorset and Taynton stone from West Oxfordshire. They are rendered with the same type 1 lime cement as is used in the brickwork of the 1710 phase 2 cascade construction so must be contemporary with it. The large quantity of unstratified ashlar made of these two material types at Bushy Park must also have belonged to this part of the cascade. It is interesting to note that some examples of another type of Bath stone – Combe Down Oolite have also been identified from the unstratified blocks. The final rock type to be used for this purpose is a piece of unstratified Petworth Marble³ from West Sussex.

The types of freestones⁴ used in the early eighteenth century cascade were widely available in London at the time of its construction. Portland Whit Bed a type of Portland stone was shipped in vast quantities to be used in the construction of St Paul's and other buildings during the late 17th early 18th century, whilst Taynton stone, an orange shelly oolitic limestone was widely used again at St Paul's but also at Blenheim Palace in Oxfordshire between 1704-1722 (Arkell 1947, 63). This would have been taken downstream by barge from the outcrops near Taynton/Burford via the River Evenlode and then the River Thames before being unloaded at Hampton/Kingston upon Thames to carts at the site Petworth Marble was quarried extensively in the eighteenth and nineteenth century (Birch 2006, 45), whilst the use of Combe Down oolite only really took off with the 18th century growth of Bath (Stanier, 2000, 68).

Paving stone used in the exterior floor surface immediately east of the north cascade wing wall [5; 7] along with the Dutch Paving Bricks during the 19th century consisted of two or even three hard rock types. First, Kentish ragstone, a hard calcareous sandstone from the Lower Greensand of Kent [7] then a type of hard shelly Purbeck limestone⁵ from the Upper Jurassic of the Isle of Purbeck [5] e.g. Feather, Spangle, Grub or Thornback bed all of which polish (Stanier, 2000, 83). Finally, there is the possible use of unstratified olive-green York stone paving (a sandstone from the Upper Carboniferous of Yorkshire). All of these materials were widely used in London during the Victorian period. When wet, the effect on the colour of these different stone types and the Dutch Paving Bricks would be striking and suitable for such a large impressive garden ornamental structure.

³ Not a true marble but a condensed freshwater limestone

⁴ Limestones with a soft open porous texture that enable the rock to be worked or carved in any direction.

⁵ Not Purbeck Marble

Distribution (dating based on brick, mortar or both)

Context	Form	Size	Date range of material		Latest dated material	
1	Stock-Moulded Unfrogged Brick type 1 cement	3	1664	1725	1664	1725
3	Stock Moulded Brick reused type 2 cement	2	1664	1850	1790	1850
4	Stock Moulded Brick type 1 cement	3	1450	1725	1664	1725
5	Dutch Paving Brick and peg tile	2	1480	1900	1480	1900
6	Stock Moulded Brick	1	1664	1725	1664	1725
8	Stock Moulded brick reused in type 8 cement	1	1664	1900	1850	1900
9	Stock moulded brick reused in type 2 cement	1	1664	1850	1790	1850
10	Stock-Moulded Unfrogged Brick type 1 cement	1	1664	1725	1664	1725
11	Stock-Moulded Unfrogged Brick type 1 cement	1	1664	1725	1664	1725
12	Type 8 cement	1	1850	1940	1850	1940
13	Type 3 cement	1	1850	1900	1850	1900
14	Type 1 cement with ashlar	1	1664	1725	1664	1725
15	Stock-Moulded Unfrogged Brick type 1 cement	1	1664	1725	1664	1725
16	Stock-Moulded Unfrogged Brick type 1 cement	1	1664	1725	1664	1725
17	Type 6 cement	1	1850	1900	1850	1900
18	Type 8 with yellow machined stock brick (on-site)	1	1850	1940	1850	1940
25	Type 8 cement	1	1850	1900	1850	1900
28	Type 3 cement yellow stock and purple stock (on-site)	3	1770	1900	1850	1900
29	Type 6 cement	1	1850	1900	1850	1900
30	Type 3 cement	1	1850	1900	1850	1900
31	Type 2 cement	2	1790	1850	1790	1850
33	Yellow Stock moulded Brick (on-site) with Type 8 cement	2	1770	1900	1850	1900
35	Yellow and Purple Stock moulded brick with Type 3 cement	3	1666	1900	1850	1900
36	Stock Moulded brick with Type 1 cement	3	1664	1750	1664	1750
37	Type 2 cement	1	1790	1850	1790	1850
38	Type 1 cement	1	1700	1725	1700	1725
39	Type 2 cement	1	1790	1850	1790	1850
40	Type 6 cement	1	1850	1900	1850	1900
41	Type 2 cement	1	1790	1850	1790	1850
42	Stock Moulded brick with type 1 cement	1	1664	1725	1664	1725
43	Stock Moulded brick with Type 2 cement	1	1790	1850	1790	1850
44	Stock Moulded brick with type 1 cement	1	1664	1725	1664	1725
45	Type 2 cement	1	1790	1850	1790	1850

