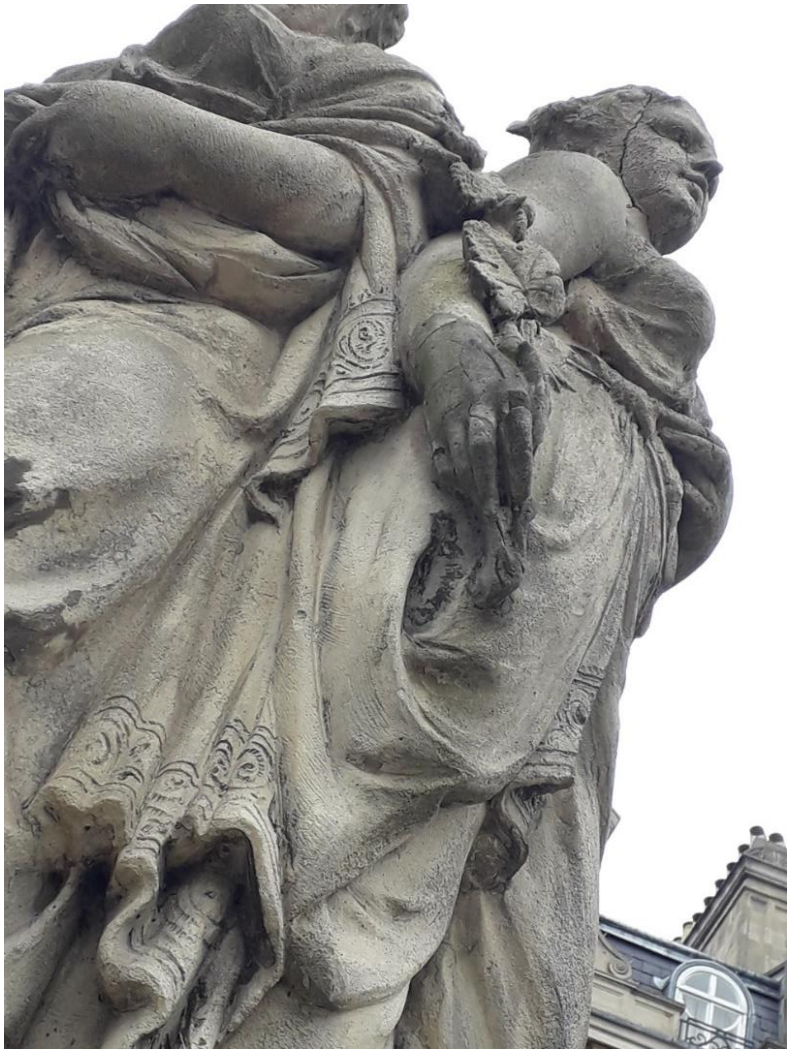
1-10 Cambridge Gate

Condition Report

June 2021



Condition survey of Gate piers, 1-10 Cambridge Gate, Regents Park.

Report prepared for:

Crown Estate Paving Commission

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CONDITION REPORT

Job No.	Issue No.	Description	Issue Date
20240	1	Condition survey report	25.08.21

PROJECT SUMMARY

REGION: County: Greater London

Authority District: Camden (London Borough)

PROPERTY: 1-10 Cambridge Gate, Regents Park, London

LOCATION: Two sets of gate piers at either end of the sweep in front of the property.

National Grid Reference: TQ 28742 82468

OBJECTS: Four terracotta statues of the Three Graces standing on plinths bearing the words, CAMBRIDGE GATES.

MATERIALS: Statues: Terracotta, Coade stone type, unglazed stoneware, paint remains

Plinths: Limestone

SURVEYED BY: Amy Anderson, ACR and Jenna Burrell

WRITTEN BY: Amy Anderson

TABLE OF CONTENTS

1.0 INTRODUCTION

Cliveden Conservation Workshop Limited (CCW) were invited to survey the four statues and plinths which form the gate piers to the driveway entrance of properties 1-10 Cambridge gate, Regents Park. The report is prepared at the request of Cambridge Gate Resident's Association in liaison with the Crown Estate Paving Commission.

The aim of the survey was to assess the current condition and structural stability of the statues and plinths and to determine whether any structural stabilisation is required in addition to assessing potential treatment options to improve their appearance and longevity in discussion with the client.

1.1 SUMMARY OF REPORT

The objects surveyed were the four sets of terracotta statues on limestone plinths. The objects, along with the boundary walls which they abut are Grade II Listed.[1] The walls were not a subject of this survey.[2]

For ease of identification, the piers have been given a number from south to north thus: monument 1 (M1)-monument 4 (M4). The plinths are labelled P e.g., M4P and the statues S, with figures in each group labeled 1-3, starting with the most south facing and moving anticlockwise. E.g., M1S.1

1.2 DESCRIPTION OF PLINTHS

The statues stand on cylindrical limestone plinths with deeply carved, ribboned, floral swags and drops around the cylindrical shaft. Above this is a large-scale leafed cyma. The two innermost flanking piers (M2 and M3) have a carved cartouche, inscribed 'Cambridge Gate' on the cylindrical shaft. All four plinths are sign painted with the words CAMBRIDGE GATE shadowed in black. In Two cases (Numbers 1 and 3), this writing is in carved relief and the paint applied to that.

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[1] 'Heritage Category:Listed Building, Grade:II, List Entry Number: 1244294, Date first listed:14-May-1974, Date of most recent amendment: 11-Jan-1999. Statutory Address: RETAINING WALL AND GATE PIERS TO FRONTAGE OF NUMBERS 1-10, CAMBRIDGE GATE' *Historic England*

[2] A sample of stone which had come detached from a damaged section was taken and could potentially be used to identify the stone and confirm its association with the plinths.

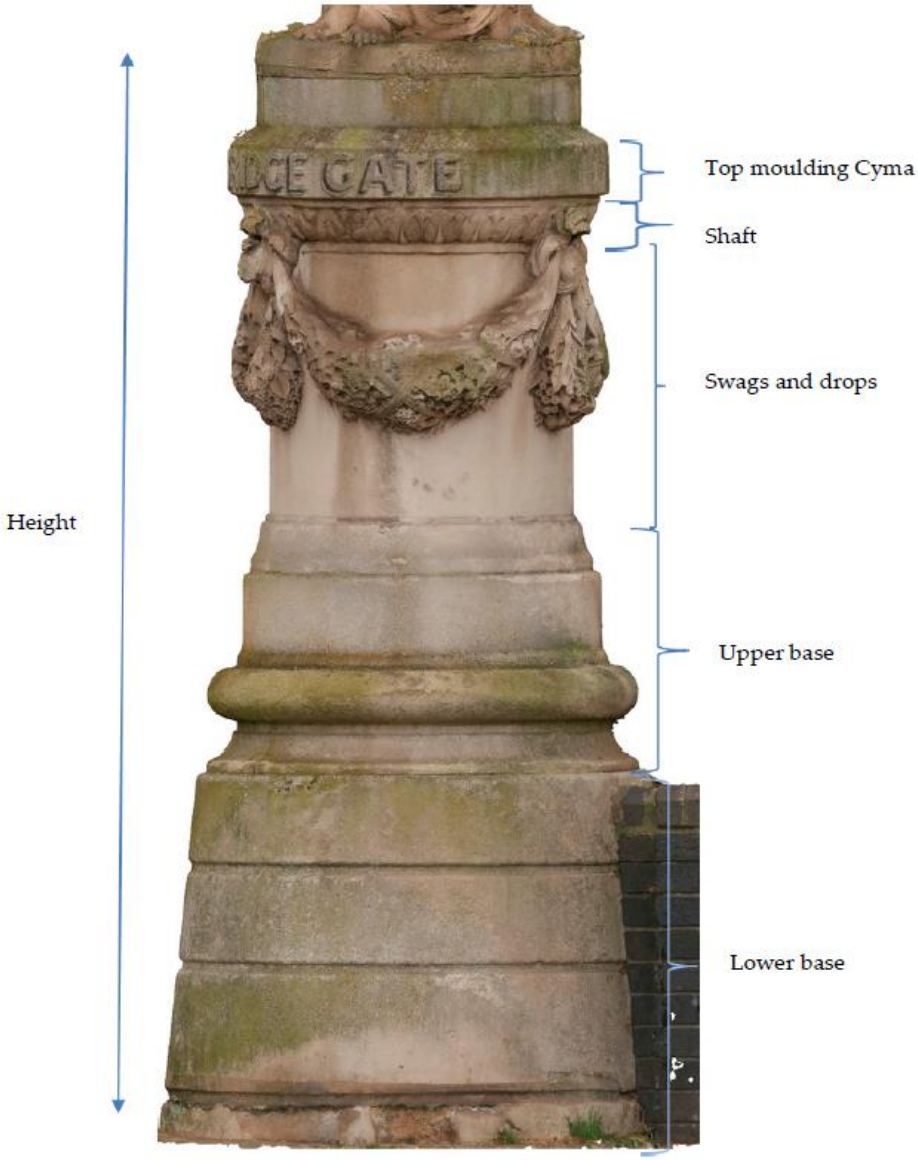


Figure 1
General plinth terminology

1.3 DESCRIPTION OF STATUES

The statues are made of buff coloured terracotta and made up of four groups of three classically designed figures referred to as The Three Graces. They stand in a repeated contrapposto pose, the 3 figures on each set arranged differently with the left or right knee forward in differing configurations creating an individual shape to each set of statues. Significant differences are to be found in the modelling of drapery, applied pattern, floral/ foliate additions and differing faces and hair styles.

