

**ARCHAEOLOGICAL
BUILDING RECORDING AND
WATCHING BRIEF OF
THE ROOF LANTERNS AND
LEADED FLAT ROOFS AT
KENSINGTON PALACE,
PALACE AVENUE,
ROYAL BOROUGH OF
KENSINGTON AND
CHELSEA,
W8 4PU**

SITE CODE: KEN29

PCA REPORT NO. R12405

MARCH 2016



**The Roof Lanterns and Leaded Flat Roofs at Kensington Palace, Palace Avenue,
Royal Borough of Kensington and Chelsea, W8 4PU**

Archaeological Building Recording and Watching Brief

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Site Code: KEN 29

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Client: Historic Royal Palaces

Ordnance Survey National Grid Reference: TQ 25844 80027

PCA Report Number: R12405

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WATCHING BRIEF

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1 NON-TECHNICAL SUMMARY

- 1.1.1 Pre-Construct Archaeology Limited (hereafter PCA) was commissioned by the curatorial department of Historic Royal Palaces (hereafter HRP) to undertake a programme of archaeological building recording and monitoring prior to, and during conservation works on three roof lanterns and adjacent lead flat roofs above the King's State Apartments in the south range of Kensington Palace (NGR TQ 25844 80027). Historic Royal Palaces act as custodian of the historic state apartments of Kensington Palace, which is owned by Her Majesty the Queen in right of the Crown.
- 1.1.2 Kensington Palace is designated as a Scheduled Monument by Historic England (ref. 1002038) and is also a Grade I listed building (ref. 1223861). Kensington Palace is summarily described in the list description as: 'originally built in 1661 for Sir Heneage Finch, acquired by William III in 1689, with new buildings by Sir Christopher Wren between 1689-1695. Alterations and additions 1718-1726 and later, including State Rooms by William Kent. The lanterns are believed to be associated with works carried out during the early 19th century for the incumbent Duke of Kent'.
- 1.1.3 HRP seek the agreement of Historic England regarding any repairs, improvements or alterations that may impact upon historic fabric. Scheduled Monument Consent has been granted by Historic England for the conservation work. The recording before and during conservation works was carried out as a condition of this consent. HRP undertook conservation works on the three roof lanterns and associated flat lead roofs to prevent further deterioration or loss of the historic building fabric. In line with the Conservation Principles of HRP, this work required archaeological building recording and watching brief.
- 1.1.4 The outcome of these investigations has supported the early 19th century date from documentary evidence for the addition of the lanterns and accordingly their relationship with the works undertaken by James Wyatt. It has also shown that since they were first built the lanterns have been repaired, typically with low quality or unsympathetic materials, on numerous occasions. They appear to have historically suffered from water ingress, based on changes in the sill levels and issues of damp and mould caused by condensation.

2 INTRODUCTION

2.1 Background

- 2.1.1 Pre-Construct Archaeology Limited (hereafter PCA) was commissioned by Historic Royal Palaces (hereafter HRP) to undertake a programme of built heritage recording before and during conservation works carried out on three historic roof lanterns and adjacent lead flat roofs, situated above the King's State Apartments of Kensington Palace, Palace Avenue, Royal Borough of Kensington and Chelsea. The Palace is centred at Ordnance Survey National Grid Reference TQ 25844 80027.
- 2.1.2 Kensington Palace has been a residence of the British Royal Family since the 17th century, and is the official London residence of the Duke and Duchess of Cambridge, Prince Harry, the Duke and Duchess of Gloucester, the Duke and Duchess of Kent, and Prince and Princess Michael of Kent. Today, the State Rooms are open to the public and managed by HRP, a nonprofit organisation that does not receive public funds. The offices and private accommodation areas of the Palace remain the responsibility of the Royal Household and are maintained by the Royal Household Property Section.
- 2.1.3 The Palace has been designated as a Scheduled Monument by Historic England (1002038) and in addition is a Grade I listed building (1223861). The palace lies within Kensington Gardens, which is Grade I listed on the Register of Historic Parks and Gardens. Both Park and Palace form part of the Kensington Palace Conservation Area designated in 1971.
- 2.1.4 HRP seek the agreement of Historic England regarding any repairs, improvements or alterations that may impact upon historic fabric. Scheduled Monument Consent has been granted by Historic England for the conservation work. The recording before and during conservation works was carried out as a condition of this consent. HRP undertook conservation works on the three roof lanterns and associated flat lead roofs to prevent further deterioration or loss of the historic building fabric. In line with the Conservation Principles of HRP, this work required archaeological building recording and watching brief.
- 2.1.5 The recording was undertaken in accordance with a *Brief for Archaeological Building Recording and Watching Brief* by Alden Gregory, Curator at the HRP, May 2015. It was also undertaken in accordance with a Level 3 record as set out in English Heritage (now Historic England) (2006) *Understanding Historic Buildings: A Guide to Good Recording Practice*.

2.2 Conservation Works

- 2.2.1 Before the conservation works took place, the roof lanterns were in a poor state of repair and had substantial areas of rot and decay. This had been caused in part by the poor quality of their original construction, as well as by previous repair methods and alterations to surrounding flat roofs that had made water ingress possible. As a result the lanterns required substantial repair and alteration to address and prevent, as far as possible, future water ingress. This work included timber and glazing repairs, re-roofing of the domed lanterns and the surrounding lead flats, provision of ventilation into the lanterns' roof voids, and the raising of the sill of the lanterns by between 150mm and 250mm. The lanterns were also redecorated as part of the project.
- 2.2.2 The extensive nature of the works, which included large areas of opening-up, required archaeological monitoring to record the changes to historic fabric. However, it also provided an opportunity to record the lanterns and associated roof structures and to investigate evidence of the earlier lanterns and for other historic alterations to the palace roofs.
- 2.2.3 Conservation is the overriding priority in all of HRP's aims and objectives; guided by strict in-house Conservation Principles. Any interventions are preceded by informed research and study of the physical and documentary evidence, and meticulous recording of the fabric before, during and after all work.
- 2.2.4 The conservation works included the following:

- a. Conservation repairs to rotten areas of timber in the structure of the lanterns and to any identified areas of decay in associated roof structures.
- b. Re-laying and remodelling the domed roofs of all three lanterns.
- c. Re-laying and re-modelling the flat lead roof in the vicinity of the lanterns.
- d. Raising the sills of the three lanterns by between 150mm and 250mm (this process may necessitate some dismantling of parts of the lanterns in order to protect the historic glazing).
- e. Undertaking glazing repairs.
- f. Provision of new ventilation.
- g. Redecorating.

2.3 Site Location and Description

- 2.3.1 Kensington Palace is situated in west London immediately to the west of Hyde Park. It is a royal residence set within the gently undulating c.112ha grounds of Kensington Gardens, one of the Royal Parks and within the Royal Borough of Kensington and Chelsea. The Palace lies to the north of the A315 Kensington High Street, south of the Bayswater Road and adjacent to the Broad Walk, a wide pedestrian thoroughfare that crosses the western end of the park between the Palace and the Round Pond.
- 2.3.2 The three roof lanterns (A to C) are located on the roof to the rear (north) of the south range and above the King's State Apartments (**Figures 2 and 3**). They light, from east to west, the Red Staircase (C), the small landing between the King's Gallery and the Presence Chamber (B) and the former so-called Nash staircase, now replaced by a passenger lift (A). The three lanterns are identical in size and form, elegant in their design with tall, glazed elevations, below appropriately proportioned, elliptical domed roofs. As a group they rest upon a flat leaded roofed structure. Documentary evidence suggests that the extant lanterns were installed in 1807-08 to replace earlier lanterns that had probably decayed. The extant lanterns show several phases of repair and conservation works, none of which have been detailed in surviving literature, and cannot therefore be dated accurately.

2.4 Designations

Listed Buildings

- 2.4.1 The listing description for the Grade I listed **Kensington Palace** (HE ref: 1223861) is quite brief and states:
- 'Royal Palace. Originally built in 1661 for Sir Heneage Finch, first Earl of Nottingham. Bought by William III in 1689 and renamed Kensington House. New Buildings by Sir Christopher Wren 1689-1695. Alterations and additions 1718-1726 and later, including State Rooms by William Kent. Listing NGR: TQ2584480027'.
- 2.4.2 To the north of the Palace is the brick-built Orangery (listed grade I) constructed for Queen Anne in 1704. The Orangery was probably designed by Nicholas Hawksmoor, with some revisions by Vanbrugh (Cherry and Pevsner 1991). The west front of the Palace overlooks Kensington Palace Green from which it is separated by tall iron railings. In front of the 18th century entrance gates (listed grade II) stands a bronze statue of William III (listed grade II) erected in 1907. The east front of the Palace overlooks lawns and a statue of Queen Victoria. To the north-east of the Palace is the early 20th century Sunken Garden, decorated with herbaceous beds, and the Orangery Garden laid out at the same time but in the Dutch Style.

Registered Parks and Gardens

- 2.4.3 **Kensington Gardens** (HE ref: 1000340) appears on the Register of Historic Parks and Gardens maintained by Historic England and is designated Grade I for its special historic interest. Its citation reads:

'Between 1536 and 1689 most of the land that later became Kensington Gardens was part of Hyde Park (qv). In 1689 Nottingham House, later to be named Kensington Palace, was bought from Daniel Finch, Earl of Nottingham as a convenient retreat for William III and Queen Mary. It was considered sufficiently removed from Westminster, yet more accessible than Hampton Court (qv). Christopher Wren (1632-1723) was commissioned to enlarge Nottingham House while George London (d 1714) and Henry Wise (1653-1738), from the nearby Brompton Nurseries, were appointed to carry out works in the grounds, mainly gravelling walks. In 1689 the king's private road (now Rotten Row) was made from Kensington, through Hyde Park to Westminster. The elaborate design of the gardens made to the south of the Palace in 1690 and 1691 are shown on an engraving dated c 1706 (Jacques and van der Horst 1988).

At the beginning of Queen Anne's reign (c 1702) Henry Wise alone was contracted to look after the gardens. Queen Anne removed the box hedges much beloved of Queen Mary. In 1704 Wise took over the kitchen garden and c 12ha of gravel pits north of the Palace which were made into a formal wilderness of several quarters, one of them containing a mock mount of evergreens, another a sunken terrace garden. The next year 41ha was taken from Hyde Park. This land, which also became Wise's responsibility, was used as a paddock to accommodate the royal deer and antelopes. By 1711 Wise, whose contract had been renewed five years earlier, considered the garden to be finished. The improvements had been complemented by the addition of ornamental buildings and garden furniture. After 1711 no more building works were undertaken by Queen Anne nor, for many years, by her successor George I.

Between 1689 and 1727 Kensington Palace grew from the nucleus of Nottingham House and had become an important royal residence. In 1726, the year in which he was appointed Royal Gardener (along with Wise), Charles Bridgeman (d.1738) submitted estimates for new works in Kensington Gardens; these were undertaken between 1727 and 1731. Bridgeman created a ha-ha and new wall as a boundary with Hyde Park; constructed the Round Pond and the Long Water or Canal, and laid out the gardens. Most of the work was initiated by George I and completed after his death by George II and Queen Caroline. Queen Anne's flower borders were removed and replaced by lawns, plantations, promenades, and vistas. In 1728 Wise retired and Bridgeman became sole Royal Gardener, continuing working to improve and maintain the gardens. In 1733 Kensington Gardens was open to the public on Sunday nights. Charles Bridgeman died in 1738, the year after Queen Caroline, and Samuel Milward was appointed Chief Gardener at Kensington Palace and St James's Palace (qv). On the death of George II in 1760 Kensington Palace ceased to be the principal royal residence, an important factor in preserving the earlier layout rather than it being redeveloped (LUC 1982).

In 1784 William Forsyth (one of the founder members of the Royal Horticultural Society) was appointed 'Gardener to the King at Kensington' and made a number of changes which included planting quantities of fruit trees in the west part of the Upper Wilderness (to the north of the Palace) and probably introducing a paddock for the royal horses. It is clear from the plans made by Forsyth (Kensington Palace and Gardens, 1787), that the sunk garden made by Wise, most of the Upper Wilderness, and all the serpentine walks had been lost by the mid 1780s.

By the early 19th century the gardens were open to the 'respectable' public every day. The increasing public access gave rise to expectations of facilities and entertainment similar to that which could be found in neighbouring Hyde Park. The Victorian and Edwardian period had a great impact on the site, this being a period of partial merging with Hyde Park. The first refreshment room opened in 1855 and the original bandstand built in 1869. The number of drinking fountains and public lavatories increased and there was a proliferation of statues and monuments throughout the Victorian period. A particular characteristic of Kensington Gardens which only evolved in the late 19th and early 20th centuries was its association with children, best symbolised by the statue of J.M Barrie's Peter Pan (1912). The children's playground north of the Palace was established in 1909'.

3 METHODOLOGY

3.1 Aims and Objectives

3.1.1 The objectives of the archaeological building recording and the watching brief as set out in the Brief (Gregory, 2015) were as follows:

- To record the lanterns (internally and externally) and the associated roof structures (where exposed, covered up or removed by the conservation works) to provide a record of their historic fabric, construction, any significant features, historic alterations and building phase changes.
- To digitise the results of the recording and provide a context based interpretation of the results, which was to help inform the conservation works.
- To carry-out the above tasks to the standard of a Level 3 survey (English Heritage, 2006), the full requirements of which are detailed below.
- To provide as necessary a well-informed watching brief service during the conservation works.
- To attend and contribute to relevant project or site meetings and distribute data to project members / contractors.
- To liaise closely with the Curator and provide regular interim updates.
- To prepare a survey report as detailed below.
- The aim was to provide a better understanding of the roof lanterns and surrounding flat lead roof and to compile a lasting record, to analyse the results and to disseminate these results.

3.1.2 The research aims of the archaeological building recording and the watching brief were as follows:

- To add to our knowledge of the alteration and repair history of the three oval roof lanterns and surrounding flat roofs
- To identify primary historic fabric in the three lanterns
- To establish if there was any physical evidence that the domed lead roofs of the three lanterns were replaced and altered in 1987?
- To itemise and record alterations and repairs to the three lanterns recorded during the archaeological recording and watching brief.

3.2 On-Site Recording

3.2.1 The historic building recording was undertaken in accordance with a Level 3 survey as set out in English Heritage (2006) *Understanding Historic Buildings: A Guide to Good Recording Practice*. It was carried out on 30th September, 26th October, 9th, 11th and 19th November, 1st December 2015, 7th and 21st January 2016 by an historic buildings archaeologist.

3.2.2 Architect's plans and elevations of the roof lanterns were annotated on site with historic details, such as repairs and alterations (**Figures 3 to 12**).

3.2.3 A photographic survey including high quality digital images was undertaken of the historic lantern structures and flat roofs, noting historic repairs, areas of replaced or badly decayed fabric and the underlying supporting structure to the lanterns. A selection of photographs has been included in this report (**Plates 1 to 106**) while **Figures 3, 5, 7, 9 to 12** show the location and direction of the plates.

3.3 Project Archive

3.3.1 The project archive is currently held at the offices of Pre-Construct Archaeology Limited in Brockley, London, under the site code KEN 29. It is anticipated that the archive (copies of

the report, drawings and photographs) will be lodged in the Historic Royal Palaces permanent archaeological stores at Hampton Court Palace in due course.

3.4 Guidance

3.4.1 All works were undertaken in accordance with standards set out in:

CIfA (2014) *Standards and guidance for the archaeological investigation and recording of standing buildings or structures*

English Heritage (now Historic England) (2005) *The Presentation of Historic Building Survey in CAD*

English Heritage (now Historic England) (2006) *Understanding Historic Buildings: A Guide to Good Recording Practice*.

Historic England (2015) *Greater London Archaeology Advisory Service: Guidelines for Archaeological Projects in Greater London*.

4 HISTORICAL BACKGROUND

4.1 Nottingham House

4.1.1 In the summer of 1689 William and Mary purchased Nottingham House, a Jacobean mansion built about 1605. It stood in Kensington, a village that 'esteem'd a very good Air'. Nottingham House was owned by William's trusted Secretary of State, Daniel Finch, Earl of Nottingham, and the purchase price was £20,000. William instructed Sir Christopher Wren, Surveyor of the King's Works from 1669 to 1718, to improve the house immediately. Nicholas Hawksmoor was appointed Clerk of the Works (1689-1715) and the project was hurried forward, as the Queen was anxious to move in (<http://www.hrp.org.uk/kensington-palace/history-and-stories/a-building-history>).

4.1.2 In order to save time and money, the Jacobean house was left intact and Wren added blocks, or pavilions, to its four corners, to provide additional accommodation for the King and Queen and their court. Each pavilion was of three storeys, with attics above. Wren also re-orientated the building by designing a new entrance and service courtyard (the Great Court) on its west side. On the south side of the Great Court, Wren built a range narrow block containing a corridor (the Stone Gallery) which led from the main entrance to the south-west pavilion, with rooms for courtiers behind. On the north side of the courtyard were the kitchens and on the west, an archway surmounted by a clock tower, which still survives.