Context	Form	Size	Date range of material		Latest dated material	
49	Stock Moulded brick with Type 2 cement	1	1790	1850	1790	1850
52	Stock Moulded brick with Type 3 cement	1	1850	1900	1850	1900
53	Stock Moulded brick with Type 2 cement	1	1790	1850	1790	1850
75	Type 1 cement	1	1700	1725	1700	1725
76	Type 4 cement	1	1850	1900	1850	1900
78	Type 1 cement	1	1700	1725	1700	1725
79	Type 6 cement	1	1850	1900	1850	1900
80	Type 6 cement	1	1850	1900	1850	1900
81	Purple Machine Frogged Brick with Type 6 cement	1	1850	1900	1850	1900
84	Type 6 cement	1	1850	1900	1850	1900
85	Type 6 cement	1	1850	1900	1850	1900
86	Type 1 cement with frogged stock moulded brick	2	1700	1850	1750	1850
87	Type 2 cement	1	1790	1950	1790	1850
88	Stock Moulded brick with Type 2 cement	2	1664	1850	1790	1850
89	Stock Moulded bricks with Type 2 cement	3	1664	1850	1790	1850
90	Stock Moulded Brick with Type 2 cement	1	1666	1850	1790	1850
91	Type 8 cement	1	1850	1940	1850	1940
92	Type 2 cement	1	1790	1850	1790	1850
93	Stock Moulded Brick	1	1664	1725	1664	1725
94	Type 2 cement	1	1790	1850	1790	1850
95	Type 3 cement	1	1850	1900	1850	1900
98	Type 3 cement	1	1850	1900	1850	1900
99	Type 2 cement	1	1790	1850	1790	1850
104	Type 6 cement	1	1850	1900	1850	1900
112	Type 2 cement	1	1790	1850	1790	1850
113	Type 3 cement	1	1850	1900	1850	1900
114	Type 1 cement	1	1700	1725	1700	1725
115	Type 3 cement	1	1850	1900	1850	1900
116	Type 4 cement	1	1850	1900	1850	1900
117	Type 1 cement	1	1700	1725	1700	1725
118	Type 3 cement	1	1850	1900	1850	1900
120	Type 4 cement	1	1850	1900	1850	1900
121	Type 3 cement	1	1850	1900	1850	1900
124	Stock Moulded bricks no cement	3	1450	1750	1666	1750
126	Stock Moulded brick no cement	1	1666	1725	1666	1725
128	Stock Moulded Bricks type 3 cement	2	1850	1900	1850	1900

Conclusions

- Because of the continual re-use of period 2 brick it has only been possible to date the site by mortar-type. In all 6 mortar types have been identified.
- Type 1 a loosely consolidated lime cement is associated with the original construction of the cascade wing walls and grottoes between 1710-1715.
- Type 2 a harder Roman type of cement is associated with late 18th-early/mid 19th century repair (Period 3) and construction of the culvert.
- Types 3, 4, 6, 8 are mortars typical of the Period 4 modifications to the structure.
- Scant evidence is supplied for a pre-1710 construction on –site or nearby by one medieval and two early post-medieval bricks reused in the period 2 cascade and the presence of Caen stone and Reigate stone rubble – materials that go into disuse after the dissolution of the monasteries in the 1530s.