Although Three Graces is a title that has been used for them, it may be that they were commissioned specifically as Four Seasons. The figures in M4 are

warmly dressed with their heads and arms draped in shawls. The carry holly and ivy. The swags of the plinth are also carved with holly and ivy. In M3 the figures are swathed with vines and grapes and one holds apples. The plinth swags are carved richly with abundant fruits. Is this Autum? In M2, figure MS2.1 guards the entrance with a distinctive sickle and a large sheaf of corn, other figures carry swags of luscious full bloomed roses. The plinth has leaves and subtle floral motifs, Summer? In M1, the figures are all holding small flowers and the swags on the plinth are rich with blooms and leaves. M1 is perhaps Spring.

Figure 2
MP1 Flowers, Forget-me-nots, leaves. Spring.

Figure 3
MP2 Flowers and foliage. Summer.

Figure 4
MP3 Fruits. Autumn.

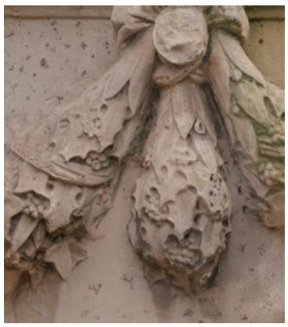


Figure 5
MP4 Holy and Ivy. Winter.

1.4 THE SURVEY

The structure and surface condition of all elements were closely examined with and without magnification. Findings of the main elements of their condition were mapped onto photographic elevations of the objects. Further images were taken of condition and artistic details to illustrate findings.

Tests were carried out to establish the permeability of the terracotta in areas of both remaining fire skin and eroded fire skin and of the limestone. Tests were carried out with a stud detector and cover meter to establish if and where any metal armature may exist. Paint samples were taken from the statues and the painted lettering on the plinths.

Cleaning tests were carried out on the limestone and terracotta on the removal of lighter soiling and biological growth/ staining, dark pollution deposits and sulphation.

A description of the site access is explained in *section 1.5*. Historical background is described *in section 2.1*. The condition of the objects is described in *section 3.0*. Results from the permeability tests, metal detecting and paint analysis are

discussed in *section 4.0*. Treatment recommendations for the statues and plinths can be found in *section 5.0.*

- Details of permeability tests are located in *Appendix C*
- Details of cover metre survey are located in *Appendix D*
- Results chart of cleaning tests are located in *Appendix B*
- Full paint analysis report is located in *Appendix A*
  Annotated photographic elevations (mark ups) detailing the main elements of their condition are located in (*Appendix E)*

1.5 SITE ACCESS

The survey was carried out by two conservators between the 26th April and 8th May 2021. Access to the statues was gained via a tower scaffold, pop up podium and ladder. The work was facilitated in liaison with the Crown Estate, the Royal Parks and Royal College of Physicians whose estates about the boundaries of the site. They generously enabled works by providing access to their planted beds, the pavement and driveway and assisted by cutting and tying back plants. Access to welfare facilities was provided with the provision of fob keys to the private gardens.

2.0 HISTORICAL BACKGROUND AND DESCRIPTION

2.1 HISTORICAL BACKGROUND

Figure 6
Monument 2 Cambridge gate, statues on plinth including associate wall and reinstated railings

The gate piers with statuary and the retaining wall running along the pavement are Grade II listed. Historic England (HE) lists them as having been installed between 1875-80.

The wall, comprising stone blocks with coping, was designed by T Archer & A Green. It originally carried railings, the existing railings being a recent replacement.[3] The gate piers at the north and south ends of the driveway in front of numbers 1-10 Cambridge gate are assumed part of this same installation. They are surmounted by four terracotta statuary groups of the "Three Graces" by Joseph Kremer, signed by the artist, and made by Coalbrookdale Co.[4] in the Ironbridge Gorge, Shropshire.

[3] *HE listing. The dates at which the railings were removed and then replaced are unknown. It may be supposed that they were removed for scrap as part of the second World War effort. In 1974, evidenced by the EH listing, they were still missing. They are missing in the image from Camden libraries and Archives Figure 87*

This photograph appears to show the statue painted. Note the missing railings and the displacement of the plinth from the wall. The photograph is not dated but cars, a bike, plastic traffic cone and the lack of railings suggest that it was taken within the last 50 yearsby 2004 an EH image from this date shows that new railings had been installed.

[4] EH listing

2.2 ART/CRAFT HISTORICAL CONTEXT

The statues are formed of cast terracotta or other fired earth and aggregate mix to form a kind of 'artificial stone' which was very popular at the time that Coalbrookdale produced these statues. This type of ceramic material, harder wearing than stone and much cheaper and quicker to produce than carved stone was made by several manufacturers in the eighteenth century and sold as 'artificial stone' by the Coade factory as early as 1769. (Kelly, 1990) Coade and other potteries, produced a wide range of neo classical ornament to supply rising consumerism and to fit the prevailing neo-classical architecture of the time. By the 1860s the production of cast architectural terracotta had reached its heyday, as showcased by the construction of the richly decorated South Kensington Museum (now the V&A) in which a number of pottery manufacturers were involved such as Doulton and Minton.[5] In the 1870s terracotta was used wholly for the facade of the Natural History Museum, London. The Coalbrookdale factory was no exception in joining this popular trend. The Coalbrookdale terracotta works were established in 1861 as a side-line to their prestigious iron production, however the works was quite short-lived and was discontinued by 1883. [6]

[5] Architectural Ceramics, Hans Van Lemman, Shire Publications Ltd, 2002

[6] Ironbridge gorge Museums Twitter @blistshill.oct17,2020

Figure 7 Ironbridge Gorge Museums @blistshill.oct 16, 2020

Made in Coalbrookdale

This photograph (Left, date unknown) shows statuary that must be from the same cast as the Cambridge Gate statues, though with different details applied. It seems that the base casts therefore were unlikely to have been commissioned for this particular job at Cambridge Gate but intended for further replication and sale.

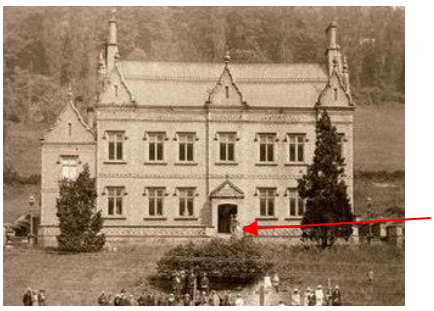


Figure 8 Image from Wickipedia dated 1921

These statues (left) were originally situated outside the Coalbrookdale Literary and Scientific Institute[7] *which housed the Coalbrookdale School of Art.*

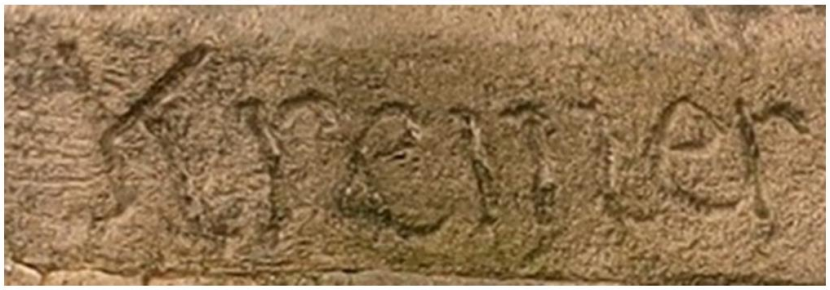
Talented artists were engaged at the potteries as "modellers". Joseph Kremer (c1833-1882) was the modeller of these statues. He was born in France and came to England in 1859. He is first recorded as working in Stoke on Trent, possibly as a modeller for Spode. By 1871 he was living in the St Pancras area of London where he died at 200 Stanhope Street in 1882.[8] His name is inscribed on the surbase of M3 and M1. That these signatures differ slightly, suggests this was not cast into a repeated surbase but scratched in at the air drying/ remodelling phase. It is possible that the remaining statuary, MS2 and MS4 were modelled by someone else.