4.2 Kensington House/Palace

4.2.1 The royal court took up residence at Kensington House, as it was then known, shortly before Christmas 1689. The following year Mary decided to launch a second round of improvements. She extended her apartments by building the Queen's Gallery. With its own staircase, the Queen's Gallery also provided a separate block adjoining for her Maids of Honour. In November 1691, a fire that destroyed part of the southern range of the Great Court was made the occasion for a complete remodelling of the approach to the royal apartments: the King's Staircase was rebuilt in marble and a finely decorated Guard Chamber was constructed, facing the foot of the stairs. The last addition to the palace in William's time was the South Front, built in 1695, probably by Hawksmoor. The main feature of the new building was a long gallery at first-floor level – the King's Gallery – in which William hung many works from his collection.

4.2.2 William and Mary were succeeded to the throne in 1702 by Queen Anne, who had been living at nearby Campden House. She undertook relatively few renovations or major building works, but spent considerable time there with her husband Prince George, second son of Frederick III of Denmark. Prince George's death in October 1708 was followed six years later by the passing away of Queen Anne on the 1st August 1714.

4.2.3 The accession of George I was celebrated at Kensington with a bonfire in the gardens, where the household servants and courtiers toasted their new king with six barrels of strong beer and over three hundred bottles of claret. On the King's first visit to Kensington he inspected the palace and gardens and declared himself satisfied with both. However, a survey of 1716 found the building to be in a very poor state of repair and several designs for alterations were in the King's hands by April 1718.

4.2.4 The core of the old Nottingham House, which still survived at the heart of the palace, was replaced by three new state rooms: the Privy Chamber, the Cupola Room and the Withdrawing Room. These rooms were probably designed by Colen Campbell, the Deputy Surveyor, rather than by Benson. The most striking feature of these rooms was the elaborate decorative painting of their ceilings. By rights this work should have been given to Sir James Thornhill, the Serjeant (or official royal) Painter. However, his £800 fee for the Cupola Room was thought too costly and the little-known William Kent offered to paint the room in a similar design for £350.

4.2.5 The Cupola Room was William Kent's first commission at Kensington Palace. Kent's skill as a painter, strongly criticised by some, was evidently admired by George I. Between 1722 and 1727 he devised decoration and hung pictures in nearly all the royal apartments

at Kensington, and finished by painting the King's Grand Staircase.

- 4.2.6 Having equipped the palace with a full set of lavishly decorated state rooms, it was ready to play a central role in the life of the court under George II. George II (1727-60) made Kensington one of his principal residences. The palace, however, changed little structurally during his long reign, the only new building erected was a stable block built in 1740 for his younger son, William, the Duke of Cumberland. Large parts of the palace fell into disuse after the death of his wife, Queen Caroline, in 1737. Horace Walpole commented in 1749 that 'though there are so many vacant chambers [at Kensington], the King hoards all he can, and has locked up half the palace since the Queen's death'.
- 4.2.7 The sudden death of George II at Kensington on 25 October 1760 ended an era in the history of the palace: it would never again serve as the seat of a reigning monarch. George III (1760-1820) did not live at Kensington Palace but his fourth son, Edward, Duke of Kent was allocated two floors of rooms in the south-east corner of the palace in 1798, below the State Apartments. These rooms had formerly been the Kings private apartments and seem to have been uninhabited after the death of George II in 1760.
- 4.2.8 The Duke's persistence resulted in a complete conversion of the lower floors of the palace, the substance of which still survives. James Wyatt, Surveyor-General to the Board of Works, was the architect of the conversion. A new porch was constructed on the eastern side of the Great Court, with an entrance hall that opened into a fine double staircase. This led to a saloon (the Red Saloon), with the dining room and others beyond.

4.3 The lanterns

- 4.3.1 Whilst little is known about the history of the three oval roof lanterns, it is possible to put the date of 1807-08 to their construction and to identify the craftsmen and women responsible. In that year the carpenter Elizabeth Miles was paid for, "preparing for Three Oval Skylights", over the Duke of Kent's apartments, while the joiner William Kelsey was employed in, "taking down Old Skylights, fitting & fixing Templets for Trimmers and putting Circular Mouldings to Sky light [and] making ... New Circular Sashes for skylights". The itemised payments to Kelsey further record that he supplied, "Wainscot ovolo circular sashes on an elliptical plan for skylights over staircases", at a cost of £97.3.4½ l. The references to sashes in these accounts need not suggest sliding windows but are likely to refer to the fixed sashes that are to be repaired (Gregory, 2015).
- 4.3.2 This record of works makes it clear that the new lanterns provided by William Kelsey replaced pre-existing ones. This is further demonstrated by the earlier Office of Works accounts for the year 1806 that record that the carpenter William Miles had shored up the Duke of Kent's back staircase and the skylight over it. It can be assumed therefore that the older lanterns were replaced because of decay rather than because of changes in style or the functions of the rooms they light. Perhaps as a consequence, the existing lanterns are not an integral part of the supporting roof structures, but instead are free-standing units that are supported on a basic system of templates and trimmers (as described in the account quoted above) and are perhaps prevented from lateral movement by a number of vertical metal pins (*ibid*).
- 4.3.3 The two staircases (the 'Red Staircase' below the eastern-most lantern, and the former so-called 'Nash Stair' below the western-most) are traditionally associated with the surveyor-ship of John Nash – though this attribution can perhaps be questioned in light of the information above – but the lanterns clearly pre-date Nash's works at Kensington Palace and can instead be shown to be part of James Wyatt's remodelling of the south east corner of the palace for the Duke of Kent; work that was overseen by John Yenn. Whether either man was involved in the design of the lanterns or whether they were effectively designed by the joiners working for William Kelsey, who built them, is unclear (*ibid*).

4.4 Recent history

- 4.4.1 The three lanterns all retain much primary historic fabric which probably includes some of the historic cylinder glass window panes. However, a visual inspection of the lanterns suggests that they have undergone several phases of repair and alteration in the

intervening years. The repairs include scarf and resin repairs of decayed timber, insertion of new glazing in some panes (including the addition of opening metal casement ventilation panels in some locations), and the possible replacement of the domed lead roofs of the three lanterns. The lead flats surrounding the lanterns were last re-laid in about 1987 and the detailing of the roof and flashings were probably also changed at that date. The domed roofs of the lanterns may have been altered at the same date.

5 RESULTS

5.1 Introduction

- 5.1.1 Each of the lanterns were referenced re-using existing identification letters A to C (**Figures 2 and 3**) and each individual repair or alteration, both internal and external, were individually numbered and cross referenced to the relevant lantern (**Figures 4, 6 and 8**).
- 5.1.2 The survey works were directed towards three elliptical (in plan) early 19th century light lanterns, identical in their original design and components, but which had latterly been altered and much repaired (**Figures 2 and 3; Plates 1 to 3**). The lanterns each comprise eight equally dimensioned casements, constructed in painted softwood with an over-sailing, shallow domed, leaded cap. Each casement in turn comprises six equal sized lights or panes, the majority of which are fixed glazing, although some of the panes, particularly in the lower register of the window, have been later adapted, with the insertion of modern metal-framed casements windows, for ventilation purposes.
- 5.1.3 Each of the eight casements has a curving profile, which is more pronounced within the shorter eastern and western end elevations. The dimensions of the window panes are not consistent throughout, neither is the curvature of the glass nor its dimensional thickness, the latter observed following the deglazing of the lanterns. The circuit of the eight casements is interrupted by eight plainly (external) detailed mullions which rise up to support a plain band or entablature with a half round moulding to the eaves level. The mullions together with a plinth or sill, elevates the joinery above the level of the surrounding flat roof. The glazing bars, where original, are relatively fine with a simple chamfer detail to the exterior (formed by the window putty) and a more extravagant elongated Gothic ovolo detail to the more visible/higher status interior. The domed roofs are fully leaded and comprise eight ribs which rise in a gentle arc to a central, plain, leaded boss.

5.2 Lantern A: External Repairs and Alterations (Figure 4)

East Elevation

- 5.2.1 External Repair 1: Repair to Sill (Plates 4 and 5): Length of new timber sill extending the full width of the eastern light (c.1020mm). Appears to have been scarfed into the base of the lantern.
- 5.2.2 External Repair 2: ?Repair to entablature (Plate 4): On reflection, whilst this joint was originally thought to be indicative of a repair, it is more likely, given its appearance on all the other lanterns, part of the construction of the band around the top of the window, which is formed from a number of overlapping sections.
- 5.2.3 External Repair 3: Repair to sill (Plate 6): Insertion of a length of softwood timber to create a new sill for the inserted modern casement (casement 5). Added by cutting back original sill with vertical cut and diagonal nailing into existing frame. This section of new timber has been crudely shaped to match the curvature of the sill. There is an additional resin repair to the junction with the post and to the base of the window and another resin repair to the sill on the western side of the casement.

North Elevation

- 5.2.4 External Repair 4: Repair to sill (Plate 7): Similar insertion of a new section of modern softwood timber sill into the base of the easternmost light. As with (ER3) the inserted sill is much cruder than the original and includes evidence of resin repairs.
- 5.2.5 Casement 5 (Plate 8): Replacement and alteration of glazing bars and insertion of window frame to facilitate introduction of new side hung iron-framed casement window. This also includes the addition of a heavier glazing bar to the top of the casement, which over-sails the window opening to provide a rain drip.
- 5.2.6 External Repair 6: Repair to sill (Plate 9): Resin repair to the sill the window within the central bay/light of the northern elevation, used to consolidate the frame and replace areas of decay within sill.

- 5.2.7 External Repair 7: Repair to sill (Plate 10): The sill of the lantern is less visible (above the level of the roof) in this area due to the step-up and change of roof levels within the surrounding flat roof. The repair is a resin repair made to the full width (light) of the sill and maybe associated with or a consequence of the insertion of casement (8).
- 5.2.8 Casement 8 (Plate 11): Insertion of a metal framed casement window involving (like 5) the addition of a timber frame to accommodate the introduced window and an over-sailing hood to act as a rain drip, added to the upper glazing bar.
- West elevation**
- 5.2.9 External Repair 9: Repair to Glazing bar (Plate 12): Resin repair to glazing bars within the western light and at the junction of the upper and central panes. The lower four panes have recently been re-puttied.
- South Elevation**
- 5.2.10 Casement 10 (Plate 13): The insertion of a side hung, metal framed casement window into the lower pane, west side of the western light. This window insertion has typically involved the addition of a supporting timber frame for the casement to be seated within and an over-sailing hood to act as a rain drip, added to and as part of a replacement glazing bar (see also IR3) along the top of the window.
- 5.2.11 External Repair 11: Repair to sill (Plate 14): The repair is a resin repair covering the greater part of the sill below casement 12 and the adjacent 'light' to the west. The rest of the sill to the west (at this level) is obscured by a step up and heightening of the base sill. The resin repair, undertaken to consolidate the sill, clearly post dates the lead-work added to protect the sill and base of the mullions, in this area. This lead-work, from its good condition looks to be a relatively recent addition. The decay to the sill may be a consequence of the casement 12 above.
- 5.2.12 Casement 12 (Plate 15): The insertion of a side hung, metal framed casement window into the corresponding, opposite pane as casement 10, but toward the eastern side of the eastern light. This casement, though metal framed, was a different design to casement 10, using distinctly different hinges. This window involved the addition of a supporting timber frame for the casement to be seated and typically an over-sailing hood to act as a rain drip.
- 5.2.13 Casement 13 (Plate 16): The insertion of a bronze centre pivoting casement window, above, but in the adjacent pane to casement 12. The insertion of the casement typically also entailed the addition of a supporting timber frame for the metal framed casement to be seated into, but, unlike windows 12 and 10, did not incorporate an over-sailing hood.
- 5.2.14 External Repair 14: Repair to Mullion (Plate 17): A timber repair made to the base of the southern-easternmost mullion, eastern elevation. This involved a surface repair to the outward face of the mullion, comprising a section of timber, measuring c.1inch in depth and the full width of the mullion post, let into the base of the mullion. It extended to a height of 15.5cm above the sill (lead covered) and either lapped or rebated into the post.
- 5.3 Lantern A: Internal Repairs and Alterations (Figure 4)**
- 5.3.1 Internal Repair 1: Replacement of bar and repair to jamb (Plates 18 and 23): Replacement of glazing bar within the westernmost light of the southern elevation, between the central and upper panes and a small timber repair to the adjoining jamb, west side. The replacement glazing bar is much plainer in detail (simple chamfer) and lacks the ovolo detailing of the original glazing bars. The glazing bar appears to have been replaced along with a short section of the adjoining window jamb. This repair, which had been let into the window frame, extended to 290mm in height and was moulded, with an ovolo detail, on its inner face to correspond with the detailing of the original frame.
- 5.3.2 Internal Repair 2: Repair to glazing bar (Plate 24): Resin repair to glazing bar between the central and lower panes of the western elevation. The repair is present either side of the central (vertical) glazing bar and extends to c.40cm in width (exact extent unclear due to over-painting). The glazing bar 'gives' noticeably when thumb pressure is applied.

- 5.3.3 **Internal Repair 3: Replacement glazing bar (Plates 18 and 25):** Replacement of a section of glazing bar added above and as part of the insertion of casement 10 into the lower pane, westernmost light of the south elevation. This length of glazing bar extends the full width of the pane (c.45cm wide), is less delicate as the original bars and uses a simple chamfered detail. The casement 10 is set in line with the glazing (biased to the outer face) and incorporates a central mortice, fixed with slot headed screws and closed using a square key.
- 5.3.4 **Internal Repair 4: Insertion of sill (Plate 26):** Section of timber sill added as part of the insertion of casement window 5 into the lower pane of eastern light. This timber sill measured 440mm x 45mm and was plain in appearance and lacked the ovolo detailing used on the corresponding length of sill to the west.
- 5.3.5 **Internal Repair 5: Replacement of glazing bars (Plates 19 and 27):** Replacement of the horizontal glazing bars between the central and lower panes of the central light to the eastern elevation and the replacement of the central vertical glazing bar of this lower window section. These inter-connecting glazing bars (forming a T shape) are clearly later replacements of less fine detailing, using a heavier weight and cruder, ovolo moulding.
- 5.3.6 **Internal Repair 6: Repair to internal mouldings (Plate 28):** Repair of a section of the projecting internal (?plaster) moulded band, level with of the base of the window, which decorates the elliptical opening when viewed from below. This section is located alongside the northern elevation, toward its easternmost light and in part below casement 5. The repair of this section of moulding, which extends for c.740mm, is quite crude, particularly the upper face, and lacks the definition and form of the ovolo detailing that survives elsewhere in the circuit.
- 5.3.7 **Internal Repair 6A: Replacement internal fascia to opening (Plate 28):** Replacement, using painted plywood, of the fascia/band located below the base of the mullions and covering the internal sill of the lantern, above the moulding described above. This fascia was nailed in place and extended the entire circuit of the lantern opening.

5.4 **Lantern B: External Repairs and Alterations (Figure 6)**

West elevation

- 5.4.1 **External Repair 15: Repair to mullion (Plate 32):** A timber repair made to the base of the southern-western mullion of the western elevation. It is a full width (of the mullion) repair which rises, in height, up to 210mm above the upper level of the sill. The base of the mullion and the adjacent sills had been crudely re-covered with lead flashings, either nailed into the base of the mullion or secured below sealant, applied to the base of the window panes.
- 5.4.2 **External Repair 16: Repair to mullion (Plate 33):** A similar, contemporary timber repair to ER15 made to the base of the north-western mullion of the western elevation. The repair rises in height to 190mm from the upper face of the sill and extends the full width of the mullion and back to line of glazing. The repair probably comprises the whole base of the mullion/post.

North elevation

- 5.4.3 **External Repair 17: Repair to mullion (Plate 34):** Probable contemporary timber scarf repair (with ER15 and ER16) made to the base of the westernmost mullion of the northern elevation. The repair to this mullion was more extensive, rising to a height of 530mm above the upper sill level, and projecting back to the glazing line. The upper joint was married using a simply splay scarf joint (to help inhibit water penetration).
- 5.4.4 **External Repair 18: Repair to mullion (Plate 35):** Small timber repair made to the easternmost mullion of the northern elevation. It comprised a section of timber scarfed into the mullion, not at the base (as typical) but c.280cm up from the top of the sill. Measuring 200-230mm in height (a diagonal joint to the top), but not extending the full width or depth of the post, it repaired the north-eastern angle of the mullion. It is most likely contemporary with repairs 15-17).
- 5.4.5 **Casement 19 (Plate 36):** The insertion of a side hung, metal-framed casement window

into the lower pane of the western light of the northern elevation. This insertion typically entailed the addition of a supporting softwood timber frame for the casement to be seated into and the use of an over-sailing hood or rain drip. Unlike those casements inserted into Lantern A, this casement window also incorporated an integral modern trickle ventilator at the head of the window/glazing.

- 5.4.6 External Repair 20: Replacement sill (Plate 37): An inserted length of timber sill presumably added as part of the introduction of casement window 21 into the lower, eastern pane of the eastern light, north elevation. This section of sill is much heavier (scantling) and cruder and than the original (not so well shaped) and is cut into the existing sill just west of the mullion and east of the glazing bar foot.
- 5.4.7 Casement 21 (Plate 38): The insertion of a side hung, metal framed casement window into the lower pane of the eastern light of the northern elevation. This insertion entailed the bulking up of the adjoining vertical glazing and the use of an over-sailing hood or rain drip. A feature common to Lantern B is that the casement windows incorporated an integral modern trickle ventilator built into the head of the window/glazing. They appear to post date the original insertion of the metal casements and must have been added to help counter condensation.
- 5.4.8 Casement 22 (Plate 39): The insertion of a bronze-framed centre pivoting (horizontal) casement window into the upper pane of the eastern light of the northern elevation and above casement 21. This casement occupied the entire opening, and accordingly no evidence of a supporting window frame or bulking up of the glazing bars, was visible. The window had latterly been sealed-up, through the application of an overlaying metal frame, which secured the upper section of the casement. No trickle ventilator was present.

