

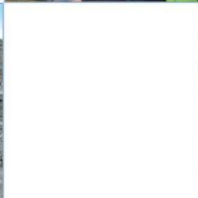
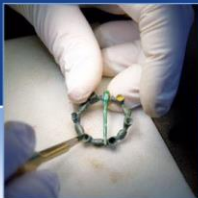
Lion's Den Lintols, Striling Castle

Archaeological Monitoring & Dendrochronological Assessment Survey

Written Scheme of Investigation

AOC 26813-59

20th March 2025



ARCHAEOLOGY

HERITAGE

CONSERVATION

Lion's Den Lintols, Striling Castle: Archaeological Monitoring and Dendrochronological Assessment

Written Scheme of Investigation

| | |
|---------------------------------------|--|
| On Behalf of: | Historic Environment Scotland Longmore House Salisbury Place Edinburgh EH9 1SH |
| National Grid Reference (NGR): | NS 78961 94081 (centred) |
| AOC Project No: | 26813-59 |
| Property In Care Ref: | PIC111 |
| Prepared by: | Diana Sproat Jamie Humble |
| Illustration by: | Mark Hoyle |
| Date: | 20th March 2025 |

This document has been prepared in accordance with AOC standard operating procedures.

Author: Diana Sproat / Jamie Humble **Date:** 20th March 2025

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1 Introduction

1.1 Project background

- 1.1.1 A programme of archaeological recording and monitoring, together with a dendrochronological assessment, is required by Historic Environment Scotland (hereafter HES) on four decaying lintols located in the basement area of Stirling Castle, PIC111 (Figure 1).
- 1.1.2 Stirling Castle is a strongly fortified medieval and later royal castle occupying a volcanic outcrop which commands the upper Forth valley. Within the castle are three main enclosures: the outer defences (on the main line of approach); the main enclosure (at the summit of the rock) bounded in the south by the Forework and encircled by a defensive wall, and to the north of it is the Nether Bailey. The principal buildings for royal occupation form a square known as the Inner Close and are enclosed by the King's Old Building, the Great Hall, the Chapel Royal and the Palace. The Palace is formed of four ranges, enclosing a central courtyard, the Lion's Den.
- 1.1.3 In the west range of the Palace, at vault level, timber lintols in four locations have been identified as requiring replacement, as decay means they no longer have structural integrity. Figure 2 outlines the exact position of each of these lintols, and the areas are presently blocked off and lintols propped up to avoid loading.
- 1.1.4 It is the intention to remove these lintols and replace them with concrete lintols. In addition, the lintel of opening W:B.19 in Room B12 has a vertical crack in the centre requiring the insertion of a 10mm thick bronze bar in the mortar joint below the lintel, with 150mm bearing on either side.

1.2 Site location

- 1.2.1 Figure 2 outlines the location of the lintols in the context of the basement plan of Stirling Castle.

2 Objectives

- 2.1 The objectives of the archaeological recording and monitoring is to create a 'preservation by record' of the lintols prior to and during their removal. During removal, an additional objective of the archaeological monitoring is to record any new discoveries behind the lintols to identify the history, date and character of the features and/or windows surrounding them. The dendrochronological assessment will aim to identify whether any further analysis, study, sampling or recording is necessary to further our knowledge of these features.
- 2.2 An additional objective of the survey is to make public the results of the investigation, subject to any confidentiality restrictions, through a technical report, and to create an archive of the results to nationally recognised standards to be included within the National Record for the Historic Environment (NHRE) and the local Historic Environment Record (HER).

3 Historical Background

- 3.1 A detailed background to the likely date of the lintols has been provided by HES in their desk-based assessment undertaken in March 2025, and has been included as an appendix to this report (Appendix 1). In summary, there is a:

'...a strong likelihood that the lintols date to before Stirling Castle came into care. Assuming the window openings on the OS map of 1858 ... are accurate, the current arrangement of the openings post-dates that survey, meaning the timber lintols were installed later than 1858. This was part of military interventions to the structure of the vaults, including raising the ceiling in B.11, and reconstructing it with wooden beams: most likely the timber lintols currently present. The stone lintol above W:B.19 is likely to date to the mid- to late-19th century, based on close architectural similarity with the additions by Robert Billings to the King's Old Building.