The materials used in the construction of the period 2 cascade are as follows:

BRICKS

- a) Thin unfrogged stock moulded transitional bricks *3032nr3033* fabric. The construction of the cascade fits neatly within the narrow date range (1664-1725) assigned to these bricks. Estimated 50% of all bricks
- b) Stock moulded Post Great Fire Bricks *3032* and *3034* that date from 1666-1750 Estimated 40% of all bricks.
- c) Earlier red *3033* and transitional red *3039* brick fabrics which are still being produced on a small scale.

STONE

Supporting the stoop basins and grottoes are large ashlar blocks of Taynton stone – a type of Bath-stone from the Thames catchment area of Oxfordshire and Portland Whit Bed – a type of Portland stone from the Dorset coast. Both of these materials were used in large quantities in Late 17th/early 18th century London and would have been off-loaded from barges at Kingston-upon-Thames and transported by cart a couple of miles to Bushy Park

10.2.2 Bibliography

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Appendix 6: Assessment of the Coral and Shell

Compiled by Dr Kevin Hayward with Dr Lesley Runnalls (coral identifications)

Introduction and Aims

25 examples of coral (54.9kg) and 9 shell fragments (1.4kg) were retained from excavation on the site of the early 18th century water gardens at Bushy Park belonging to Lord Halifax.

This material was assessed in order to:

- **Identify first whether it is modern tropical coral or fossil coral from the Jurassic of the Cotswolds.**
- **Identify, using the services of a coral specialist (Dr Lesley Runnalls – University of Reading) the species or genera of coral being used to clad the grotto areas of the cascade.**
- **Identify the types of shell used to clad the grotto areas of the cascade and whether these were from native or exotic families..**
- **In the summary, relate the use of the coral and shell at Bushy Park to the phase at which it was found and compare sites in London and account for its presence.**

Methodology

Three selected bags of coral were washed and examined by Dr Runnalls in August 2008 and compared to examples from relevant texts in order to identify species. All examples were found to have a white fresh skeletal structure of modern-day corals, thus discounting the possibility that this material was being brought from Jurassic outcrops in central/southern England. Comparison was then made with the remaining examples retained on-site and at Pre-Construct Archaeology in order to identify the entire assemblage.

Coral Types

Type a) Diplora strigosa (BRAIN CORAL) very large example 5kg [129] and 2.4kg [101]. This form grows at a depth of between 5 and 20 metres mainly in the warm shallow agitated seas of the Caribbean and Florida. They can be found in other tropical areas but are less common. Present in a total of 6 examples 14.7kg (27% of coral) [101] [105] [126] [128] [129].

Type b) Montastria annularis (STAR CORAL) very large examples 5kg [126] and 2.4kg [3] 400g [101]. This form grows at a depth of between 5 and 25 metres mainly in the warm shallow agitated seas of the Caribbean and Florida. They can be found in other tropical areas but are less common.

Present in a total of 19 examples 40.2kg (73% of coral) [+] [3] [101] [105] [126] [128]

Shell Types

Type a) Queen Scallop Shell *Aequipecten opercularis* Large free swimming bivalve – pronounced narrow ribbing common in British Waters. Present in 5 examples [968g)

b) Abalone possibly *Haliotis tuberculata* Sizeable limpet like marine gastropod with the interior of the shell having nacre of mother-of-pearl which is highly iridescent. These changes in colour make the shells attractive as decorative objects. Found worldwide but also in seas around the Channel Islands where they are a delicacy and known locally as ormers. Present upturned 3 examples [126] [128].

c) Cockle possibly the common cockle *Cerastoderma edule* is widely distributed around the coastlines of Northern Europe. 1 example [128].