South Elevation

- 5.4.9 External Repair 23: Replacement sill (Plate 40): The insertion of a length of timber sill added as part of the insertion of casement 24 into the lower pane of the eastern light. The sill extends the full width of the pane, although over-painting obscures much detail.
- 5.4.10 Casement 24 (Plate 41): The insertion of a side hung, metal framed casement window into the lower pane of the eastern light of the southern elevation. This insertion looks to have entailed the bulking up of the adjoining vertical glazing and the insertion of an additional timber to bulk up the horizontal bar at the window head. It also incorporated the typical (to B) integral modern trickle ventilator built into the head of the window/glazing.
- 5.4.11 Casement 25 (Plate 42): The insertion of a bronze-framed centre pivoting casement window into the central, western pane, of the eastern light, south side. This insertion typically entailed the addition of a supporting softwood timber frame for the casement to be seated into and the use of an over-sailing hood or rain drip. Unlike those casements inserted into Lantern A, this casement window also incorporated an integral modern trickle ventilator at the head of the window/glazing.
- 5.4.12 Casement 26 (Plate 43): The insertion of a side hung, metal-framed casement window into the lower pane of the western light of the southern elevation. This insertion looks to have entailed the bulking up or replacement of the adjoining vertical and horizontal glazing bars and incorporated a typical (to B) integral modern trickle ventilator built into the head of the window/glazing.

NB: Side casements to lower panes and pivoting casements to central/upper panes.

5.5 Lantern B: Internal Repairs and Alterations (Figure 6)

- 5.5.1 All of the glazing to lantern B is covered by an internal application of adhesive sheets which are both reflective, when viewed externally and presumably heat reflective.
- 5.5.2 Internal Repair 7: Replacement of glazing bar (Plates 44 and 47): Replacement of the central vertical glazing bar located within the central light of the western elevation. The original fine ovolo glazing bar has been replaced with a softwood glazing bar, which despite using a similar ovolo mould was noticeably less delicate in detail with a heavier central bead. The adjoining horizontal bars appear to be original.

NB. There is a localised resin repair to the sill just below the central glazing bar.

- 5.5.3 Internal Repair 8: Replacement of glazing bar (Plates 45 and 48): Replacement of the vertical glazing to the lower pane of the central light within the eastern elevation. As with IR7, the replacement bar, though using an ovolo mould, was less refined.
- 5.5.4 Internal Repair 9: Repair to window (Plate 49): Timber repair made to the base of the window jamb (south side) of the central light within the western elevation. The repair is scarfed into the window frame, rising to a height of c.350mm above the level of the sill. Possibly relates to the external repair made to the mullion, recorded as repair ER15.
- 5.5.5 Internal Repair 10: Glazing bar (Plate 50): Detachment and distortion of the base of the central glazing bar of the eastern light on the southern elevation, adjacent to casement window 24. This event appears to have been a consequence of the addition of the casement window, in that water intrusion and corrosion of the window has caused the base of the glazing bar to decay and detach. Generally similar corrosion (of the casements) has been seen to have caused consequent decay to the historic joinery in the areas of the casements. This example is one of the more significant in terms of decay.
- 5.5.6 Internal Repair 11: Replacement internal fascia board (Plate 51): Replacement fascia/board located below the base of the window mullions and covering the internal side on its entire circuit of the lantern opening. The fascia is formed from shaped and painted 7mm, 4 ply composite board, which is fixed through nailing.

5.6 Lantern C: External Repairs and Alterations (Figure 8)

West Elevation (Plate 52)

- 5.6.1 External Repair 27: Repair to mullion (Plate 53): A softwood timber repair made to the base of the southern-western mullion of the western elevation. It is a considerable, full width (of the mullion and adjoining bead) repair which rises in height up to 915mm above the upper level of the sill and is scarfed into the mullion with a diagonal (splay) scarf uppermost. The repair is badly decayed (possibly due to poor jointing) and appears to be more decayed than the original mullion. The base of the mullion and the adjacent sills had been crudely re-covered with lead flashings, either nailed into the base of the mullion or secured below sealant, applied to the base of the window panes. This is all relatively recent work of no historic merit.
- 5.6.2 External Repair 28: Repair to mullion (Plate 54): A softwood timber repair made to the base of the north-western mullion of the western elevation. It is a full width (of the mullion) repair which rises in height up to 270mm above the upper level of the sill and is scarfed into the mullion with a diagonal (splay) scarf uppermost. The base of the mullion and the adjacent sills had been crudely re-covered with lead flashings.

East Elevation

- 5.6.3 External Repair 29: Repair to Mullion (Plate 55): A softwood timber repair made to the base of the south-eastern mullion of the eastern elevation. This repair is less clear than those described above, but appears to be scarfed into the mullion, as seen by a possible downward diagonal cut on the north side of the mullion, and rises to a height of c.350mm above the sill. The base of the mullion and the adjacent sills had been crudely re-covered with lead flashings.

Northern Elevation

- 5.6.4 Casement 30 (Plate 56): The insertion of a standard side hung, metal framed casement window into the lower pane of the eastern light of the southern elevation. This insertion looks to have entailed the replacement of the adjoining vertical glazing bar to the west of the casement and the addition of a timber hood forming a rain drip above the window. The casement incorporated a typical integral modern trickle ventilator built into the head of the window/glazing.
- 5.6.5 Casement 31 (Plate 57): The insertion of a standard side hung, metal-framed casement window into the lower pane of the western light of the southern elevation. This insertion looks to have entailed the replacement of the adjoining vertical glazing bar to the east of

- the casement, the addition of a timber rail to the west and a timber hood forming a rain drip above the casement. The casement also incorporated a typical integral modern trickle ventilator built into the head of the window/glazing.
- 5.6.6 **Casement 32 (Plate 58):** The insertion of a standard side hung, metal framed casement window into the lower pane of the western light of the northern elevation. This insertion looks to have entailed the replacement of the adjoining vertical glazing bar to the east of the casement and a new horizontal glazing bar above the window. The casement also incorporated a typical integral modern trickle ventilator built into the head of the window/glazing.
- 5.6.7 **Casement 33 (Plate 59):** The insertion of a bronze-framed centre pivoting casement window into the central pane (east) of the western light, north elevation. This insertion has entailed the bulking up and replacement of the glazing bars to the west and below the window and the insertion of a heavier top rail/frame above to seat the inserted casement.
- 5.6.8 **External Repair 34 (Plate 60):** The alteration of the horizontal glazing bar below casement 33 and above casement 32. It is associated directly with their insertion.
- 5.6.9 **Casement 35 (Plate 61):** The insertion of a standard side hung, metal framed casement window into the lower pane of the eastern light of the northern elevation. This insertion looks to have entailed the replacement of the adjoining vertical glazing bar to the west of the casement and the addition of a new horizontal glazing bar above the window. The casement also incorporated a typical integral modern trickle ventilator built into the head of the window/glazing.
- 5.7 Lantern C: Internal Repairs (Figure 8; Plates 62 and 63)**
- 5.7.1 **Internal Repair 12: Replacement of glazing bar (Plate 64):** Replacement or resetting of the vertical glazing bar to the lower pane of the western light within the southern elevation. The glazing bar has become detached and pushed out of true at the base when the adjacent casement 31 was inserted.
- 5.7.2 **Internal Repair 13: Replacement of glazing bar (Plate 65):** Replacement or resetting of the vertical glazing bar to the east of casement 32 within the westernmost light of the northern elevation. Its replacement or re-setting occurred as a consequence of the insertion of casement 32.
- 5.7.3 **Internal Repair 14 (Plate 66):** Replacement of glazing bar: Replacement of the horizontal glazing bar above casement 32 within the westernmost light of the northern elevation. Its replacement or re-setting occurred as a consequence of the insertion of window 32.
- 5.7.4 **Internal Repair 15: Replacement of glazing bar (Plate 67):** Replacement of the horizontal glazing bar below casement 33 within the westernmost light of the northern elevation. Its replacement occurred along with repair IR14, as a consequence of the insertion of windows 32 and 33.
- 5.7.5 **Internal Repair 16: Repair to mullion (Plate 68):** A timber repair made to the base of the southern-eastern mullion of the eastern elevation, viewed internally. The repair rises in height up to 320mm above the upper level of the sill and is scarfed into the mullion with a diagonal (splay) scarf uppermost.
- 5.7.6 **Internal Repair 17: Repair to mullion (Plate 69):** A timber repair made to the base of the north-western mullion of the northern elevation, viewed internally. The repair rises in height up to 230mm above the upper level of the sill and is scarfed into the mullion with a diagonal (splay) scarf uppermost. Adjacent to casement 32.
- 5.7.7 **Internal Repair 18: Repair to mullion (Plate 70):** A timber repair made to the base of the western mullion of the central light, northern elevation. The repair rises in height up to 240-260mm above the upper level of the sill and is scarfed into the mullion with a diagonal (splay) scarf uppermost.
- 5.7.8 **Internal Repair 19: Re-setting of glazing bar (Plate 71):** Replacement or resetting of the horizontal glazing bar between middle and lower panes, central light, eastern elevation. Whilst original, the reset bar is not flush with the adjacent glazing bars, and is most likely

associated with repairs made to the adjacent mullion (repair ER27).

5.8 Roof Investigations

5.8.1 A series of openings, involving the removal of the code 8 leadwork and the underlying roof boards, were made to investigate the roof structures adjacent to all three lanterns, to ascertain the relationship between the lanterns and the underlying roof and try to identify how the lanterns were fixed and located. These investigative openings were each given an identifying number, cross-referenced to the lanterns pre-existing identifying letter (A to C) (Figure 3).

5.9 Lantern A: Opening A1 (Figure 10; Plate 73 and 74)

5.9.1 Opening A1 entailed the removal of a 'quadrant' of the roof covering located along the north-eastern side of Lantern A (Figure 10; Plates 73 and 74). This involved the initial removal of the leadwork to the flat roof within this quadrant and the subsequent removal of the underlying softwood boards. The latter, 9 inch boards, butted up against the lantern base/ring beam and were laid north-south, closely cut to follow the curve of the lantern. This was covered in fibrous matting fixed in place using copper nails.

5.9.2 The removal of the boards revealed details of the base to the lantern and the adjacent roof structure. This showed that the lantern base comprised eight individual sections of softwood sill beam (each section relating to the lights above) which butted up against and carpentered, using a wide birds-mouth into the foot of each of the eight vertical mullions. The presence of two pegs at the base of the north-eastern mullion, would suggest a mortice and tenon or similar between the mullion foot and sill section, however, this section of sill, and the majority of those viewed elsewhere had been 'diagonal nailed' into the mullion foot and the pegging was the exception rather than the norm. Nailing appears to have been used widely in the lanterns assembly and was recorded extensively in the sill sections of lantern B. Each section of shaped sill were of considerable scantling, measuring 7 x 5½ inches and were clearly original part of the lantern structure.

5.9.3 The eastern end of lantern A (as seen by the limitations of the opening) was underpinned by both a considerable principal floor joist, aligned north-south and supporting the very eastern end of the sill and a diagonal-set dragon tie or trimmer beam, aligned south-east-north-west, providing support to the north-eastern section of the lantern. It is most likely this supporting structure of trimmer beams is repeated around the entire circuit of the lantern, forming a 12-sided structure tied into the flanking principals (east-west and north-south). This sub-structure was more clearly revealed following the lifting of the lantern. The principal joist (in A1), measuring 8¾ x 9 inches is a considerable scantling regular softwood beam in the square, with cut upper and lower faces and uncut (through cleaving) sides. It is adjoined to the west side by the trimmer beam, itself a considerable scantling softwood timber of 8½ x 3¼ inches, presumably through nailed (though not seen) into the west side of the principal. A 3 inch void was present below the soffits of these two timbers and above the laths forming the structure of ceiling below.

5.9.4 The principal joist was overlain by a series of lighter softwood common joists aligned east-west. These joists varied in their age, scantling and how they married with the principal joist. Some joists were trenched over the top of the principal joist, suggesting a contemporary date, while others were halved or simply overlay the beam. They were clearly of different periods and represent a reworking and heightening of the flat roof partly re-using original timbers. Thin wooden fillets were latterly tacked onto the top of the joists to level up the roof boards.

5.10 Lantern A: Opening A2 (Figure 10; Plate 75)

5.10.1 Opening A2 entailed the removal of a corresponding 'quadrant' of the roof located along the north-western side of Lantern A (Figure 10; Plate 75). This involved the removal of the same sequence of leadwork, fibre matting and softwood boards.

5.10.2 The western principal, an 8¾ x 8 inch softwood beam in the square, provided the same support to the western end of the lantern, as did the adjoining diagonal-set trimmer beam, which formed the north-western 'corner' support for the lantern sub-structure. The principal was overlain by three east-west aligned common joists, the northern joist, a re-

used timber showing adze marks to one side and the central joist a rebate cut into its soffit, where it formerly (but no longer) lapped over the top of the principal, again another indication of the re-working of the flat roof. The roof void between the top of the roof boards and the ceiling laths below measured 0.44m.

- 5.10.3 Both sections of the sill beam had been heightened in this area of the roof by the addition of timber inserts overlaying the sill beam and either side of the north-western mullion (formerly visibly obscured by lead flashings). That to the east of the mullion was a recent replacement fabricated from non-native hardwood (**Plate 76**) and other insert, an earlier softwood section nailed into place. The sill beam, as seen in opening A1, was diagonal nailed into the base of the mullion.

5.11 Lantern B: Opening B1 (Figure 11; Plate 77)

- 5.11.1 Opening B1 entailed the removal of a 'quadrant' of the roof located along the north-western side of Lantern B and south of the central valley (**Figure 11; Plate 77**). The same sequence of lead-work, fibre matting and softwood boards were encountered. The boards were nailed into softwood joists, either aligned east-west and forming the southern edge to the central valley, or diagonally set following the line of the original trimmer beam below. They represent a later reworking and heightening of the flat roof. The sectional sill (or ring beam) to the lantern typically measured 7 inches in depth and in conjunction with the adjoining mullions were supported by a diagonally set trimmer beam/dragon tie. This is an arrangement consistently recorded within the other roof openings and more fully exposed when the lanterns were lifted. The roof void in this area is less than that recorded in A1 and A2, with the laths for the ceiling below tacked directly into the soffit of the trimmer. The present ceiling void measures 16 inches.

- 5.11.2 The sill was typically formed of sections, each shaped at the ends to match the slightly chamfered outer profile of the mullion foot. No evidence of pegging between the mullion and sill beam sections was observed. The height of the sill at the western end of the lantern had (as also seen in A2) been heightened with the addition of curving softwood timber inserts nailed onto the top of the existing sill beam (**Plate 78**). In this area their addition was carried out in conjunction with the raising of the roof height (to maintain a lip above the level of the roof) and the creation of a central, recessed valley.

5.12 Lantern C: Openings C1 and C2 (Figure 12; Plate 79 and 80)

- 5.12.1 Openings C1 and C2 were exposed following removal of east-west aligned roof boards to the western side of lantern C (**Figure 12; Plates 79 and 80**). This exposed the same roof structure adjacent to the lantern, of heavy scantling principal joists aligned north-south and a lighter scantling diagonally set trimmer joists. Another parallel north-south aligned principal joist lay 450mm further to the west. This principal, included evidence of empty mortice holes cut into the top and sides of the joist, but also held a lighter east-west aligned joist pegged into its western side, which in turn was lapped over another north-south joist to the west. The latter formed the structure of the ceiling below which also comprised (visibly) a parallel quarter pole ceiling joist. The principals were overlain by north-south aligned unplanned softwood joists or battens supporting the boards to the flat roof.

5.13 Domed Roof over Lantern A (Plates 81 to 83)

- 5.13.1 The structure of the domed roof over Lantern A was revealed following the removal of the code 8 lead flashings and sections of softwood sarking (**Plate 81**). The latter comprised two different types of covering, either small lengths of softwood boards (typically 9 x ¼ inch) bridging the void between two or three rafters or much longer, tapering segments of boards, formed to the curvature of the dome and extending the full height of the dome from its sill to the apex (**Plate 82**). The boards (of both types) butt against each other and were nailed into the top of the rafters using 1-1½ inch flat-headed handmade nails. An elliptical timber boss covered the apex of the dome (at the convergence of rafters) and a series of 8 softwood ribs, were nailed, using flat section wrought-iron nails, into the underlying rafters, through the boards. These rib features were associated with the lead-work.