[7] Twitter: Ironbridge Gorge Museums @blistshill.oct 16, 2020

[8] 'Joseph C. Kremer', *Mapping the Practice and Profession of Sculpture in Britain and Ireland 1851-1951*, University of Glasgow History of Art and HATII, online database 2011 [http://sculpture.gla.ac.uk/view/person.php?id=ann_1251235618, accessed 12 May 2021]

Figure 9
MS1 signature of Kremer with paint remains in the inscription

Figure 10
MSS3



2.3 MATERIALS AND PRODUCTION METHODS

Materials and methods for creating cast terracotta items would have been very similar to those used in the Coade factory which, are again producing works of this type. The terracotta can be classed as a type of stoneware in which a large part of the clay is vitrified (melted to a glassy consistency at high heat in the kiln) and so is hard and not very porous. The clay was mixed with other ingredients much of which would have already been through the kiln such as "grogg" (pulverised pre-fired ceramic), ground glass and other inclusions such as sand. This would both give it strength and, importantly, prevent it from shrinking during firing. (Kelly, 1990) These inclusions are clearly visible in the surface of the terracotta on the Coalbrookdale Statures creating it's rough texture. In some areas it is possible to see some very large aggregate in the terracotta mix.

Figure 11
M3S.2 Big toe, L foot. Very large looking like quartz with a coloured vein running through. This statue in particular has larger grogg particles.

Figure 12
M3S.2. Drapery: Large particles of different colours and sizes. Note the dark red particles. Other areas show a sandier looking matrix.

These ingredients would have been pugged together with ball clay in the Coade factory (Kelly, 1990) and were likely to have been pressed into a mould by hand then air dried.[9] Once out of the mould sections could be put together and other elements, from separate casts could be added or details modelled and attached and then fired at a high enough temperature to produce stoneware.

It is possible to discern repeated cast elements which are the basis of all the statues which have been skilfully 'mixed and matched' and modified ensuring that every figure is as deceptively as individual as a carving might be. The viewer does not detect the repeats easily. Further study, could determine the exact number of repeats that exist. Some of those identified here are:

- The Left arms and hands crooked across the body are of 2 shapes:
  - Horizontal crooked arm is always naked as a base shape but with the torso of the figure then clad in exactly the same drapery.
  - Downward slanting crooked arm is always clothed identically to the elbow with some drapery modified at the hand.
- Left and right arms extend straight down, with a repeated hand empty or holding a stem.
- There are 2 basic left and right leg shapes but all have been significantly altered with drapery additions pre-firing.

- Feet are always of the same cast but the drapery above them changes shape with the differing left and right leg options

Figure 13
Left arms crooked horizontally and repeated drapery on the breast. Left to Right: M1.3 (flowers added), MS2.3, MS3.1 and MS4.2 holding remains of probable floral additions

Figure 14
Left arms crooked and slanting with basic drapery shape over the breast and a shawl down to elbow level. (Added elements: scarf, brooch, flowers, additional drapery.)

Figure 15
Left arms straight with significant additions of drapery and plant decoration.

Figure 16
Right arms crooked, each holding a different motif and M4.3 with added drapery to the forearm. From left to right:MS3.2, MS1.1, MS2.1

Figure 17
Feet are all the same but with two types of drapery covering them depending on the configuration of the leg choices

The faces may also be repeated, possibly at different angles but erosion of the heads, the losses of originals and repairs makes it very hard to identify this.

It can be seen that the core body shapes such as torso the heads and selected arms and leg casts have been put together after drying but before the kiln to create variation in the basic poses. Then substantial remodeling and addition of further cast shapes undertaken to create four distinct variants with differences in drapery, floral decorations and other attributes clearly observable. After this artistic process, the firing would have occurred.

Below is a Comparison of figures known also to have been made by Coalbrookdale

Figure 18
Statues from outside Coalbrookdale Science and literary Institute

A comparison of these two images, shows the figures are almost identical, including the drapery. The figures differ only in the addition to swags of flowers and different pattern having been inscribed on the robes, and possibly different heads and/or hair dos.

Figure 19
MS3.1

Figure 20
MS3.1

The angle of the head in this image, looks more like that in Fig 18, black and white photo when viewed from this slightly different angle.

2.4 PAINTED SURFACE

At several different points in the history, the statues were painted. Paint analysis has not yet revealed whether this was before or after they were covered with the black pollution layer. It may be that they were designed to be painted, perhaps the very rough surface of the fire-skin was deliberately created to provide a key for the paint. Many of the terracotta cast items in the Regent's Park Nash architecture were made to be painted to look like the rest of the building (Kelly, 1990). These statues date from several decades later than the Nash terraces and several architectural features on the building of 1-10 Cambridge Gate comprise unpainted terracotta. It is not unlikely that the statues may have been part of this later unpainted aesthetic in celebration of the medium itself. The alternative is that as they got polluted and aesthetically less pleasing, and were overpainted to disguise this, just as some residents requested in casual conversation on site during our work.

3.0 CONDITION

Section three of this report details the structural and surface condition of the plinths and statues. The significant elements of their condition, including erosion, spalling, losses, previous repairs, cracks and pollution are annotated on images of each statue. (Appendix E) The report should be read in close conjunction with this.

3.1 STRUCTURAL CONDITION PLINTHS

Monument 1 (M1), the southernmost pier, which adjoins the property of the Royal College of physicians, shows significant historic movement away from the wall and visibly leans toward the south-west. The cause of the shift is the growth of a large London Plane tree within the grounds of the Royal College of Physicians directly next to the wall. The condition of the wall shows a clear heft upwards at the base of the tree which has disrupted the stonework and the wall slopes towards the road. Large sections of previous repairs at the join between the wall and the plinth, show that this has been a long-term issue as the tree has grown. Cracks of 5-7mm along the edge of the fill on the north side of the plinth suggest that this issue is ongoing. The displacement of the M1 statues and plinth is not thought to be problematic, but the rate of movement could be monitored.

Figure 21
Pier 1 leaning westwards towards the road

Figure 22
Southern boundary wall cracked and distorted by the growth of the tree and the displacement of the wall westwards towards gate pier 1.

Figure 23
Wall-plinth join south side. Historic fill and continued movement with a 3mm gap and southward displacement

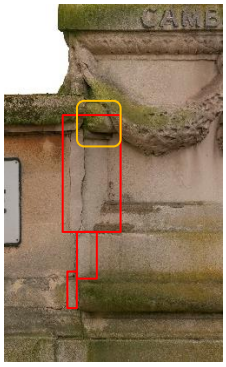


Figure 24
Wall-plinth joint, north side. Previous repair blocks and downward displacement of section of coping stone

The limestone of the plinths is eroding dramatically and fast, causing great losses of detail as well as reduction to the flat areas and edges of moulded surfaces. There are many areas of carved detail on the point of falling at any moment Figure . The limestone of which the plinths and also the wall is made erodes easily, grain by grain as well as being lost in larger spalling areas (Figure 25 & Figure 26). Many repairs have been effected over the years which are harder than the stone surface and are often causing damage, leaving seriously eroded areas around them (Figure 29 & Figure 30).

Figure 25
Sudden loss of large areas of detail from deep cracks within the stone

Figure 26
Surface erosion with gradual but almost total loss of detail and softening of carved edges. These areas are clean where the water has washed the polluted surface away

Figure 27
Erosion of material around shell fossils

Figure 28
Smaller scale losses due to flaking/ delamination

Figure 29
MP1 Repair to edges of moulding where the stone is eroding beneath. Both images show different campaigns of repair.

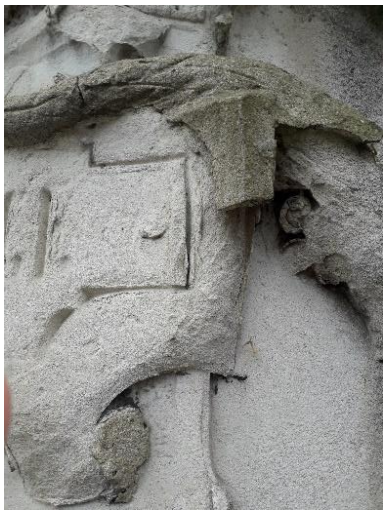


Figure 30
MP2 Large hollow area behind and below the hard repair

The carved elements on the shafts vary in the extent of their loss of detail, but in general, four plinths have lost a very significant amount of carving, maintaining only the reduced volume of the swags and drops. Where carving survives it is usually on the under sides where it is more protected from rainwater run-off. The deterioration is ongoing.

Below are images showing a comparison of the extent of erosion in the 4 plinths, the worst condition being MP2. MP2 is particularly badly affected overall having lost almost all detail on all swags as well as large chunks of the shape which have spalled off Figure 31.

The best-preserved detail is on MP3, Figure 32. The condition of detail in MP1 and 4 falls somewhere in between with the severity of loss. Figure 31 & Figure 32 respectively.