Discussion

Apart from unstratified examples, all the retained shell and coral came from the cladding and demolition debris surrounding the northern and southern grottoes. These date at least from Phase 3 onwards [3] but of course may well have been reused in earlier cladding associated with the original (Phase 2) construction of the cascade. The end result, along with was to create a naturalistic look to the cascade. The use of brain and star coral from the Caribbean is an indication that distance was no object when it came to decoration of this garden feature. However, the presence of these same types of coral in 18th century occupation levels at Tabard Square, Southwark (LLS02) [295] [390] showed that these materials were widely available in London at this time, probably used as ship ballast. The shell, however was all probably collected from native waters including the Abalone from the Channel Islands.

Finally, rendering of the coral and shell in mortar types characteristic of Phase 3, 4b and 4d provide evidence for the continued repairs to the grotto areas throughout the 18th and 19th centuries.

Recommendations

The coral and shell to be retained and returned to Royal Parks.

Appendix 7: The Metal Finds

By Märit Gaimster

Iron objects were retrieved from phases 4 and 5, consisting mostly of structural fittings to fix and hold the decorative cladding. Pointed flat iron straps, however, may have had a decorative function as “metal leaves”.

Sub-Phase 4d: mid- to late 9th century cladding and render to the eastern face of the structure

Iron fixtures and fittings were retrieved from context [128], the cladding found on the lower half of the eastern face of wing walls 100 and 101 and on the lowest step of cascade 102; this included angular flint cobbles, rock coral, queen scallop shells, upturned abalone shells and 19th-century blue glass slag. Metal finds referring to these works were also recovered from the Phase 5 demolition layer [126], which contained frequent inclusions of the 19th-century cladding elements.

The metal finds from context [128] include six clamps of different size and design. Three consist of flat, tapering iron spikes with a simple angled head; the two complete clamps have a length of 135 and 210mm respectively. The remaining three are flat iron straps with angled heads, in opposed direction, at either end; their length is 115 to 120mm. Further clamps were retrieved from demolition layer [126]. Six tapering iron spikes range in length from 140 to 235mm; two further short clamps, measuring 120–130mm and likely the type with two angled heads, are both fixed at one end in lumps of lead casing.

In addition, there is a large piece, c.90 x 200mm, of roughly cast or molded iron casing, with compartments and hollows for holding and displaying components of the cladding. The casing is covered in lime mortar, with the fragment of a shell still extant. A similar casing, measuring c.240 x 280mm, came from demolition layer [126].

On either side of the cascade steps, within the confines of the lower pond, a series of twelve vertically set and symmetrically arranged metal spikes were recorded *in situ*. Their position coincides well with the “metal leaves” that can be seen protruding through the surface of the lower pond on the 18th-century so-called “Ricci” painting. It is possible they represent the original “leaves”, reset in the late 19th-century mortar. A clutch of these pointed flat iron straps (sf 1), fixed at one end in a lead casing and set in mortar was retrieved from demolition layer [126]. The straps have a width of 20–25mm; two are complete with pointed ends, measuring 500 and 570mm respectively.

context	sf	description
126	1	clutch of four flat iron straps, fixed at one end in a lump of lead casing; W 20–25mm; two complete pointed straps L 500 and 570mm; three further pointed pieces L 160, 280 and 350mm
126		eight iron clamps; complete; six with flat tapering spikes and angled heads L 140 to 235mm W 150–200mm ; two flat straps with angled heads ?at both ends, in opposed direction; one end set in lead casing; W 150–200mm; L 120–130mm
126		piece of iron rough cast/molded casing for cladding components; c.240 x 280mm
128		six iron clamps; three with flat tapering spikes and angled heads; two complete L 135 and 210mm; three of flat straps with angled heads at both ends and in opposed direction; L 115–120mm W c.150mm
128		piece of iron rough cast/molded casing for cladding components; c.90 x 200mm; small piece of shell extant

Metal finds from Bushy Park