- 5.13.2 Removal of the sarking boards revealed the rafter detail (**Plate 83**). The softwood unplaned rafters, measuring 5 inches deep and 1¼ inches wide, and shaped to the curvature of the dome (in the vertical plain) reduced to gradually, tapering in width, so each rafter butted against its neighbour where they converged at the apex. The rafters sat onto an outer sill or plate and were strengthened in elevation by small sections of timber used as cross-bracing between the rafters. These rafters converged at the apex to pinch an elliptical timber boss (similar to that used for the leading detail) using a simple notch cut out of the end of the rafter and were fixed to the rear of the fascia. Consequently the dome structure was held in tension by the weight of the overlying leading. The laths for the domed plaster ceiling were nailed directly into the soffits of these rafters.
- 5.14 Domed Roof over Lantern B (Plates 84 to 86)**
- 5.14.1 The covering to the roof structure over lantern B was similarly revealed. It was also covered in individual lengths of softwood boards, of a form similar to that present on the eastern side of lantern A (**Plates 84 and 85**). The boards were not a uniform size, with boards spanning three rafters and others, only two. The boards reduced in width as they progressed toward the summit of the dome, at which point they were laid perpendicular (north-south) to the lower boards and within a geometric shaped upper section. The boards are overlain by the same elliptical cap and radiating softwood ribs, located at the junctions of the sections of leadwork covering the dome. Removal of the softwood boards revealed an identical roof structure as present over lantern A (**Plate 86**).
- 5.15 Domed Roof over Lantern C (Plates 87 to 89)**
- 5.15.1 Lantern C was similarly covered with rough, unplaned, softwood boards, fixed through nailing into the underlying rafters (**Plate 87**). These boards were similar in form to those present on the western side of lantern A, comprising long strips or tapering segments of boards, formed to the curvature of the dome and extending the full height of the dome from its sill to just short of the apex. They were nailed in regular intervals using handmade iron nails. The roof structure over Lantern C was identical to that described for lantern A (**Plate 88**), although it was apparent that about half of the rafters were not formed from a single timber, but were composite with a additional central curved section (forming the sweep of the dome) nailed into a plain rafter, shaped only at the top and base (**Plate 89**). This was a feature also present in both the other two lanterns.
- 5.16 Raising of Lantern A (Figure 10; Plates 90 to 93)**
- 5.16.1 The raising of Lantern A revealed the supporting sub-frame on which the lantern was built off (**Figure 10; Plates 90 to 92**). The two heavy scantling north-south beams (set at 3.33m apart) were set into the adjacent parapet wall to the south (not viewed to the north due to the valley) and were joined by a pair of slightly lighter scantling beams, aligned east-west. This principal outer rectangular frame supported a series of lighter trimmers or ties that broadly coincided with the elliptical circuit of the lantern. The outer, corner trimmers were carpentered into the main sub-frame, while the inner trimmers were simply nailed into both. The construction and dimensions of this supporting sub-frame was repeated across all three lanterns. A further contemporary softwood joist, trenched into inner faces of the north-south beams to provide additional bracing, was present running along and parallel with the parapet wall. Observations in this area revealed that the southern east-west beam of the sub-frame structure was scribed on its southern face with a Baltic mark (**Plate 93**) giving provenance to the structural timber used for these sub-frames. The use of good quality imported timber sourced from the Baltic regions is not uncommon to this period, particularly within the capital. This sub-structure was overlain by light scantling regular section timbers, many re-used, and some trenched or lapped over the backs of the original sub-frame, to form the surrounding flat roof structure. The absence of modern fixings (screws/galvanised nails etc) would suggest that this flat roof is relatively historic though post-dates the lanterns. Another tier of overlying machine-cut and treated softwood however represents a modern reworking of the levels to the flat roof of c.1987.
- 5.16.2 The process of raising the lantern and its repair revealed detail relating to how the window casements were fabricated into the lantern structure. Each casement panel comprised a curving (in plan) window frame of six lights, which was located and slotted into rebates cut

into the inner face of the mullions and rest directly onto the sill. The casement panels were held in place by the rebates and the ultimately by the formation of the lantern.

5.17 Raising of Lantern B (Figure 11; Plates 94 to 99)

- 5.17.1 The raising of lantern B, detaching it from its supporting sub-structure to initiate conservation works, revealed a number of unforeseen structural relationships between the lantern and its underlying sub-frame (Plates 94 and 95). It also detailed the full circuit of the supporting sub-frame and its relationship with the adjacent roof.
- 5.17.2 Whilst sections of the underlying sub-structure to the lanterns had been partially glimpsed upon within the investigative openings (see above), the full extent of this sub-structure was observed during the removal (elevation) of the lantern B (Figure 11). This structure was constructed using heavy scantling principal binding joists, aligned north-south (Plate 97) and lighter joists east-west (Plate 96), forming a rectangular super-structure (with long sides to the north and south) for a series of lighter scantling ties and trimmer beams, arranged diagonally across the four internal corners. The heavy scantling outer frame was built using regular, cleaved and sawn (into the square), softwood 9 x 9 inch beams running north-south and slightly lighter 6 x 9 inch (set deep section) east-west beams between. The latter were tenoned into the inner sides of the north-south beams and marked with chiselled carpenters marks, I and II (with I to the south) at their western ends. The southern end of the north-south binding joists were set into the flanking southern parapet wall, although their relationship to the north was not observed (extending below the valley to the north) but they clearly performed a structural function for both the lantern and the flat roof as a whole.
- 5.17.3 The internal array of ties and trimmer joists were arranged to accommodate the curving 'form' of the elliptical plaster reveal and as a support, together with the rectangular outer sub-structure, to the lantern. These joists were all contemporary but used different assembly methods, with those bridging the four corners, notched into the top of the outer frame and the innermost four trimmers, butted up to and through nailed into the corner ties and the outer frame. Overall this structure provided a twelve sided opening commensurate with the requirements of an elliptical opening. The plasterwork for the internal reveal and cornice was built off a network of timber laths nailed into this polygonal framework and a series of timber blocks used to create the elliptical form, demonstrating, maybe unsurprisingly, the plasterwork, which also overlay the base of the mullions, was secondary, added after the construction of the lantern.
- 5.17.4 It was evident that the structural relationship between the lantern and the sub-structure was accomplished through carpentering the base of the mullions directly into the sub-structure, and not using dowels or pins as previously thought. The foot of each mullion was located and fixed into the sub-structure in two ways; the inner face of the mullion was halved over and nailed into the inner side of the sub-frame (Plate 98), while a tenon cut into the base of the mullion, located within a mortice cut into the upper face of the same sub-structure. This mortice and tenon was also nailed to stop the joint pulling apart.
- 5.17.5 Each pair of mullions, as described above, retained individual sections of curving sill (to the casements), nailed into the base of the post (Plate 99). Therefore, eight mullions and eight intermediate sill sections. No evidence of carpentry joints fixing the sills to the posts were observed, and they were simply 'pinched' and nailed into the posts. The mullions were slightly chamfered to the outside (close to the line of the glazing) and incorporated a vertical rebate cut into the window facing side to locate the side rails or jambs of the casement windows. This rail was plain externally, using a bead edging against the mullion, and a more intricate ovolo detail to the interior. The bottom rail to the casement was also formed from a separate section, overlying the heavy sill and located within a notch cut into the base of the side rails.
- 5.17.6 The adjoining flat roof simply overlay or was tenoned into the principal north-south binding joists to the east and west of the lantern. The upper joists supporting the softwood boards to the leaded flat, were not uniform and varied in scantling. Accordingly some were 'levelled up' using small pieces of softwood board, similar to that used to clad the lantern roofs, sections of laths or much larger softwood blocks. The joists themselves were all

softwood and diagonal nailed into the top of the principal. Sections of rafter also overlay the lantern sub-structure, suggesting a later change in roof levels. The nails used were traditional hand-made flat section nails, with no sign of modern fixings suggesting this is a relatively historic (pre-war) event or the reworking was undertaken by a tradesman who persisted in using traditional methods and materials. The lower tier of rafters supporting the laths for the ceiling below, seen both to the east and west of the lantern, comprised unplanned construction timber of 5½ x 2 inch scantling, tenoned into the principals and nailed using modern flat, round headed machine-made nails. These joists appear to be a later reworking, possibly re-using and refitted into existing mortices within the binding joists. To the west they were held from above by a batten fixed to the top of the principal while to the east, they lapped over a batten nailed to along the lower edge.

5.18 Raising of Lantern C (Plate 100)

- 5.18.1 Following the exposure of the roof structure recorded in openings C1 and C2, detail of the sub-structure to the lantern was further revealed, in conjunction with the raising of the lantern and the insertion of a composite sill (**Figure 12; Plate 100**). This entailed the stripping back of the flat roof to the east of lantern C, which revealed an identical sub-structure, comprised of a heavy scantling outer frame, with lighter internal trimmers and ties, as described for lanterns A and B. Another heavy scantling beam, aligned (north-south) and present to the east of the lantern and parallel with the parapet wall appeared to be contemporary with the sub-frame. However it was a re-used beam, as two mortices with empty peg holes, were present in its west facing side. These mortices did not coincide with an equivalent in the east facing side of the opposite beam (to sub-frame). A later tie, bracing the sub-frame to this beam had been added, trenched in and held using a wrought iron coach bolt. This was all overlain by lighter scantling joists forming the flat roof structure.

5.19 Roman marking to mullions (Plates 101 to 104)

- 5.19.1 Two sets of carpenters marks, in the form of chiselled or scribed Roman numerals, were revealed during the conservation works. These were observed, in two different locations, marked onto the inner face (**Plates 101 and 102**) or alternatively the foot of the mullion posts of lanterns A and B (**Plates 103 and 104**). The former (mid-post) was seen following the removal (for repair) of each complete window casement, rebated into the flanking mullions and the latter (formerly hidden below the flat roof) seen when the lanterns were raised. The numerical sequence ranged from I-VIII (1-8) equivalent to the number of posts, although the numbering was by no means consistent.

Lantern A (Figure 5)

- 5.19.2 The numerical markings on Lantern A were located either mid-height of the post (**Plate 101**) or at the foot (**Plate 103**). The former was consistently seen on the right-hand inner face of each mullion post, starting as (I) on the western post north side, progressing in a clockwise direction (II), (III) etc, to the east. This numerical sequence was consistent apart from the post that should have been scribed (VII), which was unmarked. The Roman marking to the foot of the posts did not coincide numerically or characteristically with that described above, being chiselled marks which commenced (as I) on the eastern post, south side (a mirror image of the casement markings). Again the sequence progressed in a clockwise direction, although inexplicably the post between (III) and (V) was marked (VII), while the post which should have been (VII) was unmarked. Possibly this post (VII) was relocated during the construction of the lantern structure. The base of the post to (VIII) was replaced (as part of these conservation works) using Sapele hardwood, scarfed into the mullion foot.

Lantern B

- 5.19.3 The numerical markings on Lantern B also occurred at mid-post (**Plate 102**) and at the mullion foot (**Plate 104**) and, with regard to the former, in the same right-hand locations. As the first marking (II) occurred on the north post east side, and the numbering progressed clock-wise, logically, the eastern post, north side, should have been marked (I), although no marking was evident. This was also the case for post which should have been marked (VI). Interestingly posts seven and eight were mirror marked with seven (IV) and eight

(IIIIV). Whilst the mid-post markings, between lanterns A and B, did not concur, the markings at the post foot, where they survived, did. The eastern post to the south side as marked (I) and that to the west (in a clockwise direction) marked (II), with (VIII; **Plate 104**) and (VII) marked on the posts to the east in an anti-clockwise direction. The three posts which should have been numbered three to five were not marked, as they had been replaced, while post six, though unaltered, was inexplicably unmarked.

Lantern C

5.19.4 In stark contrast there was little evidence of marking on Lantern C, with only a mark of (II) seen at mid-height on the southern post, west side. No markings were present on the base of the posts. Why the other two lanterns were marked and this lantern was not is unclear.

5.20 Repairs to Lanterns 2015-2016 (Plates 105 and 106)

5.20.1 The level of the lanterns were raised above the flat roof by the insertion of a new composite softwood sill (c.280mm in height) formed from four tiers of timber sections, through bolted together to form a single composite structure (**Plates 105 and 106**). The foot of the mullions were fixed into this new structure using L-shaped steel brackets and repaired (if needed) using Sapele hardwood. The removed intermediate sill sections, original to the lanterns, were also repaired, where needed, and were drilled and through-bolted into the new composite substructure.

6 DISCUSSION

- 6.1.1 The outcome of the historic building recording carried out prior to, and during works associated with the repair and conservation of three light lanterns (A to C) situated above the King's State Apartments in the south range of Kensington Palace has confirmed that all three lanterns are contemporary structures. According to documentary references the lanterns were constructed between 1807-08 and were part of James Wyatt's remodelling of the south-east corner of the palace. This work was overseen by John Yenn, for the Duke of Kent.
- 6.1.2 Documentary reference is made in 1807-8 to the payment of carpenter Elizabeth Miles for 'preparing for three oval skylights', over the Duke of Kent's apartments, and to the joiner William Kelsey who was employed in, 'taking down old skylights, fitting & fixing templets for trimmers and putting circular mouldings to sky light' and to making 'new circular sashes for skylights'. The itemised payments to Kelsey also record the supply of 'wainscot ovolo circular sashes on an elliptical plan for skylights over staircases'. These details when viewed together with the results of the survey works cast little doubt as to the date and the provenance of the lanterns.
- 6.1.3 Accordingly no evidence was recognised during the investigations to suggest that the lanterns pre-date the early 19th century. All three lanterns were identical in their construction, originally built of softwood, more typical for fenestration works of this period and comprised of a composite construction of individual sections carpentered and nailed together on site. The mullions, sectional sills, window casements and fascia all comprised individual sections, most likely initially fabricated in the carpenters workshop, which due to the logistics of transporting them up onto the roof in one piece, were carried as components and re-assembled on site. This re-assembly is perhaps demonstrated by Roman markings to the mullion posts at both mid-post, associated with the location of each of the eight individual window casements, and at the post foot, where the mullions were located into the contemporary lantern sub-structure. These markings consistently appear on both Lanterns A and B, the former set over the Nash Staircase, but inexplicably, as all three are undoubtedly contemporary, were not present on Lantern C, over Wyatt's 'Red Staircase'.
- 6.1.4 The documentary references to 'fitting & fixing templets for trimmers' were manifest in the form of the sub-structures that supported the lanterns. All three were identical in form and dimension, using the same heavy scantling super-structure, comprised of tenoned sawn or sawn and cleaved softwood joists, supporting an inner structure of lighter trimmer beams and ties, which closely follow the elliptical circuit of the lantern footprint. Accordingly, these 'templates' were purpose-built structures that were contemporary with the early 19th century lanterns and were not re-used or adapted structures associated with earlier stair lights or lanterns. This was clear following the uncoupling of the lantern base from the sub-structure, of which the latter showed no evidence of empty mortices/trenches unrelated to the present lantern and suggestive of re-use. This also demonstrated the relationship between the lantern and the sub-structure was accomplished through carpentering the base of the mullions directly into the sub-structure, and not using dowels or pins as previously thought. The base of each of the eight mullions were both morticed into the top of, and halved over and nailed into the inner side of the sub-structure. A circuit of lath and plaster nailed to the inner side of the sub-frame and a series of spacers, obscured this detail and created the internal elliptical moulding to the roof light.
- 6.1.5 The domed roof structures over all three lanterns were identical in their construction, using shaped or part-shaped softwood rafters rising from the top plate to pinch a central elliptical boss, producing a dome structure additionally held in tension by the weight of the overlying leading. The roof structure was laterally strengthened using intermediate bracing (between the rafters) and overlain and further consolidated by nailed on sarking boards. Variations in style of this sarking but similarities in the nailing (using hand-made tacks) would suggest that these boards had been historically stripped off and replaced, with some patching, after the initial construction. Whilst the ribs and leadwork to the domes were relatively recent replacements, the identical form of the roof structures over all three

- lanterns were contemporary with the lanterns, as no evidence was present to suggest otherwise, and were therefore unlikely later replacements, as previously suspected.
- 6.1.6 Where not replaced by modern inserted casement windows, the curved glazing to the casements, or sashes as they are historically referred to, comprised cylinder glass. This glazing was incredibly delicate, ranging between 1-2mm and in many cases there was little tolerance between the glass and the window frame/glazing bars. Whilst informed opinion points toward the use of cylinder glass throughout (pers. comm. Chris Jarrett), slight changes in clarity, with some glass exhibiting a slight greenish tint compared to a 'white' clearer glass, suggest some later replacement and re-glazing using more recent cylinder glass. Adaptations made to the historic sash/casements include the insertion of modern side-hung or central-pivoting casements, which were added to increase ventilation into the lanterns and to address problems with condensation. The central pivoting casements were built using bronze frames, possibly to guard against corrosion from the condensation, a feature common to the iron framed casements. It is the intention to re-instate these windows following conservation works.
- 6.1.7 The insertion of these casements invariably entailed the loss or alteration of historic glazing bars to receive the inserted window. Partial replacement or repair to the glazing bars was a feature common to the lanterns, although the repairs to the lantern sills and base of the mullion posts were much more evident. This invariably entailed a softwood repair by scarfing-in a new section into the base of the mullion or a resin/composite repair to the sill. These were invariably low quality modern repairs which have not stood the test of time. Historic adjustments in the levels of the lantern sill, heightened by overlaying new sections onto the existing sill and covering with leadwork, depict a relatively recent attempt to raise the sills above the surrounding roof, particularly the stepping-up of the roof in the area of lantern A and changes to the valley. The insertion of a new composite sill, mounted-onto and bolted into the historic sub-structure, have considerably raised (up to c. 280mm-300mm) the historic base of the lanterns above the level of the flat roofs and away from damp and decay, while the replacement of the rotten lower sections to the mullion posts (with hard wood Sapele) is clearly a much more appropriate and hopefully longer lasting repair.
- 6.1.8 The flat roofs principally comprise two main phases, most recently a reworking (slight heightening) of the roof levels to its current elevation (undertaken in 1987), which also saw the replacement and laying of the present roof boards, and an underlying structure of more historic re-used joists, which respect the lanterns and were halved or trenched over the backs of the principal joists. Whilst no evidence of modern materials (fixings or timber) were identified, the character of the roof, the wide re-use of common joists, some cut, some waney edge and the difference in their scantling, contrasts with the regular and well carpentered sub-structures and joists inserted to support the new lanterns, would suggest they are not contemporary, and possibly are a late 19th or early 20th century reworking.
- 6.1.9 The outcome of these investigations has been able to support the suggested early 19th century date for the addition of the lanterns and accordingly their relationship with the works undertaken by James Wyatt. It has also shown that since they were first built the lanterns have been repaired, typically with low quality or unsympathetic materials, on numerous occasions. They appear to have historically suffered from water ingress, based on changes in the sill levels and issues of damp and mould caused by condensation.