Figure 1
MP2 Almost compete erosion of detail on the swags and the central knot. Small areas survive where protected from the water run-off.

Figure 32
MP3 almost complete although still deteriorating

Figure 33
MP1 moderate to bad erosion. Swags eroded badly on two sides of the plinth. Cyma pattern is almost discernable but worn.

Figure 34
MP4 moderate erosion to detail, cyma detail can be read

The cartouche of MP2 too has eroded badly losing large parts of the design. Considerable key areas have been rebuilt in the past with a hard mortar and the limestone has eroded substantially behind these repairs leaving them hollow and proud of the monument. The inscribed writing of the cartouche has become almost illegible along with the carving of the cyma (Figure 31). The legibility of the whole cartouche is only saved by the shape of the hard repairs which are causing it to deteriorate at a faster rate in places.

For full details of condition of MP2 see annotated drawings. Only significant or typical comparative details are outlined here.

Figure 35
MP2 showing extent of loss / previous repair

The carving on the shaft of MP3 is the most whole and with some crisp carving of swags and drops, showing how MP2 would have been. This could be useful if areas are to be recurved or modelled/ carved. The raised letters of the top moulding of M3 are softened in profile, but still just about reads as three dimensional, aided by the sign-writing. (Figure 36). For full details of condition of MP2 see annotated drawings. Only significant or typical comparative details are outlined here.

Figure 36
MP3 Crisp detail

Figure 37
MP3 Raised letters discernable

MP1 is badly eroded on two of the swags in particular and the other two are heavily eroded on the upper surface but detail survives beneath.

Figure 38
MP1, cyma still readable. Large repair to one area approximately 20cm

Figure 39
MP1 areas of spalling and loss

Figure 40
MP4. The carving is in similar but better condition than MP1

For full details of condition of MP4 and MP1 see annotated drawings. Only significant or typical comparative details are outlined here.

3.1.1 Plinth bases and uncarved stone

There have been major repairs to the lower areas of the base of all 4 plinth bases, where render has been applied in large swathes. These have been made with harder, less permeable materials, in several campaigns of repair. In some places these patches adhere well to the stone, however, where water has been able to penetrate behind, the stone has eroded badly. This is particularly evident in Monuments MP2 and MP4 (Figure 41 and Figure 42). MP1 and MP3 show smaller areas of similar render repair (See markup of repairs all elevations). In places the render is still firmly attached to the monument and may do more damage to remove it than in leaving it, however it is difficult to determine how much moisture is trapped behind these areas. Due to the failure of pointing at around all joints, in particular that between the pavement and the base, water ingress will be contributing to this issue. Although not obviously associated with damaging repairs, MP2 has one large masonry block in the centre of the trio of mouldings running around half of the plinth's circumference which is particularly prone to erosion, with a network of fissures running horizontally with associated loss of stone surface along the fissures (Figure 43). This may be what lies beneath the remainder of the render.

Figure 41
M4. A large area of render repair about 7mm thick all around the bottom two tiers of moulding with significant delamination behind. Edges of the render is adhering well elsewhere. Pointing between the bases and the pavement will be allowing liquid water to penetrate beneath.
M4 Crudely cut stone to fit railings

Figure 42
MP4. Elevation 1south facing: as above

Figure 43
MP2. Two schemes of render repair on the base sections, adhering strongly, one grey (left side of repair) and rough in texture one reddish and smooth (right side of repair). It is perhaps an indication of why the blocks below were rendered. This render repair runs all the way around the base at this height.
Above the render is the block with fissures and cracks which continues around half the circumference of the base.

Further condition notes to upper and lower bases as marked on elevations: Appendix E

3.1.2 Overall

Fills (all harder material) and areas of erosion are as marked on all elevations and unless of particular note are not commented on here. Moulding tops are particularly prone to erosion. Surface of Shafts (uncarved) are eroded in streaks due to water run-off, some plinths more so than others. See Appendix E for notes to accompany the marked up elevations.

MP4

Displacement of this monument is described above (Figures 22-24). Wall displacement has caused large cracks with more than one iteration of infill with mortar fills to crack. Large mortar fills and loss to stone outlined above (Figure 44).

Figure 44
MP4

Elevation 1

- Loss between displaced plinth and wall (by coping)

Elevation 2

- Large stone loss: crudely removed to accommodate the installation of railings (Figure 44).
- Metal strap which supports the railing is attached with a bolt to the plinth. It is un-painted and rusting. There is a small rust stain but no sign of damaging expansion as yet.

Elevation 4

- 2 x corroding metal brackets

3.2 STRUCTURAL CONDITION STATUES

Despite the many cracks and repairs to the statues, their structural stability appears largely sound. The full extent of the condition of the statues are mapped on the annotated drawings and are too many to list and illustrate here beyond typical or notable examples. They should be consulted for understanding the full extent of the condition of individual statues.

3.2.1 The armatures

The installation of the statues on the plinths and possible armatures within are not fully understood. Inspection with the stud detector and cover metre picked up readings suggesting that a 40mm iron bar runs up the centre of each group of Graces, either partially or fully. Neither method of metal detection was able to penetrate to the depth of a possible bar in the centre due to the fluctuating shapes of the clothing. The top of the ferrous bar can be seen from above at the intersection between 3 figures where the cement covering has cracked and fallen away in several cases. It does not appear unduly corroded. Two small droplets of lead were observed on the surface of two statues which could be associated with the fitting of the central bar althoug there is no evidence of it being used to cap the top. Strong signals were picked up on the back of two heads MS1.1 and MS1.3 showing repair. It is possible this signal was being picked up by the proximity to the central bar but this not thought to be the case. The tests did not show if the metal 'armature' extended into the surbase and plinth. There appear to be no further armatures except those visible in the replaced hand on Monument 3 Figure 6.

View of the top centre of each set of statues between the heads. Showing the only sign of metal armature beyond one repaired hand. M3 andM4 show minor signs of expansion where the cement capping is cracked

Figure 45 MS1 (left)

Figure 46 MS2 (right)

Figure 47
MS3 (left)

Figure 48
MS4 (right)

Figure 49
MS3.1. Ferrous armature for the hand associated with repairs

3.2.2 Cracks

There is major through-cracking to MS3.1 A large line of cracks run from top to the bottom of the statue, with multiple cracks to the face, head and torso as well as the full length of the left leg. The head appears at first to have been pieced together from fractured elements. One might associate this with the presence of corroding and expanding ferrous armatures within. The central iron bar of MS3.1 shows some cracking to the top mortar cap of all four statues, outwardly it appears fairly uncorroded at the top where it is visible. There are cracks which can be seen in the aera between the heads, which show there may have been some expansion, of the iron. MS3 shows the most disruption in this area but it does not seem significant enough to have caused the cracking seen. All the cracks appear stable. Since there is no armature detected in the leg and it sounds hollow when tapped as one would expect, this is highly unlikely to have been caused by expansion of an armature. It is interesting to note that MS4.2 also has a crack, albeit hairline, in the same place on the forward leg. This may be a weakness in the cast either caused by a joint between cast sections,

and/or a very think layer of terracotta applied inside the mould creating uneven stresses within the shape.

The cracks on MS3.1 may have started by thermal expansion and contraction of the terracotta in fluctuating weather conditions, cracking the sections of the cast at its weakest points, mainly the joints between the cast sections. The cracks would then have been exacerbated by freeze and thaw cycles affecting the water being trapped in biological growth and debris caught in the cracks.

The cracks on the face of MS3 are very regular - this may possibly show a pattern of separate cast shapes which would have been joined with clay slip during manufacturing. This could since have been preferentially eroded, although this would mean the head was cast in more sections than usually needed. The crack pattern could alternatively indicate stress fractures created in the kiln from differing thicknesses and shapes of the clay. The cracks at the back of her head are less ordered. This could be representative of areas where separate pieces of clay were been pressed into the moulds, creating less well bound lines. Whatever the reason, any cracks will have been excacerbated over time by repeated thermal expansion and contraction and freeze thaw cycles.

Figure 51
MS3 figure 1. Detail of face cracks and large crack running from top to bottom

Figure 53
***MS3.1** Possible casting sections or tension fractures, forced apart at their weakest point by thermal expansion and freeze thaw cycles over the years*

Figure 50
***MS3.1** crack running from head through torso ad fingers*

Figure 52
***M3.1** Back of same head. Cracks seem random. Multiple repairs*

Cracking around the heads and necks of the statues is fairly widespread particularly where the heads have been replaced. Only MS4 has a full set of 3 original heads, none of which are cracked. There is no structural movement on any of the sculptures except at the base of the neck MS1.1 and on one area of floral addition on M4 which was moving and removed for safe keeping.[10]

Area of movement MS1.1

Figure 53
The crack all around the neck is moving. Other deep looking cracks are stable. The softness of the repair is shown clearly in the erosion of the crack edges.
The beads around her neck are of the same campaign of repair as the face. It is not known if they replicate originals as there are none present. The gaps may represent subsequent loss of original or loss of repairs.