7 ACKNOWLEDGEMENTS

- 7.1.1 Pre-Construct Archaeology Limited would like to thank HRP for commissioning the project. The assistance of Sykes & Son Ltd on site is much appreciated.
- 7.1.2 The project was managed for Pre-Construct Archaeology Limited by Charlotte Matthews. The on site recording was carried out by Adam Garwood. Adam wrote this report and the illustrations were prepared by Hayley Baxter.

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APPENDIX 1: OASIS FORM

OASIS ID: preconst1-242832

Project details

Project name	Roof Lanterns and Leaded Flat Roofs at Kensington Palace		
Short description of the project	A programme of historic building recording and archaeological monitoring was undertaken prior to, and during conservation works on three roof lanterns and adjacent lead flat roofs above the King's State Apartments in the south range of Kensington Palace. It has confirmed that all three lanterns are contemporary structures, built between 1807-08 and added as part of James Wyatt's remodelling of the south-east corner of the palace for the Duke of Kent.		
Project dates	Start: 30-09-2015 End: 21-01-2016		
Previous/future work	Yes / Yes		
Any associated project reference codes	KEN29 - Sitecode		
Type of project	Building Recording		
Site status	Listed Building		
Site status	Scheduled Monument (SM)		
Site status	Conservation Area		
Current Land use	Other 2 - In use as a building		
Monument type	PALACE Post Medieval		
Methods techniques	& "Measured Survey", "Photographic Survey", "Survey/Recording"		Of
Prompt	Listed Building Consent		

Project location

Country	England
Site location	GREATER LONDON KENSINGTON AND CHELSEA KENSINGTON AND CHELSEA Kensington Palace, Palace Avenue,
Postcode	W8 4PU
Site coordinates	TQ 25844 80027 51.504650686663 -0.186591204158 51 30 16 N 000 11 11 W Point

Project creators

Name of Organisation	Pre-Construct Archaeology Limited
Project brief originator	Historic Royal Palaces
Project design originator	Charlotte Matthews
Project director/manager	Charlotte Matthews
Project supervisor	Adam Garwood
Type of sponsor/funding	Historic Royal Palaces

body

Name of sponsor/funding body
Historic Royal Palaces

Project archives

Physical Archive Exists? No

Digital Archive recipient LAARC

Digital Media available "Images raster / digital photography", "Text"

Paper Archive recipient LAARC

Paper Media available "Microfilm", "Plan"

Project bibliography 1

Publication type Grey literature (unpublished document/manuscript)

Title The Roof Lanterns and Leaded Flat Roofs at Kensington Palace, Palace Avenue, Royal Borough of Kensington and Chelsea, W8 4PU: Archaeological Building Recording and Watching Brief

Author(s)/Editor(s) Garwood, A

Other bibliographic details PCA Report Number: R12405

Date 2016

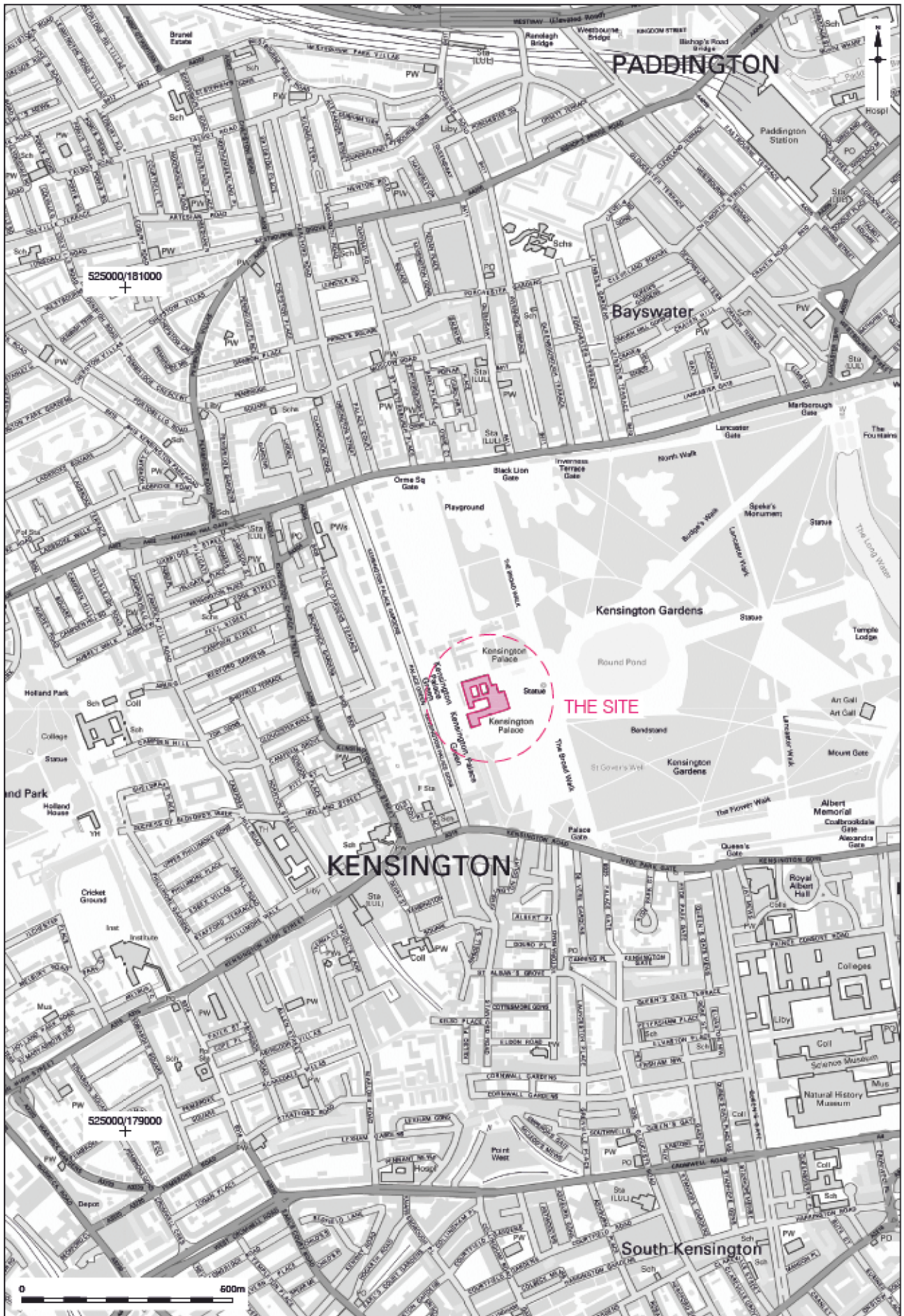
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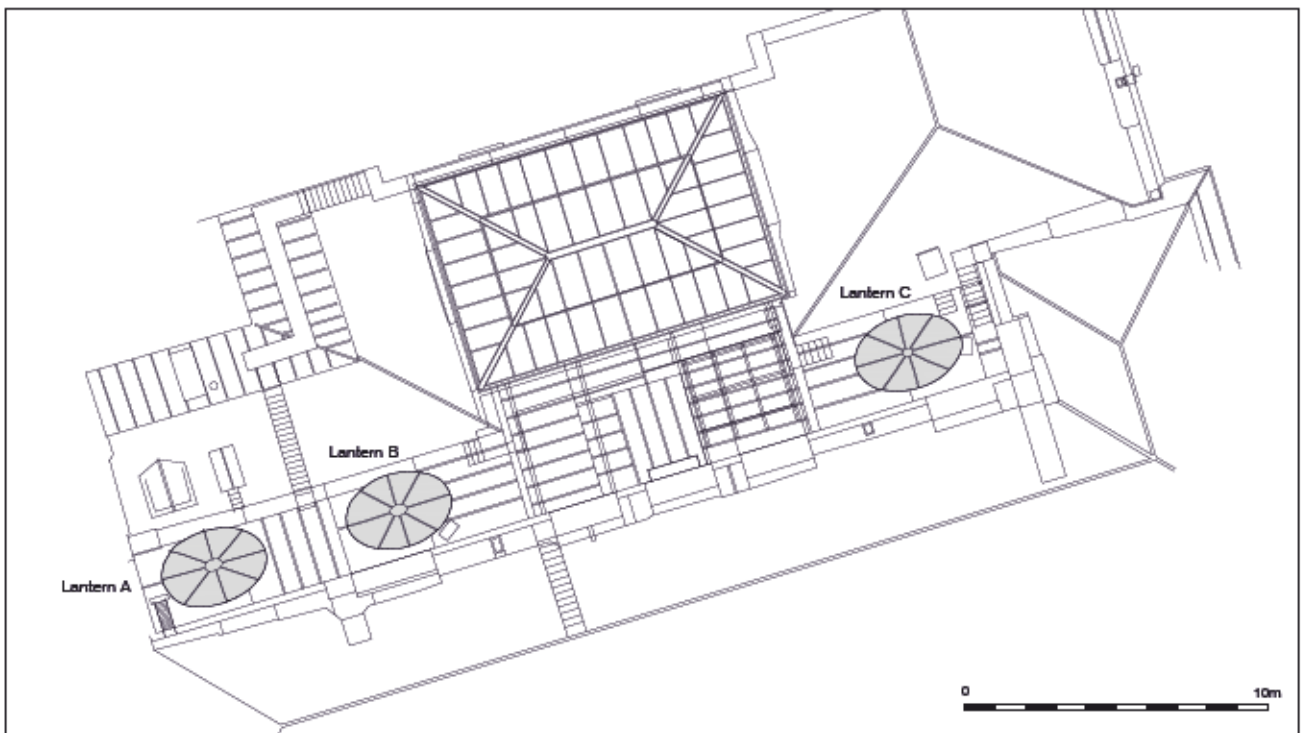
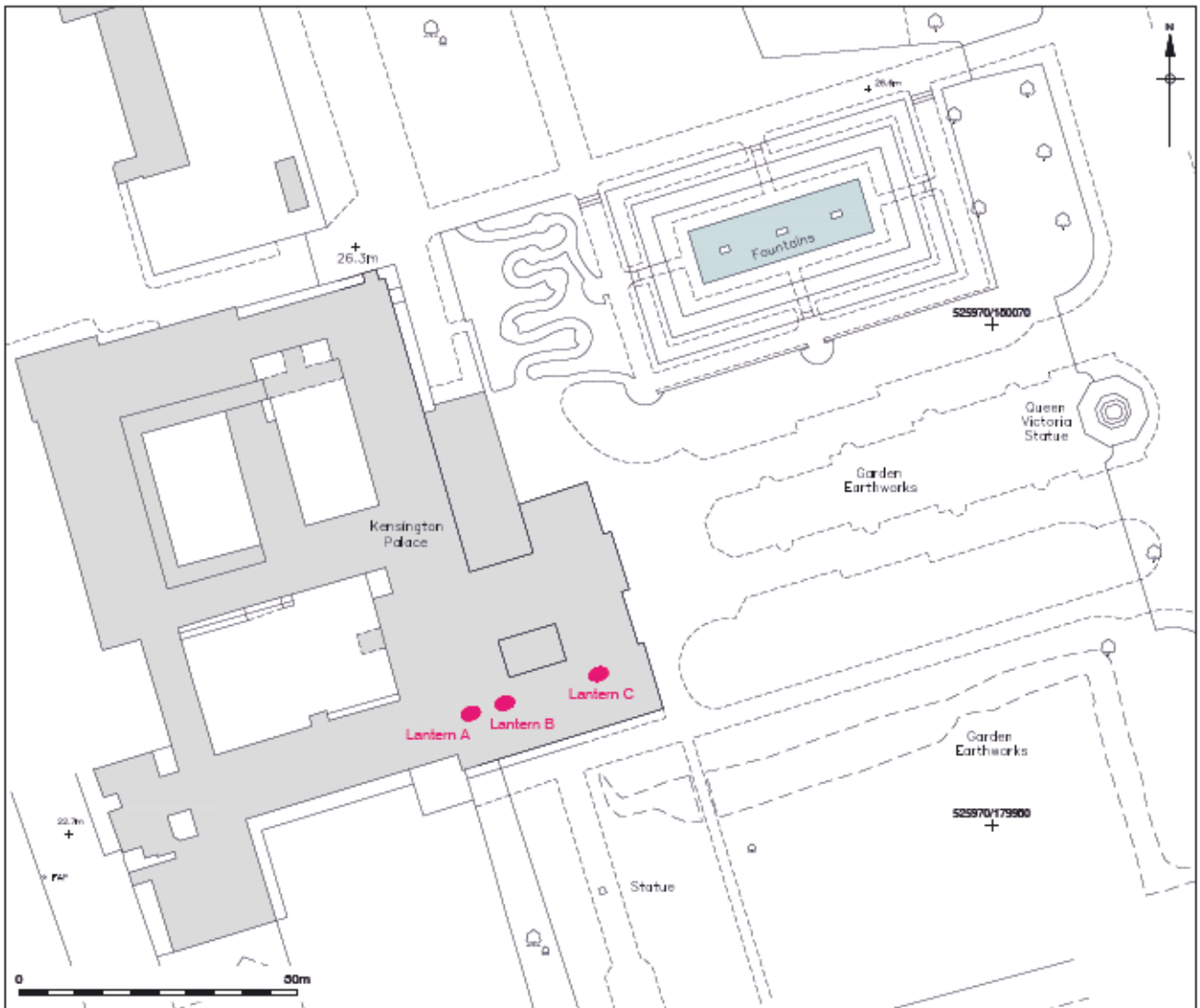


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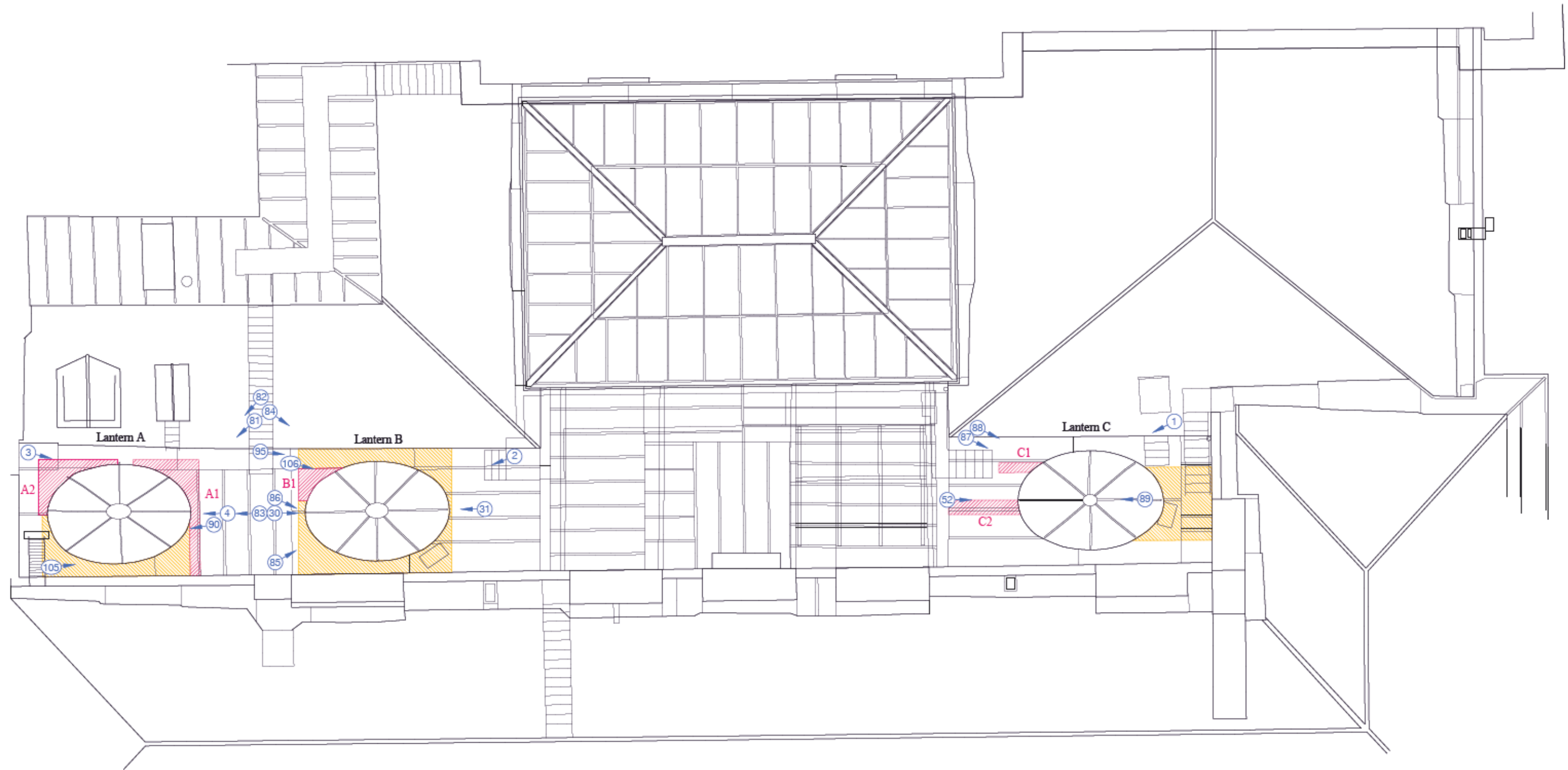
16/03/16 HB




Figure 1
Site Location
1:12,500 at A4

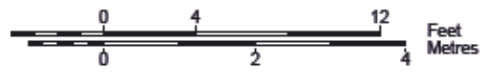


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Figure 2
 Detailed Site Location
 1:1,250 & 250 at A4



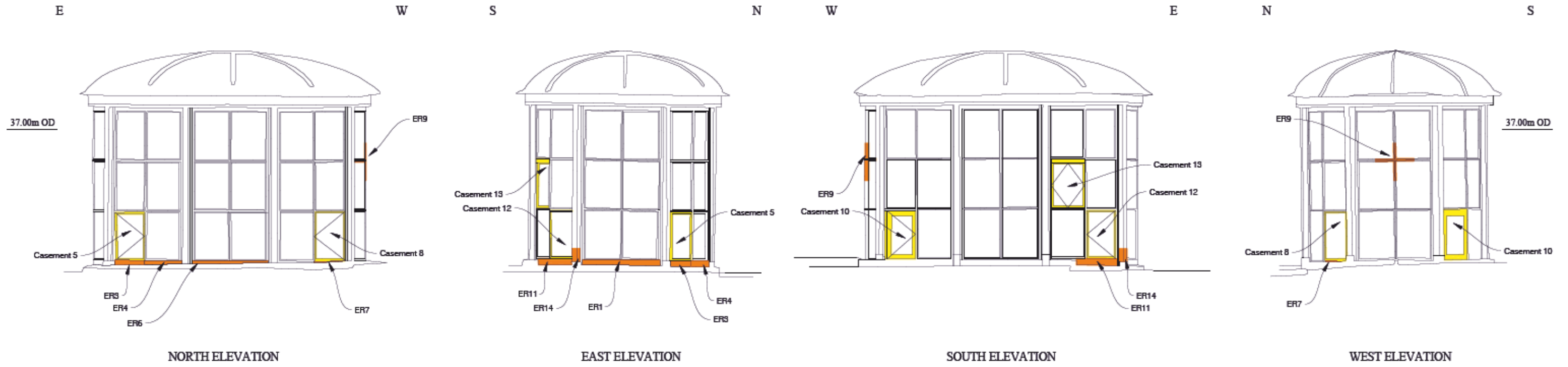
-  Investigative Openings A-C
-  Areas of Sub-Structure revealed after raising of Lantern
-  Location and Direction of Plate



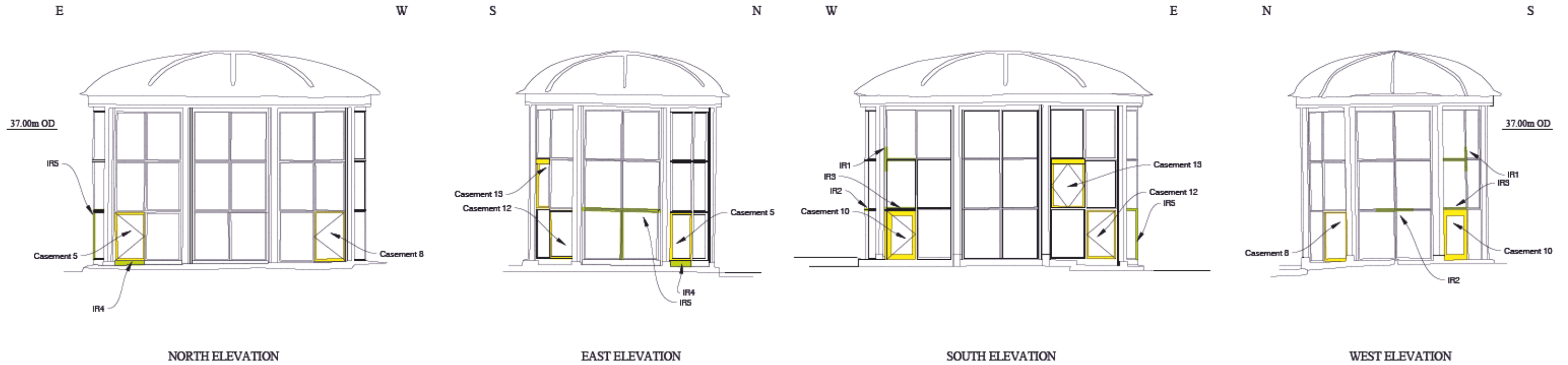
Based on Existing General Roof Plan drawing (Project HRP A.33 No. 110) supplied by Donald Inaall Associates, 2015
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Figure 3
Roof Plan showing Lanterns A-C & Openings A1-C2
1:100 at A3

Lantern A:
External Repairs & Window Casements

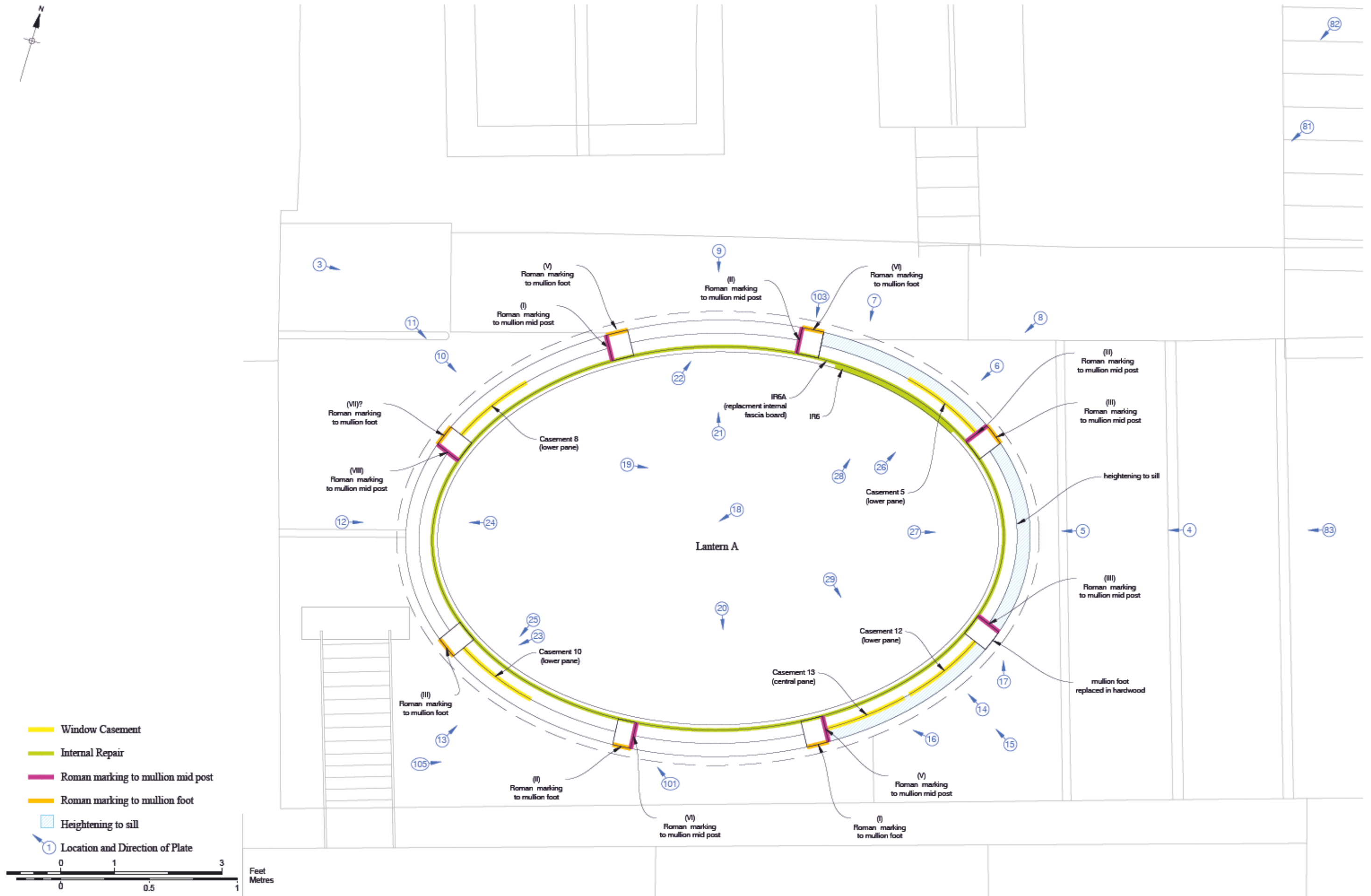


Lantern A:
Internal Repairs & Window Casements



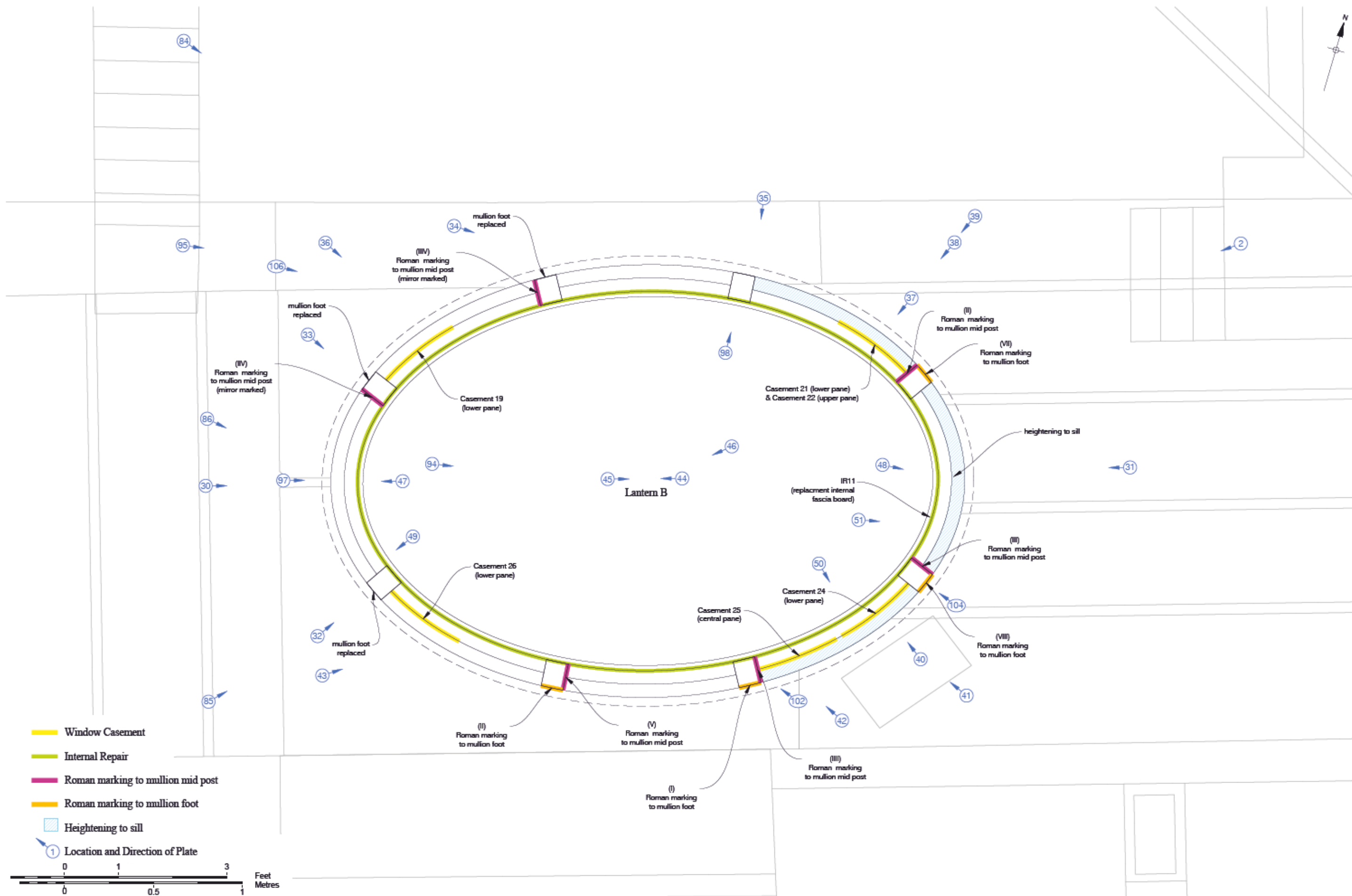
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- External Repair
- Internal Repair



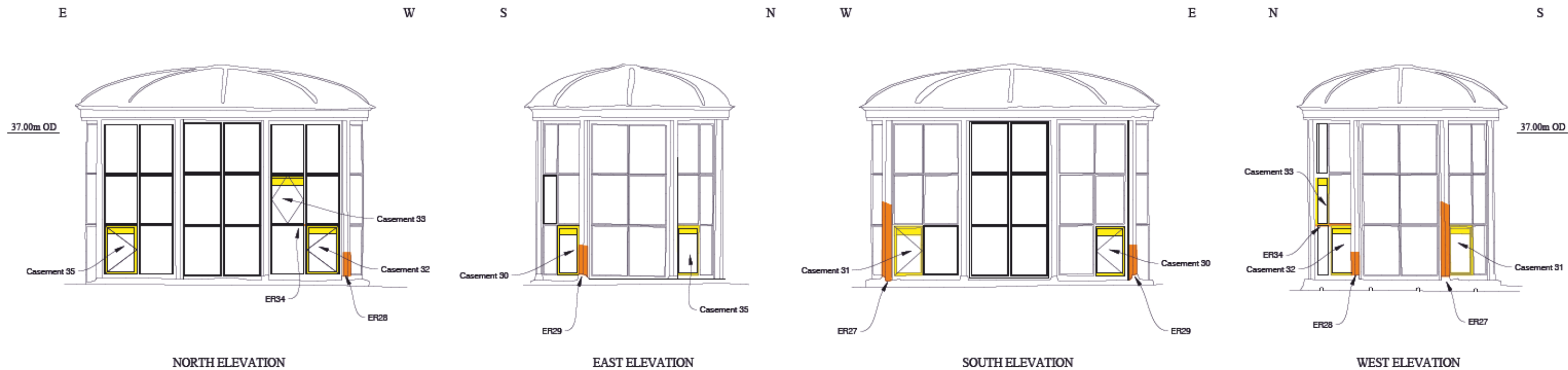


Based on drawing HRP.A.33 No.156 (Reflective Roof Plan) supplied by Donald Inshall Associates, 2016
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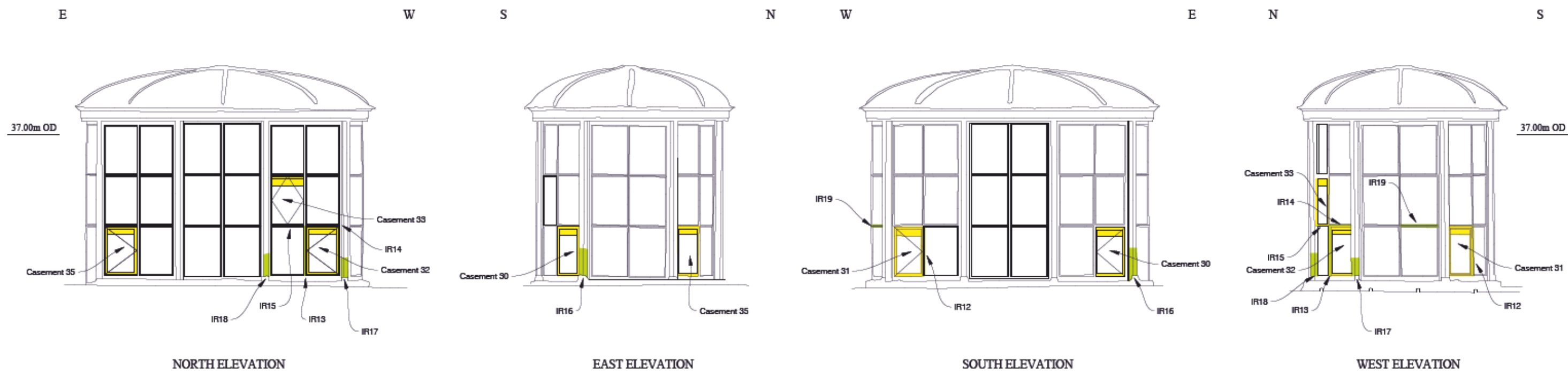
Figure 5
Lantern A: Plan showing Roman marking and photographic plates
1:20 at A3