Figure 54
MS4.1 Removed loose section

Figure 55
MS4.1 area from which loose section was removed

3.2.3 Losses and compensation

The most obvious losses/ replacements are the 4 replaced heads and the back of a fifth. They have been replaced with casts made of different materials and colours. It isn't known when any of these repairs were carried out, or why the heads were lost in the first place, but the necks are obviously vulnerable areas, with many layers of repair. No work has been done on ascertaining from where the moulds were taken, but they could have been taken from the original heads

[10] This is currently being kept by the property manager in his flat for safe keeping.

which may then have been in better condition. The repairs are an important part of the history of these items and decisions will need to be made about how to treat them for example: to repair or replace, to paint them to match terracotta, paint overall in order to improve the reading of the statues, or leave them as they are. Other structural losses include toes, fingers, hands, noses and pieces of foliate modelling including the extant section of M4. mentioned above. These areas are annotated on the 3D drawings in red, showing repairs. There are very few areas of loss which have not been compensated or which are readily visible. Due to the extensive pollution and biological growth on the surface it is possible that more will be revealed after cleaning.

Several campaigns of repair to discrete areas of loss are readable through the different types of mortar and cement used.[11]

Four replaced heads overall and some significant repair to the back of M3.1

Figure 56
MS1.1
Soft grey cement

Cast taken from remaining statue? If so from which? This head is important as it may have been replicated before the original became eroded and be the closest in original shape to any of the existing.

The neck seems too long in it is generally larger than the other heads. It is rather clumsy looking.

[11] The separate campaigns of repair have not been mapped due to time restraints and the practicality of this information for treatment.

Figure 2
MS1.3 Thought to be hard terracotta. Pale, smooth textured. Cracking and delaminating significantly

Major losses of detail.

This head is smaller than the other heads, partly due to erosion and partly it has perhaps shrunk in the kiln if it was a mould taken from an existing head, then fired? This is made more obvious by the larger scale and proximity of the grey, MS1.1 head. If taken from a cast, it is difficult to assess which head it may be cast from.

Figure 58
MS2.2 Grey sandy material. Not thought to be harder than the surrounding terracotta

Significant hard and dry lichen growth which will be contributing to the erosion of this repair.

The shape of this head is in proportion with the body.

Figure 59
MS2.3 Distinctively large aggregate in pale binder

Significant hard and dry lichen growth which will be contributing to the erosion of this repair.

The shape of this head is in proportion with the body and details remain clear.

Figure 60
MS3.1

Large area of the back of the head have been repaired with no decorative detail added. Badly cracked. The original front of the head survives but is very cracked.

Figure 61
MS4

No replacement heads, all originals well attached

Many of the fingers are cracked and have been lost but largely replaced. The full extent of these losses is mapped on the annotated drawings and are too many to illustrate here beyond typical or notable examples. The extent of repairs and the variety of colours and textures that they create has made the figures read as fragmented, making them less aesthetically pleasing overall.

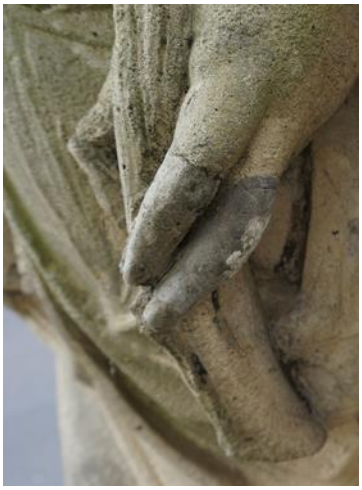


Figure 62

MS2.1

Figure 63

MS2.2

Figure 64

MS2.3 Toes repairs and loss

Figure 65

MS3.2 toe repairs

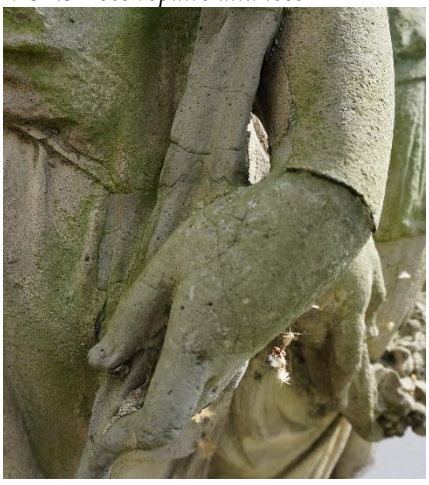


Figure 66 & 67

MS1.2 damage to hand and foliage stalk, also arm repair. Ill-fitting but stable

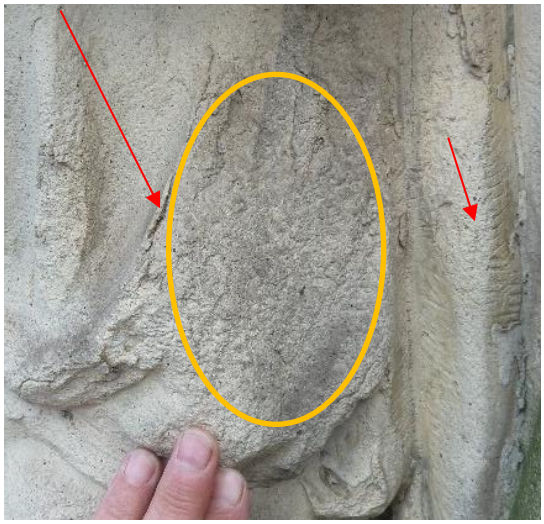
3.3 SURFACE CONDITION STATUES

3.3.1 Erosion

There have been losses of detail of the statues, particularly to finer projecting detail such as the heads and faces which have borne the brunt of the weather and the statues are continuing to deteriorate.

Erosion particularly discernable in the pathway of water run off overall, where the fire-skin and tooling detail has become partially or completely lost.(marked in orange dots on the mark ups) The texture of the eroded terracotta is coarser than the slightly flatter, glassier surface texture of the fire-skin which has no, or fewer loose particles of aggregate.[12] The surfaces are not generally friable as on only some aggregate material is loose on the very surface of the otherwise still hard material.

Some areas are delaminating. This is shown as orange hatching on the 3d images. Here, larger areas of terracotta are spalling from the main body where small cracks have allowed water in. These cracks may be started and then exacerbated by the growth of biological material and the presence or debris of insects and the expansion of water during freeze, thaw cycles which push the surface off. This can cause large areas of loss to happen at once. This can be seen in the head of M1.3 above and examples below.



[12] The fire-skin is the outer skin of the terracotta which is fired at a higher temperature than the remaining thickness of the terracotta. The result is that the particles are more closely packed. This creates a skin which is harder and more water resistant than the underlying material. Once this is damaged, the softer substrate becomes exposed and erodes faster.

Figure 68

Intact areas of fire-skin, arrow right, clearly visible here with erosion surrounding them, arrow L. as well as spalling in the area (circle) of missing fire skin. Very unstable

Figure 69

Larger area of cracking with the fracture running around an area which will delaminate

Figure 70

MS3.2 Significant erosion of surface seen on all heads. All fire-skin gone. This one unusually shows no crack around the neck.

Figure 71

MS1.1 General pitting of the fire-skin is very common over the surface of all figures. The fire-skin in places is very rough and difficult to distinguish from where it is partially lost

Figure 72 (left)

MS1.3 This replacement head of a hard material thought to be terracotta. It is badly cracking and spalling. The whiter area of the face shows where the rain washes down the surface.

Figure 73 (left)
Holes left in the surface where aggregate has been washed from the surface of the terracotta leaving various sized holes

3.3.2 Biological Damage

Bird guano is present on the statue heads.

Lichen and algae cover swathes of the surface [13] organic growth, Lichens, (composite organisms of algae and fungi) are known to contribute to the deterioration of stone; this is referenced in various publications. The impact of lichen growth – from the way they grow and are attached to terracotta surfaces - is not so well known or published.[14] There is potential for lichens to cause decay (increase surface porosity) by chemical-physical effects.

This is particularly evident on Monuments 1 and 2 which are beneath and in the shade of the large trees. Here the lichens and moss are abundant and moist and the greening from algae extensive.

On monuments 3 and 4, the lichens are drier, harder and blacker however, cleaning tests suggest that this can largely be removed. M4.1 shows some yellow staining on areas of the drapery. It is not known if this is staining from biological growth, or from constituents within the terracotta itself, or some other accretion. In deeper crevices, moss and seed debris have settled and hold moisture against the surface. The issues caused by biological growth, insects and plant debris are outlined above.

[13] visible on the images without annotation which are needed to show it.