Lantern C:
External Repairs & Window Casements

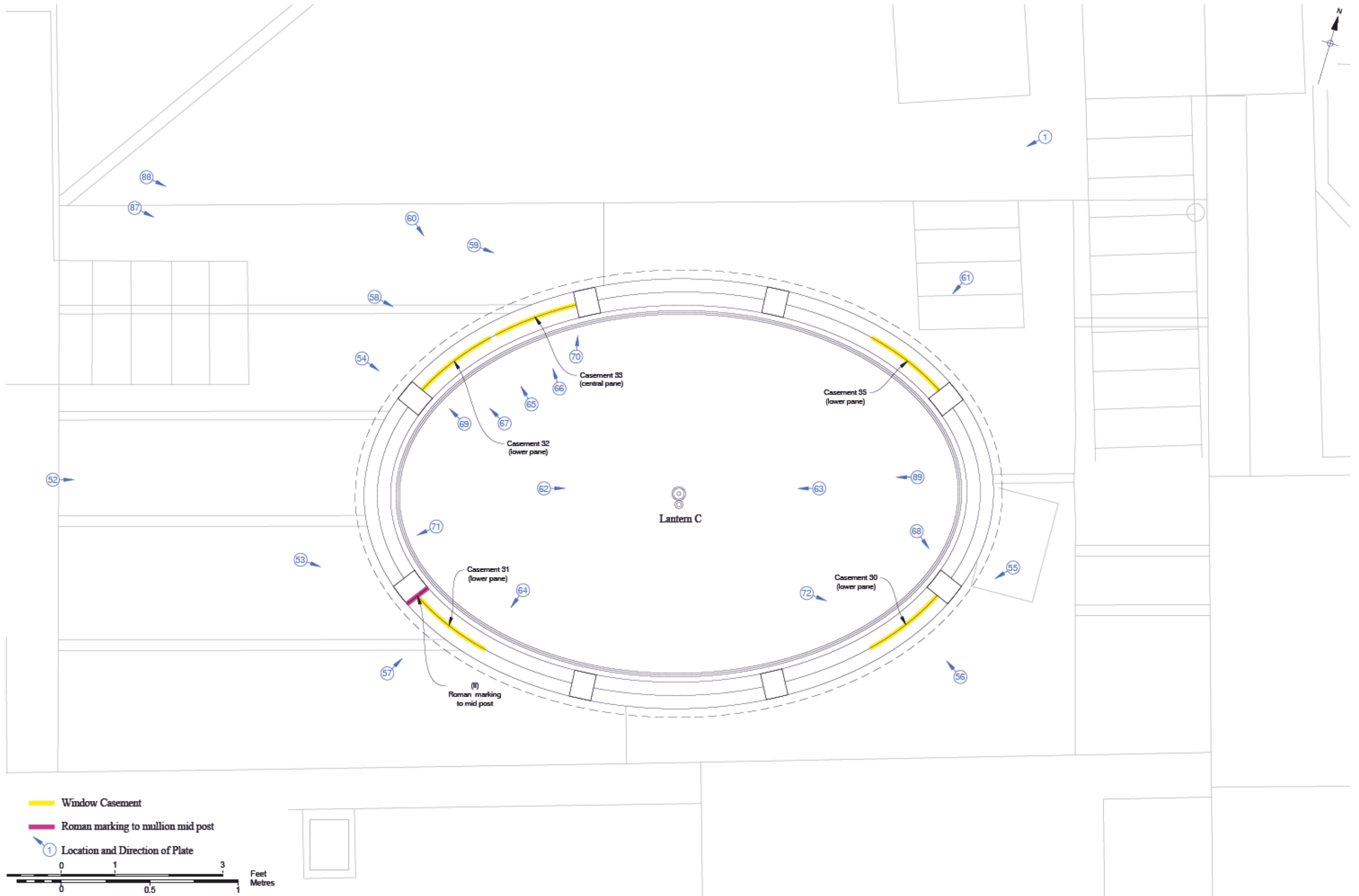


Lantern C:
Internal Repairs & Window Casements



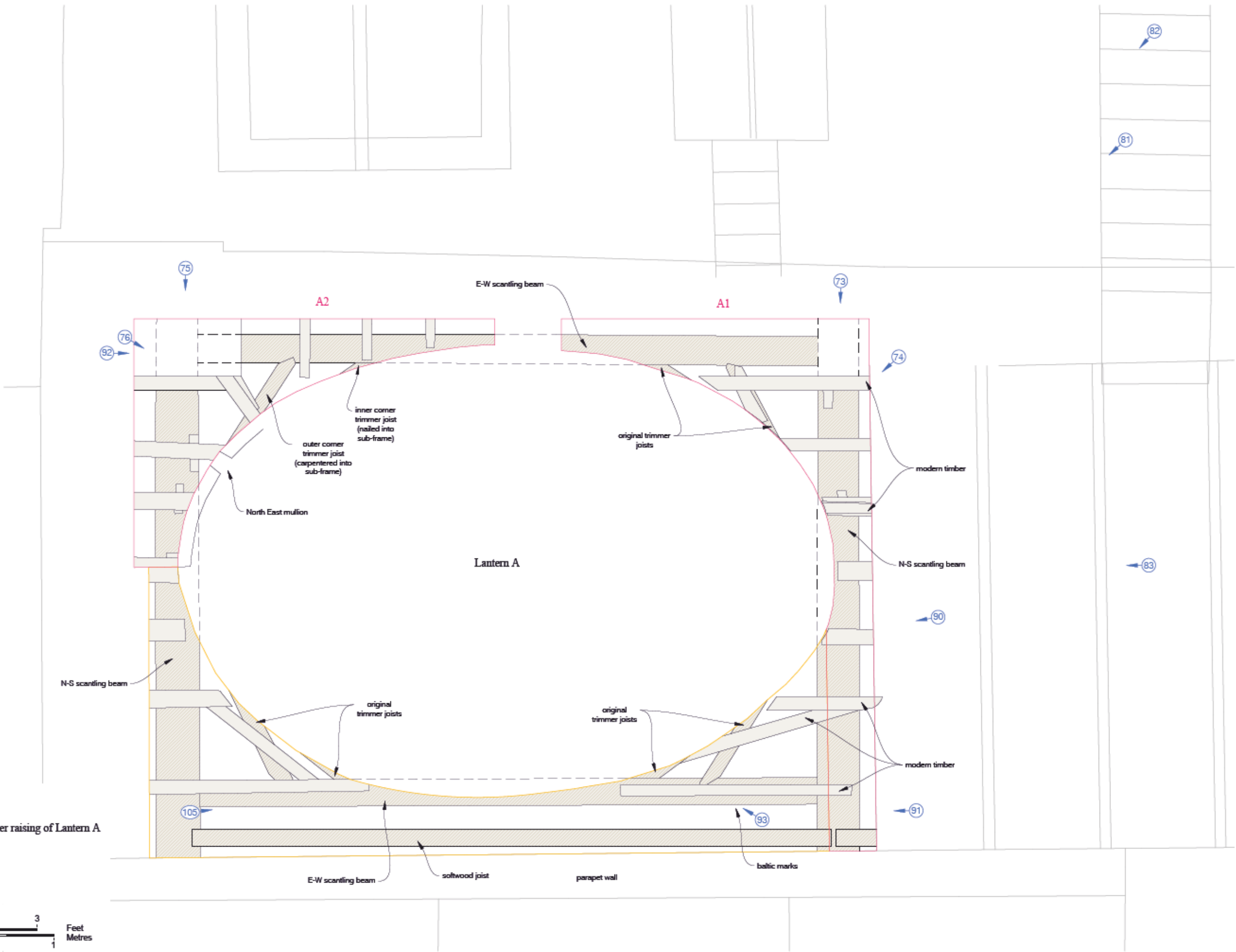
- Window Casement
- External Repair
- Internal Repair





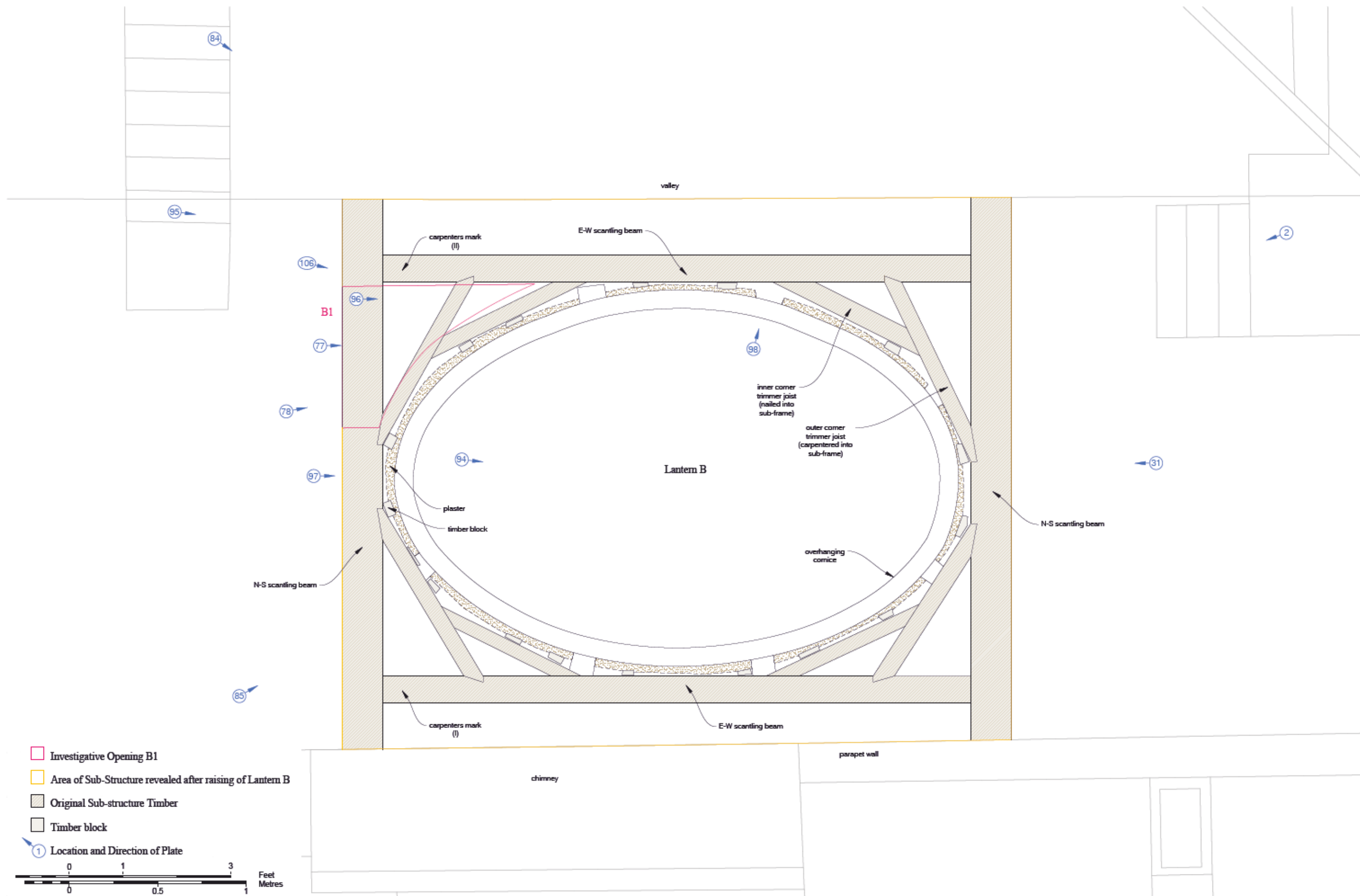
Based on drawing HRP.A.33 No.176 (Reflective Roof Plan) supplied by Donald Insaill Associates, 2016
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Figure 9
 Lantern C: Plan showing Roman marking and photographic plates
 1:20 at A3



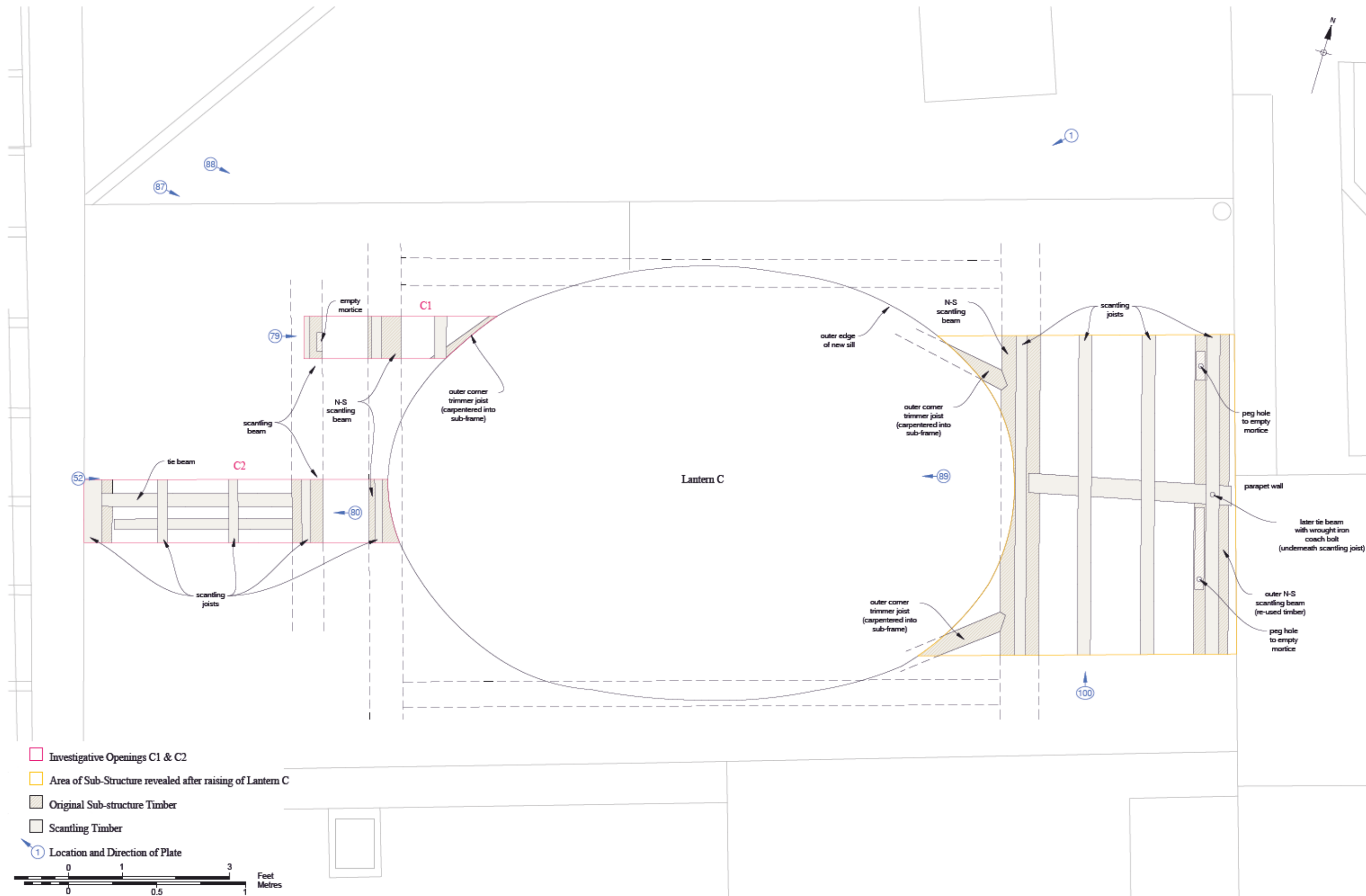
Based on Existing General Roof Plan drawing (Project HRP.A.33 No. 110) supplied by Donald Insaal Associatea, 2015
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Figure 10
 Lantern A: Plan showing Lantern sub-structure and openings and photographic plates
 1:20 at A3



Based on Existing General Roof Plan drawing (Project HRPA.33 No. 110) supplied by Donald Insaal Associatea, 2015
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Figure 11
 Lantern B: Plan showing complete circuit of sub-structure and photographic plates
 1:20 at A3



Based on Existing General Roof Plan drawing (Project HRP A.33 No. 110) supplied by Donald Insall Associates, 2015
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Figure 12
 Lantern C: Plan showing Lantern sub-structure and openings and photographic plates
 1:20 at A3

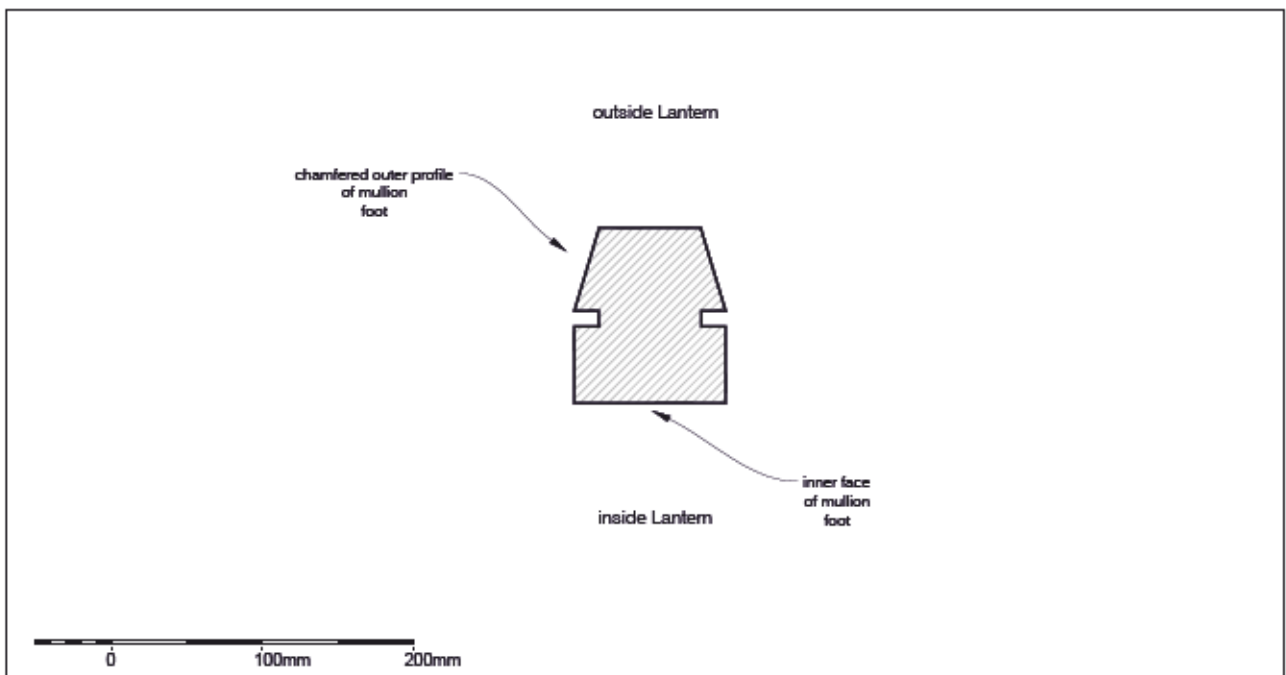
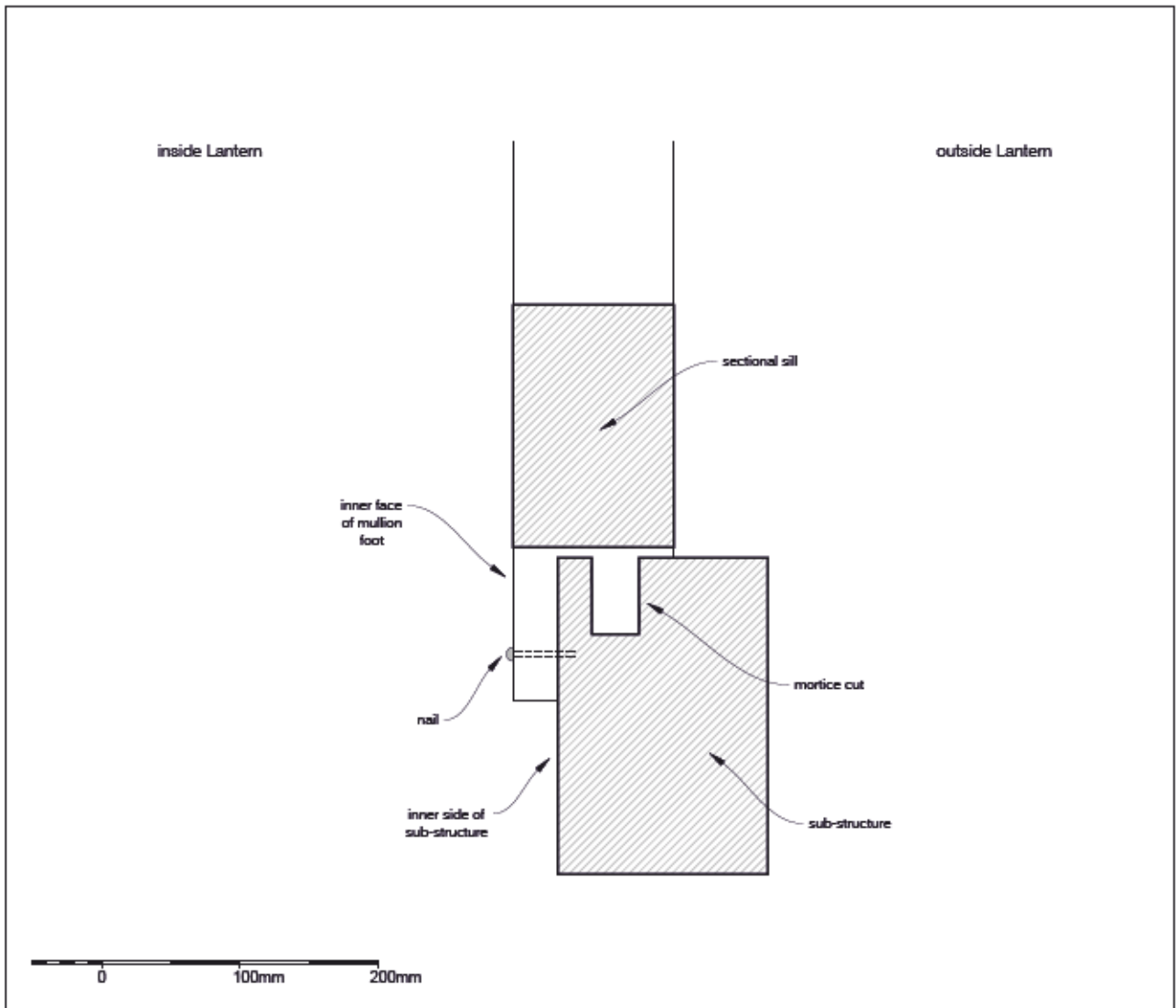


Figure 13
Measured sketch cross-section of mullion foot & sub-structure
1:5 at A4



Plate 1 Lanterns C, B & A looking west



Plate 2 Lanterns B & A looking west



Plate 3 Lantern A and B looking east



Plate 4 Lantern A looking west



Plate 5 Lantern A: External Repair 1



Plate 6 Lantern A: External Repair 3



Plate 7 Lantern A: External Repair 4



Plate 8 Lantern A: Casement 5



Plate 9 Lantern A: External Repair 6



Plate 10 Lantern A: External Repair 7



Plate 11 Lantern A: Casement 8



Plate 12 Lantern A: External Repair 9



Plate 13 Lantern A: Casement 10



Plate 14 Lantern A: External Repair 11



Plate 15 Lantern A: Casement 12



Plate 16 Lantern A: Casement 13



Plate 17 Lantern A: External Repair 14



Plate 18 Lantern A: Internal looking south-west



Plate 19 Lantern A: Internal looking east



Plate 20 Lantern A: Window Detail looking south



Plate 21 Lantern A: Window Detail looking north



Plate 22 Detail of typical glazing bar

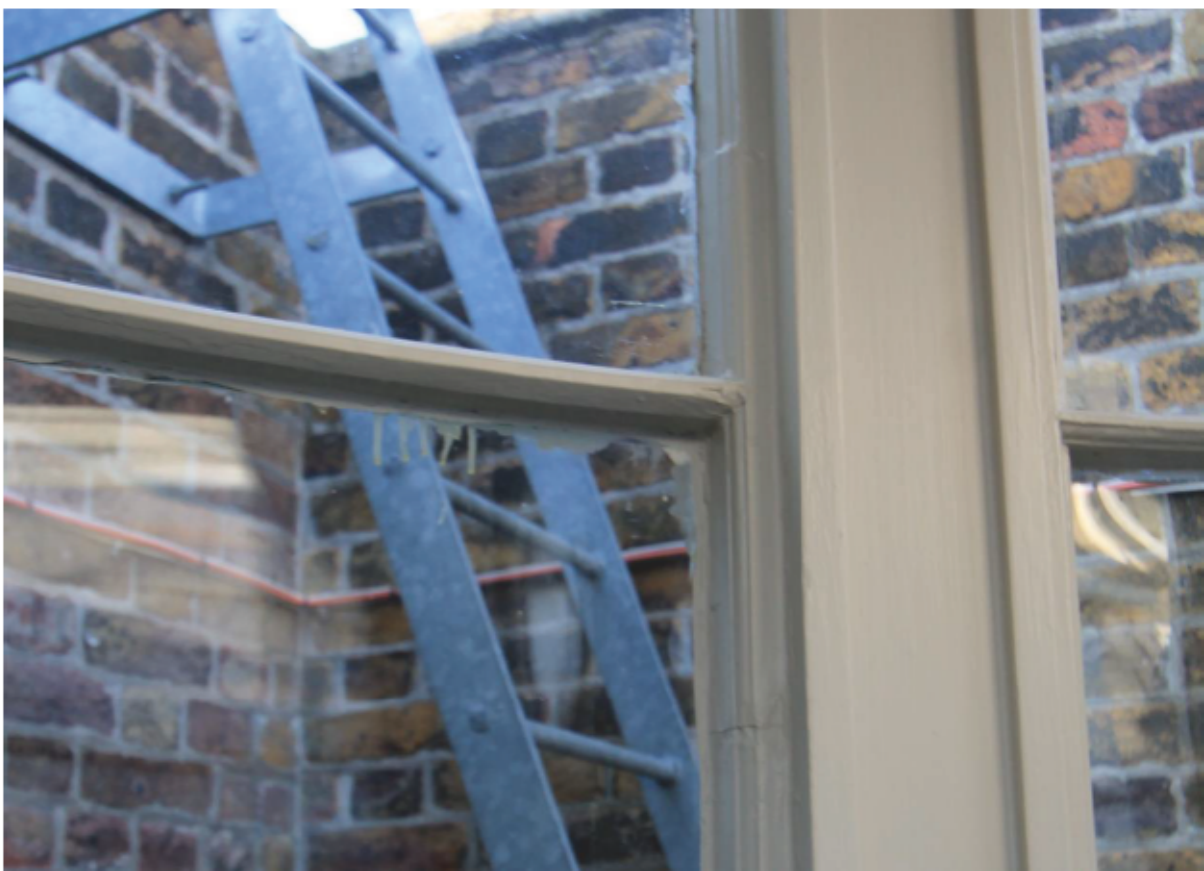


Plate 23 Lantern A: Internal Repair 1 showing plain glazing bar



Plate 24 Lantern A: Internal Repair 2



Plate 25 Lantern A: Internal Repair 3



Plate 26 Lantern A: Internal Repair 4



Plate 27 Lantern A: Internal Repair 5



Plate 28 Lantern A: Internal Repair 6 and 6A



Plate 29 Lantern A: Detail of Cornice



Plate 30 Lantern B: looking east



Plate 31 Lantern B: looking west



Plate 32 Lantern B: External Repair 15



Plate 33 Lantern B: External Repair 16



Plate 34 Lantern B: External Repair 17



Plate 35 Lantern B: External Repair 18



Plate 36 Lantern B: Casement 19



Plate 37 Lantern B: External Repair 20



Plate 38 Lantern B: Casement 21



Plate 39 Lantern B: Casement 22



Plate 40 Lantern B: External Repair 23



Plate 41 Lantern B: Casement 24



Plate 42 Lantern B: Casement 25



Plate 43 Lantern B: Casement 26



Plate 44 Lantern B: looking west



Plate 45 Lantern B: looking east



Plate 46 Lantern B: Ceiling and pendant light anchor



Plate 47 Lantern B: Internal Repair 7



Plate 48 Lantern B: Internal Repair 8



Plate 49 Lantern B: Internal Repair 9



Plate 50 Lantern B: Internal Repair 10



Plate 51 Lantern B: Internal Repair 11



Plate 52 Lantern C: looking east



Plate 53 Lantern C: External Repair 27



Plate 54 Lantern C: External Repair 28



Plate 55 Lantern C: External Repair 29



Plate 56 Lantern C: Casement 30



Plate 57 Lantern C: Casement 31



Plate 58 Lantern C: Casement 32



Plate 59 Lantern C: Casement 33



Plate 60 Lantern C: External Repair 34



Plate 61 Lantern C: Casement 35



Plate 62 Lantern C: looking east



Plate 63 Lantern C: looking west



Plate 64 Lantern C: Internal Repair 12



Plate 65 Lantern C: Internal Repair 13



Plate 66 Lantern C: Internal Repair 14



Plate 67 Lantern C: Internal Repair 15



Plate 68 Lantern C: Internal Repair 16



Plate 69 Lantern C: Internal Repair 17



Plate 70 Lantern C: Internal Repair 18



Plate 71 Lantern C: Internal Repair 19



Plate 72 Lantern C: Decay below casement 30



Plate 73 Lantern A: Opening A1 looking south



Plate 74 Opening A1: Detail of sectional sill and supporting sub-structure looking south-west



Plate 75 Lantern A: Opening A2 looking south



Plate 76 Lantern A: Modern heightening to sill



Plate 77 Lantern B: Opening B1



Plate 78 Lantern B: Later sill heightening (removed)



Plate 79 Lantern C: Opening C1 looking east



Plate 80 Lantern C: Opening C2 looking west



Plate 81 Lantern A: Stripping of domed roof exposing sarking boards, looking south-west



Plate 82 Lantern A: Following removal of lead flashings and ribs



Plate 83 Lantern A: Following removal of sarking boards, looking west



Plate 84 Lantern B: Following removal of lead flashings, looking south-east



Plate 85 Lantern B: Detail of sarking boards and central boss for leadwork



Plate 86 Lantern B: Detail of rafters and eaves



Plate 87 Lantern C: Following removal of leadwork, looking south-east

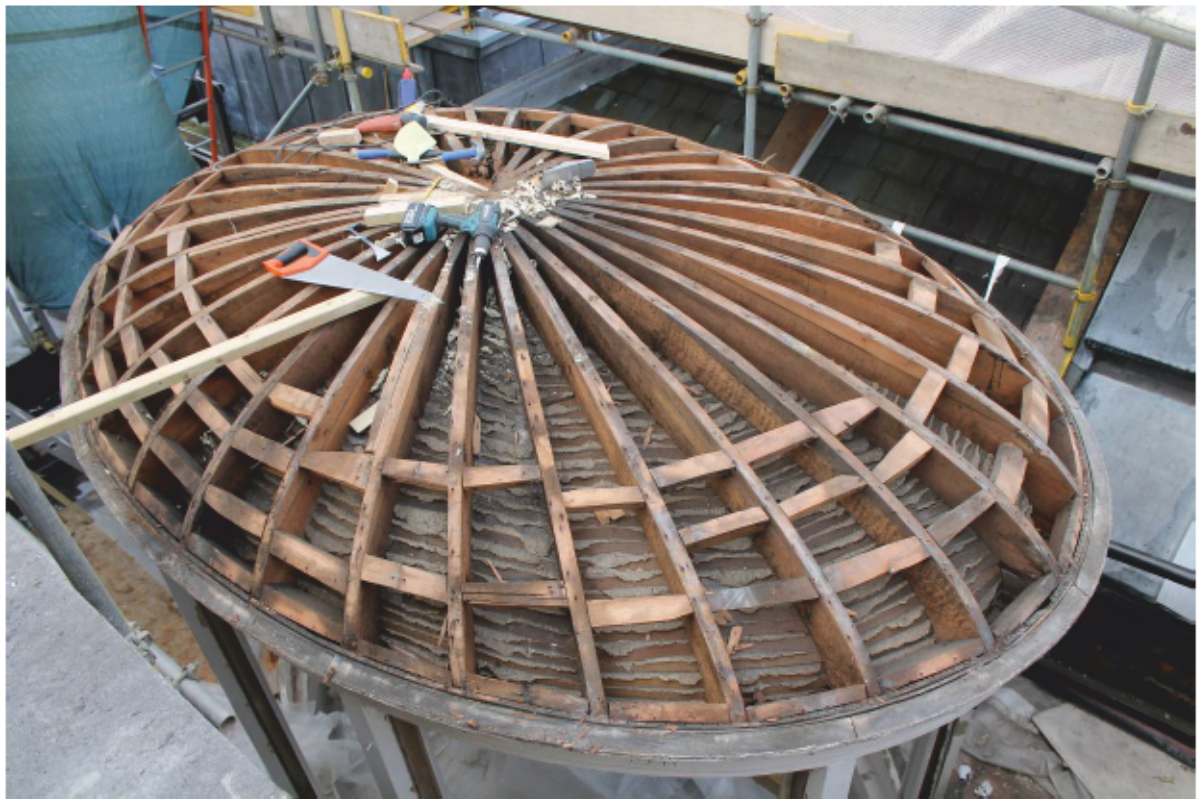


Plate 88 Lantern C: During conservation works



Plate 89 Lantern C: Composite rafter



Plate 90 Lantern A: Insertion of new softwood composite sill



Plate 91 Lantern A: Sub-structure looking west



Plate 92 Lantern A: Sub-structure looking east



Plate 93 Lantern A: Scribed Baltic marks



Plate 94 Raising of Lantern B, internal, looking east



Plate 95 Lantern B, support structure, looking east



Plate 96 Lantern B: Sub-structure looking east



Plate 97 Lantern B: Sub-structure looking east



Plate 98 Lantern B: Mullion foot halved over and nailed into sub-structure (viewed through internal plaster moulding)



Plate 99 Lantern B: Original sill sections



Plate 100 Lantern C: Sub-structure looking north



Plate 101 Lantern A: Roman marking to mullion (mid-post)



Plate 102 Lantern B: Roman marking to mullion (mid post)



Plate 103 Lantern A: Roman marking to mullion foot



Plate 104 Lantern B: Roman marking to mullion foot



Plate 105 Lantern A: Sectional sill repaired and fixed to new composite sill, looking north-east



Plate 106 Lantern B: Repaired sill sections and new Sapele hardwood mullion inserts looking south-east

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