[14] NHM Cleaning trial report, Catherine Woolfitt/Mark Fineberg for Avanti Architects

Monument 4 has some residual matter from the roots of a Virginia Creeper growing on the wall on a small area. This can scar the surface and pull off fragile areas if removed.

Figure 74
MS1 Algae greening and lichen growth under the trees

Figure 75
MS2 Dark areas more likely to stain

Figure 76
MS4 Yellow staining of unknown cause

Figure 77
MS4 creeper debris clinging to the surface

Figure 78
MS4 further creeper debris

3.3.3 Pollution damage

Black pollution is deposited over the surfaces and defaces the plinths and statues. This is identified with green hashes on mark up images (Appendix E) and is clearly visible in the images without annotation.

There is evidence of heavy atmospheric soiling deposits on terracotta typically formed in areas saturated by rainwater and are insoluble in water, which makes their removal difficult. This proved to be the case in the cleaning trials, where atmospheric dark (grey-black) soiling deposits could not be completely removed with any cleaning process tested. It is likely that the dark soiling contains a combination of organic soiling and particulates deposited from the atmosphere including those derived from fuel emissions. Across the elevation the extent and bonding of soiling (degree to which soiling has permeated surface pores) varies widely.

Cleaning tests suggest that removal with chemical poultices leaves a pink stain behind. Further tests and trials will be needed to ascertain how to remove these stains more satisfactorily.

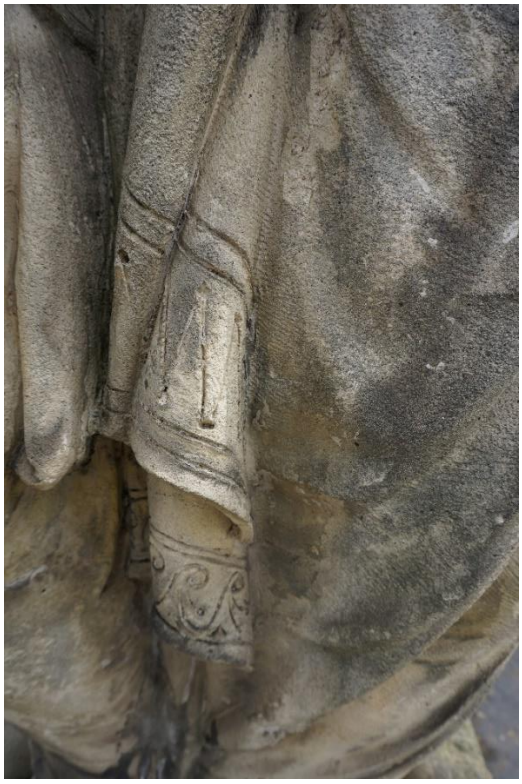


Figure 79
MS2.1 environmental pollution deposit.

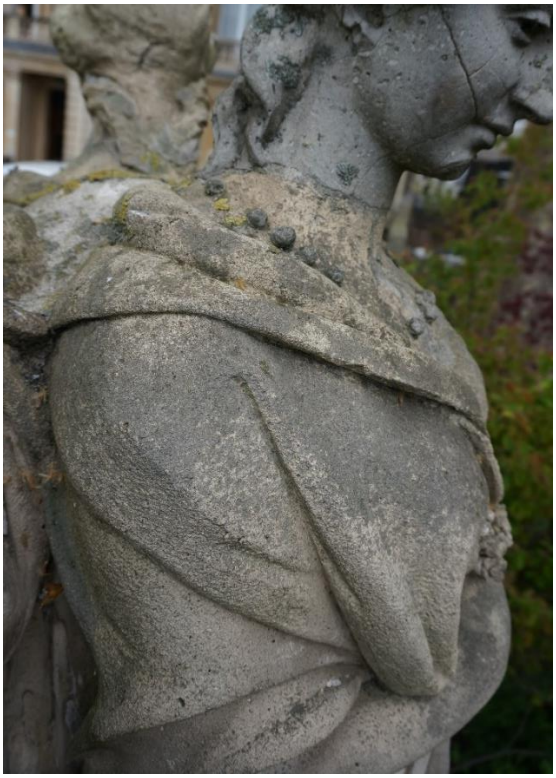


Figure 80
MS1.1 Possibly a mix of dark pollution and biological staining.

There are a number of specific patches exhibiting very dark pollution effects, these are most dramatically seen on the right proper leg of MS1.3. Patches of this kind are associated with cementitious fills and are assumed to be sulphation crusts.[15]

The same darkening is also associated with paint remains in the undercuts and sheltered areas of the both the statues.[16]

[15] Calcium carbonate is the principal constituent of limestone as well as cement. Acidic sulphurous gases, released by the combustion of coal and other fossil fuel, expose the carbonate to chemical reaction. The resulting calcium sulphate and carbon crystals bind to sheltered areas of the affected medium in a dark crust which can be very thick and creates a non-porous layer preventing the medium below from breathing. Calcium carbonate is not the principal component of terracotta and this is why these thicker black deposits are associated only with the patches and paint presumably containing carbonates.

[16] Paints can contain lead carbonates from lead in the paint and they also use calcium carbonate in their make-up, particularly if the paint surface is a limewash/whitewash.

Figure 81 & 82
Sulphation associated with fills. MS3.3 (left) subject to cleaning trials. This has proved difficult to remove in trials. The fills themselves don't seem to be causing any harm to the object and may have a surface similar in permeability which allows them to be compatible.

3.3.4 Paint

The statues have been painted several times in the past and remains of thick layers of buff/ white paint are still visible in many undercut areas as well as some thinner remains on the flat surfaces. It is known that they were washed, probably pressure washed[17], about 20 years ago, and this would have removed a large part of any that remained. The remains are most visible on MS4 but exist in the crevices of all of the statues and clog some of the decorative detail and the signature.

Paint analysis shows that the earliest coatings on the terracotta figures were stone-coloured limewashes. It was not possible to tell if any of these limewashes date back to 1880, but four, possibly five, lots of limewash were found in one sample, and the practice of coating the statues in this fashion must have extended over a long period.

[17] Pers. Comm. with resident

At some point in the second half of the twentieth century the early coatings must have been largely cleaned off, because their remains were only found in four of the eleven samples taken from the figures.

The cleaned terracotta surface of the statues was then coated with an organic layer presumably applied as a sealant. In the cross-sections, that layer appears brown but this may be partly due to dirt. The sealant worked its way down between the remains of early layers.

The statues were then painted with a buff-coloured alkyd paint. The main material in this paint is titanium dioxide white, a pigment first widely used for paints after the late 1950s/early 60s.

Final paint scheme on Statue

Following repairs, the statues were repainted, this time with an off-white alkyd paint containing silicate particles to give it a rough texture.[18]

It is not known if the statues were originally painted when installed, or only later in their history. Further paint analysis may help ascertain this. From an inspection with the naked eye and also magnification with Optivisors it appears to be that the first layer of paint has been applied over the black pollution layer. This would suggest that the motive for painting them was to improve them aesthetically and brighten them up. It would also have allowed the mis-matching coloured repairs to be assimilated.

Figure 83
Paint remains, base of statue MS4

Figure 84
Paint remains in the cracks of applied detail, MS4

[18] Paint Analysis Report, Catherine Hassall for Cliveden Conservation. May 2021. Full report contained within Appendix A

Figure 85
Sulphation associated with paint in sheltered areas

Figure 86
Paint clogging the detail

Figure 87 [19]

This photograph appears to show the statue painted. Note the missing railings and the displacement of the plinth from the wall. The photograph is not dated but cars, a bike, plastic traffic cone and the lack of railings suggest that it was taken within the last 50 years.

[19] Image from Camden Libraries and Archives

3.4 SURFACE CONDITION PLINTHS

3.4.1 Pollution

Like the statues, the plinths have an overall layer of black pollution from fossil fuel deposits which have penetrated the stone. There are also sulphation crusts particularly on the undercuts (Figures 88 & 89).

It is not easy at first sight to determine what is atmospheric pollution and what is dark biological growth and staining. Due to the easy loss of the surface of the stone, some of the black pollution and other staining/ deposits have been washed away with the surface of the stone as water runs down the monument, leaving the surface patchy and streaky. Despite this much remains.

Cleaning tests show that washing with detergent and water by hand can remove much biological growth and dirt deposition, along with some of the loose stone surface, but the black environmental pollution and the sulphation remains quite stubborn and, like the statues, a pink stain can remain after cleaning.

The sulphation is thick on many of the undersides, creating a hard, water resistant layer. The stone behind this can often be delaminating.

Figure 88 & 89
Sulphation crusts on the undersides

Figure 90 & 91
Atmospheric pollution and biological growth and insect debris

3.4.2 Biological damage

Except where the rain has washed it away, the bases are largely covered with green algae. Moss can be found in cracks and joints and lichen on the upper moulding. This is likely to hasten the decay of the surface. MP4 shows significant damage from the roots of a creeper which have left a series of marks etched into the stone. Some dead roots are still firmly attached after the rest of the creeper has been removed.

Figure 92
The creeper has left small round dots over much of the surface of the plinth on the south side. It may even be responsible for the giraffe skin type of pattern where the plant has plucked away the surface when being removed.

Figure 93
Creeper sucker pads/roots adhering to the stone

3.4.3 Paint

It is thought that the body of the plinths has never been coated. No trace of any limewash was found in paint samples taken from the plinths.

The letters painted on the top moulding however have several iterations of overpainting. Currently there are buff and grey painted letters with a black shadow. Paint analysis picked up twentieth century metallic 'gold' paint with black for the shadow, however, visual inspection showed that there were more schemes than this. There is evidence of a yellow layer, possibly a base for gold leaf. One small particle of gold was seen and is not thought to be confused with a later metallic paint from the twentieth century, but this was not picked up through the analysis. There are at least two black layers present. Clearly several crumbly samples did not survive cohesively enough to be mounted and analysed. The earlier, brittle paint layers were difficult to sample. To the eye, the paint stratigraphy is confusing and needs further analysis.

4.0 CLEANING TESTS

Cleaning tests were carried out to establish favourable means of cleaning the limestone and the Terracotta as far, as safely and practically as possible without over cleaning and causing alteration or damage to the different underlying substrates.

The tests were aimed at finding suitable methods for cleaning organic soiling (lichens and other growths) as well as atmospheric soiling and sulphation which are more difficult to remove. Tests were limited due to time restraints.

The materials trialled for organic cleaning of both substrates were:

- Water used with nylon dental brushes
- 5% prediluted Synperonic A7 in deionised water. Used in conjunction with denture brushes.

The materials and methods trialled for removal of pollution soiling and sulphation were:

- Complex Pastes 1-3. Manufacturer: Restorative Techniques
- Monumentique, manufacturer: Restorative Techniques
- 10% ammonium carbonate poultice with Sepiolite and Arbocel®

The tables of results for sets of tests on both the limestone and the terracotta showing methods and dwell times used can be found in appendix B. The discissions and conclusions drawn for separate substrates are also found there.

5.0 RECOMMENDATIONS

5.1 SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The gate piers and statues are deteriorating quite rapidly as a result of their constant exposure to pollution and weather. Previous repairs to the plinths and statues have created a patchwork of textures and colours through the use of different materials at different times, creating a very uneven and scruffy appearance overall. The paint which may once have been applied to united the surface and cover pollution staining, is now lost with only traces remaining in the crevices.

The core structures of the statues and plinths appear stable, despite the overall displacement of M1. However, there is much surface damage, particularly to the limestone, which renders the structure of the carved detail extremely unstable and subject to further loss on all plinths. Urgent cleaning, consolidation, filling and capping repairs are required as essential treatment, to attempt to stabilise and to slow down the rate of loss. It should be understood that there is no way of stopping the ravages of time, only a selection of tools used to their best advantage to help slow down this change. With this in mind, a maintenance cycle is important in preserving the statues.

The statues are less vulnerable than the plinths but are still suffering from ongoing loss of fire skin and erosion of surfaces which have already lost the fire-skin. This is evidenced as loss of volume and detail, particularly to the heads as well as spalling areas and repairs. The cracks, sometimes significant, particularly on MS3.1 do not appear to be moving but may be allowing ingress of water and debris and the cause of this cracking remains unclear. Slowing the rate of erosion and spalling is the most essential treatment needed.

Both plinths and statues have had several phases of repair and restoration. The restoration to the plinths is causing further and faster damage to the surrounding areas due to incompatible repair materials. These previous repairs need to be removed to prevent further erosion, but the extent of this intervention should be balanced with the damage that the removal in itself may cause. The pointing is compromised and should be renewed.

The statues also have had many replacement details. These replacements are generally not causing further erosion as the repairs are usually softer than the original materials. However, they are in themselves eroding and becoming unstable, revealing in one instance rusting armature. Repair joints are deteriorating. The head of MS1.1 is moving at the neck joint. Removing this

could provide a good opportunity to aid understanding of how the statues and repairs are fixed and give some further clues as to what may be happening or have happened regarding the large cracking of MS3.1. Key decisions will need to be made as to which, if any, repairs should be removed/remodelled and whether applying a unifying surface coating or a partial coating to miss-matching areas is desirable or feasible. If so, to determine the most suitable coating for the terracotta, although compatible options are limited. The plinths could benefit from a lime shelter coat, or partial coat to help protect their very vulnerable surface.

The surfaces are dirty and stained overall, with insect and plant debris caught in the interstices and much biological growth overall. This needs to be cleaned to prevent moisture being held against the surface and to prevent a possible increase in porosity of the surface due to chemical and physical nature of lichens and algae and creeper adhesions. Cleaning tests show that removal of much of this surface dirt is successful with water, detergent and brushes, however, some lichen staining may remain along with the insoluble pollution products. In addition, without extreme heat or biocide, the organisms will not be killed and it will be faster to regrow. (It will grow again any way but established roots etc will be lose their grip). Use of biocide should be considered but bearing in mind the proximity of valued plants, particularly in the Royal College of Physicians collection.

The dark pollution deposits are aesthetically disrupting and could be lessened. So far tests have not shown that the pollution staining is possible to remove completely or evenly. Further tests will be needed to establish if further improvement can be made. The thick sulphation crusts on the plinths are more damaging than the lighter black deposits and will have created an impervious skin which should be removed to prevent further erosion of the limestone detail. Tests so far show that both can be lessened, but further tests are needed to establish how much is possible, and what level of clean is realistically needed on each area, bearing in mind that a coating may be the chosen finish.

Paint

The paint that remains on the statues is limited to crevices and small patches. It provides historical evidence about the statues in its stratigraphy. It is also clogging some of the detail and appears to have sulphation on the surface in places. This could be removed or reduced. It would be good to keep an area of paint with the full stratigraphy for future understanding of their history, but beyond that it is thought that there is no impediment to cleaning back to the underlying surface. If recoating, a sound surface will be required.

The painted lettering on all four plinths has been repainted several times, has losses and is flaking in places. Discussion will be needed to decide what treatment should be given to these surfaces about the level of removal and a new paint scheme to make them more readable and retention of the existing paint layers. Further paint analysis is suggested to understand the schemes better to help with informed decision making.

5.2 STATUES AND PLINTHS

5.2.1 Cleaning recommendations

Organic soiling

Areas of heavy organic soiling (lichens and other growth) may be difficult to remove completely.

Biocide 1 week prior to cleaning to aid removal and delay regrowth. (To be discussed as above)

Essential**:**

- Clean all surfaces using hot water with nylon brushes, melamine sponges and liquid soap (Vulpex, yet to be tested) or Synperonic A7). Use of superheated water at low pressure could be useful. Areas around lettering and vulnerable, loose, spalling sections should be carried out with extreme care using brushes
- Rinse with hot water, soft nylon brushes/ melamine sponges. Use of dry steam[20]may help clear the surface without causing as much erosion as brushes. Used with use of controlled pressure and working distance from the surface and monitoring the surface for any damage). Thermatech would also be useful in the provision of hot water for washing by hand.
- Remove creeper pad/root debris attached to MP4 and MS4 mechanically with hand tools if washing (and biocide) have not dislodged them.

Atmospheric soiling

Heavy dark soiling deposits on terracotta and stone are insoluble in water which makes their removal difficult. Methods trialled were only partially successful. Further tests are recommended. Across the objects, the extent and bonding of soiling varies widely, therefore cleaning needs to be flexible to adapt to individual areas and to avoid overcleaning and surface damage. The level of

[20] Thermatech Superheated Water Washer-Restorative Techniques

cleaning may be less if the statues are to be coated but removal of the pollutants would aid adhesion of the coating layer.

- Options could include use of all three chemicals tested where suitable and practical subject to further trials, particularly for Ammonium Carbonate to address pink staining.
- Super-heated water/dry steam could be employed with tested parameters on the statues to aid pre wetting and chemical clearing. Frequent inspections of the surface would be needed to ensure there is no damage to the surface of the terracotta. Whatever mechanical measure is used on the limestone is likely to remove some surface.
- Abrasive pencil machine, the nozzle aperture of is 1.2mm diameter and may be useful for removal of smaller areas of stubborn pollution staining and sulphation.

Heavy black pollutant- sulphation

- Chemical poultices: 10% ammonium carbonate with sepiolite and Arbocel and/or fumed silica (the latter not tested), several applications will be needed and cleared with dry steam or water as appropriate. Ensure no staining at poultice edges. Monumentique paste had good results too in some areas and could be part of the tool kit.
- Airbrasive pencil with 1.2mm nozzle could be useful for the stubborn areas and crevices, cleared with dry steam[21].
- Laser cleaning could provide an option for heavy pollution
- Paint removal of thick curling crusts of paint should be removed mechanically with scalpels and small tools to ensure adhesion of any added paint layers. Thought should be given to how much of the remaining paint should remain in situ as a historical record (leaving paint as a record is more reliable and futureproof than paper records alone, particularly as there is no archive.) There may be a need to use limited chemical cleaning, particularly on the splashes of modern black paint from the railing painting.

5.2.1 Treatment

All treatment should be carried in appropriate environmental conditions for the application and tending of the lime in particular. For this reason, a permanent scaffold is required rather than mobile tower and ladders etc.

[21] In consultation with Jamie Fairchild of Restorative techniques. Further conversation would be beneficial. Delivers soft abrasive at an oblique angle creating a vortex and

Scaffolding should have Monerflex sides and a roof to ensure that more reliable atmospheric conditions can be met.

Treatment options are presented below, ranging from 'essential' upwards numerically from essential and less costly, to fuller treatments and (usually correspondingly) more costly. All repair mortars and coatings subject to tests before treatment.

Essential (i.e., no options)

1. Pure conservation only

2. Conservation and an element of restoration

3. Comprehensive restoration

Plinths

Consolidation

Materials subject to tests:

- Consolidate limestone surfaces as far as possible using appropriate nano lime CaLoSil consolidants and grout solutions. Materials subject to tests.
- Possible use of Paraloid B64 as holding repairs where appropriate
- Employ 'dental repair' style filling using lime-based mortars to match surfaces, of wider cracks, fissures in the limestone and the terracotta to create a cohesive surface to match the surrounding stone as far as possible.

Removal of added materials Plinths

Essential:

- Remove hard repairs on the limestone carving, plinth shaft and upper base using sharp chisels. Some loss of limestone and carved detail is sadly inevitable.
- Removing sections of render/ deeper fills on the lower plinths presents issues for onsite decision. If more damage is likely to be caused by removal than to leave, then cut back to stable material and fill and render using lime-based mortars to match the stone in colour and texture as accurately as possible without compromising its function.
- Remove compromised pointing with sharp chisels and rake out pointing on all joints including the pavement and repoint in lime-based mortar
- Remove rusting iron railing fixings on wall abutting plinth MP4 and the section attached to the NE side of the shaft (elevation 4) and recreate alternative aesthetically acceptable fixing if needed.

1. Remove all render and degraded stone including fissured block on MP2, cut back to sound material in preparation for masonry repairs.

5.2.3 Repairs

Essential:

- Repoint joints in lime-based mortar
- Replace pointing down both sides of crack between wall and plinth (MP1 and MP4. Repoint in lime-based mortars and fill large gaps where coping meets the wall. MP1 and MP4.
- Fill / model small losses to stone such as shell holes and eroded edges with hydrated lime-based mortar.
- Cap consolidated cracks and flakes with lime-based mortar to prevent further liquid water ingress
- Rebuild high points of carving using lime- based mortar modelling, in particular knows and patera on the swags to build a somewhat sacrificial shelter for areas of high rain water erosion below.
- Fill crack around section of fissured convex base moulding M3 (elevation1). Drill, and fix with stainless steel threaded rods and polyester resin and fill hole and crack.
- Remove rusting iron railing fixings on wall abutting plinth MP4 and the section attached to the NE side of the shaft of MP4 (elevation 4). Fill losses. Recreate alternative aesthetically acceptable fixing *if needed* with stainless steel fixing.

Further Repairs with Options

1. Beyond consolidation filling, leave the surface of the stone with no further repairs.
2. Carry out mortar modelled repairs to re-build up shapes to match surrounding areas and bring back the line of the carved structure (clear agreement about this level required as it is so open to interpretation). Rebuild with use of Ceramic Ts and layers of appropriate mortars, possibly hydraulic for base coat with top coat / modelling in hydrated lime-based repair mortar to match the surface texture and colour as far as possible.
3. As above but build up a more significant suggestion of the detail where known, e.g., repeated detail such as the cyma decoration and details of cartouche surviving on MP3 to bring back its purpose of announcing the entrance to Cambridge Gate. Model with materials and methods as above.

4. Cut right back to the line of the shaft and recurve all swags and sections. The carving would not be amended to resemble eroded stone and would be very visible. Re-carve cartouche. This option is not recommended. Replace plinth base masonry where cut back to remove all degraded stone and cement repairs replace with new masonry.

Loss to stone around railing MP4

1. Leave of loss surrounding railing end MP4 (elevation 1) and point.
2. Rebuild using mortars
3. Cut stone to receive new masonry blocks to reinstate the losses.

5.2.4 Surface Treatment

1. No application of a shelter coat

2. Apply a shelter coat to the plinths to protect the surface and provide a sacrificial layer overall. Partial shelter coat could be considered. Shelter coats are by their nature sacrificial and need to be maintained on an appropriate maintenance cycle. They can help to homogenise the appearance of the stone and repairs. They can clog carved detail with frequent applications. Historically this does not seem to have been applied

Essential: Consolidate paint of lettering MP2 and MP3

1. Remove clumsily applied black shadowing

2. Remove clumsily applied black shadowing and repaint/ regild lettering dependant on paint analysis results.

5.3 STATUES

3.3.1 Treatment recommendations

Consolidation

Materials subject to tests:

- Consolidate terracotta surfaces as far as possible using appropriate nano lime CaLoSil consolidants and grout solutions. Materials subject to tests.
- Possible use of Paraloid B64 as holding repairs if it will enable other treatments to be carried out without loss where appropriate
- Employ 'dental repair' style filling using lime-based mortars to match surfaces, of wider cracks, fissures in the limestone and the terracotta to

create a cohesive surface to match the surrounding terracotta as far as possible.

Essential repairs

- Remove damaging repairs and replace losses using lime mortars.
- Carefully remove head of MS.1 Inspect and record the interior and create an appropriate means of refixing it or a replacement. Affix and fill joint
- Remove hand of MS3.3 with its rusting armature and replace (see options below)

Repairs to previously repaired/replaced areas

As above and/or:

1. Leave stable repairs, even if unsightly, fill cracks/joints where needed. This would include leaving in situ all replacement heads and hands where not unstable.
2. Remove some or all previous unsightly repairs, those poorly modelled/cast or badly degraded. Investigate joints where fixed, document findings and create new fixings where needed. Remodel or recast smaller elements such as fingers and toes in mortar. Take moulds from existing original features where possible and make casts in new material such as Jesmonite. Affix and fill joints.
   Remodel replaced areas such as heads where an appropriate example cannot be cast (e.g., due to the differing requirements of the aesthetic composition). Take a mould and cast in new material such as Jesmonite. Affix and fill joints.

3. Remove some or all previous unsightly repairs, those poorly modelled/cast or badly degraded. Investigate joints where repairs have been fixed, document findings and create new fixings. Remodel or recast smaller elements such as fingers and toes in mortar. Remodel replacement heads and hands and cast in fired terracotta to match the original. Affix and fill joints.

When making decisions about remodelling and recasting significant elements such as the heads, it is important to note that these existing repairs are part of their fabrication history and as such should be considered carefully before removing and replacing them. The cast replacements will have been taken as moulds from the objects at a time when they were all less eroded than they are now. Thus, they may provide a clearer representation of the original artist's intent than the remaining original material itself. Unlike a museum, where the

heads might be catalogued and kept in storage, this is not a realistic scenario here and any removal is likely to lead to total loss with the exception of the laser documentation already carried out.

Surface treatments

Essential: Remove paint on statues from incised decoration and signatures using hand tools

1. Reduce elsewhere to produce a stable surface for an applied coating

2. Remove all paint from statues with hand tools and possible use of chemical removal in some areas if agreed by all parties and subject to methods, excepting a small area to be kept for historical reference.

Options:

1. Leave statues uncoated

2. Apply a coating possibly of mineral paint. (This would not be reversible or easily re-treatable with another method) or possibly a lime wash with additive to increase adhesion (less stable but in keeping with previous treatments.

3. Apply a coating to mismatching repairs to reintegrate them with the original terracotta.

5.4 ONGOING MAINTENANCE

Monitor the movement of the wall and the forward displacement of M1. This could be done with tell tales or visually and by measurement of cracks in several places during a systematic maintenance programme.

Create a regular inspection and maintenance cycle to ensure that fills and joins remain sound, to reapply shelter coat if/when needed and to remove biological growth and collection of debris.

Consider repairs to the soft Limestone of the walls which are part of the architectural ensemble and also form part of the grade 2 listing. The stone is eroding just as the plinths are.

LIST OF APPENDICIES

Please Refer to Separate Documents for the following:

A Paint Analysis Report

B Cleaning test results

C Karsten Tube Tests

D Cover Meter Survey

E Photographic Survey