Figure 1: Site location plan

01/26813-59/WSI/01/01



Figure 2: Detailed Site Location Plan showing Position of Lintols in the Basement of the West Range (after Clanfield 2025, Fig 1) © HES

While all of the lintols under consideration, both timber and stone, are from later interventions and not part of the original building fabric of the Palace, they show the history of the building and developments in its use. The appearance internally suggests that the facing stonework and part of the vault ceiling has been cut away to form bigger openings, apparently leaving the random rubble core exposed in places. This makes them significant in demonstrating historic interventions and phases of use of the building, and this must be taken into account when considering options for repair. Though these elements relate to a later phase of the Palace's development, they are nevertheless an important part of its past and one that is not fully understood at present.' (Clanfield 2025).

4 Methodology

4.1 Archaeological Monitoring

4.1.1 Introduction

A pre-removal Enhanced/'Level 4' historic building survey is required by HES of the four lintols and the surrounding stonework as outlined in Figure 2 (ALGAO 2013; HE 2016).

In addition to this, archaeological monitoring is required whilst the lintols are being removed (and all physical intervention) whilst the new lintols are being installed, in the event that any additional features are exposed.

Following this, there will be a short report on the results.

4.1.2 Photographic record

For both on-site visits, a general and detailed photographic survey will be undertaken of the lintols and their surrounding stonework and context using a digital SLR camera in raw format to a minimum 24-megapixel resolution.

A 2m and 1m ranging pole or smaller scale will be placed in a selection of shots where access and health and safety allows for scale, and a smaller scale will be used for detail shots where it can be safely and securely placed. Some photographs, given the confines of the subject matter, may not have a scale in them.

A pictorial register of photographs will be made on site which will be transferred to the final drawn record to create photo plans, also accompanied by a written register for the report.

4.1.3 Written Record

The photographic record will be supplemented by a written account of the lintols and their context using AOC *pro-forma* recording sheets.

4.1.4 Measured Survey

The detailed pre-removal measured survey of the lintols, and their surrounding stonework, will be undertaken using photogrammetry. Images will be captured in raw (DNG/ARW) format and will be processed in Agisoft Metashape or Reality Capture software to create an orthographic image over which a 2D CAD drawings can be made of the areas and their surrounding stonework.

4.1.5 Dendrochronological Assessment

After the lintols have been removed, a dendrochronologist will be present to advise on whether the lintols have any value for further research, analysis or sampling.

4.2 Reporting

4.2.1 Upon completion of all of the elements of the survey noted above, a short report will be produced, prepared in accordance with ClfA, HES and AOC standards and will include the following:

- A summary of the background to the project and principal findings;

- Site location map and detailed site plan;
- Detail of the site background, site location and project background;
- Objectives of the investigation;
- Detailed methodology;
- Historical background to put the site into context;
- Historical map and other representations that are referenced in the text;
- A detailed description of the windows, lintols and their immediate context;
- The photographic record used as plates to illustrate the report;
- Annotated drawings reproduced at an appropriate scale;
- Results of the dendrochronological assessment;
- Discussion bringing together the findings of the historical background and on-site investigations;
- Conclusions;
- Recommendations for potential future work and research if relevant;
- All references listed, both cartographic and bibliographic, and
- Appendices, including:
 - Photographic register
 - Plans showing position and direction of each photograph
 - Copy of the OASIS record
 - Copy of HES desk-based assessment (Clanfield 2025)

4.2.2 A draft copy of the report will be presented to HES for comments, after which any comments will be addressed, and edits completed within a reasonably mutually-agreed timescale.

4.3 Outputs and Archive Deposition

4.3.1 The outputs for the project will be subject to the standards of the HES digital team. The deliverables will be included as part of the report stating and explaining all stages of the project, calculations, data registration, challenges in the project, metadata (using our metadata form), equipment used, software used, and accuracy values achieved, the data as raw data (images filed to our standard filing structure), archival .obj mesh file with associated .mtl and texture files.

4.3.2 The archive will be prepared for deposition in the National Record for the Historic Environment (NHRE) within 6 months of the completion of the on-site works to ClfA standards (2014). This specific includes:

- A copy of all digital photographs related to the historic building recording survey.
- PDF and hard copy of the report.

5 Operational Factors

5.1 Health and Safety

5.1.1 AOC Archaeology has always maintained high standards of health and safety on-site and a copy of our Health & Safety Policy can be supplied on request. The Project Manager will prepare appropriate documentation, including RAMS, for inclusion in the site's Health & Safety Plan, and these will be approved by HES prior to going on site.

5.3 Timetable

5.3.1 It is envisaged that the removal of the lintols will take place in May 2025. Therefore, the pre-removal survey will be undertaken in late April 2025, with the monitoring undertaken to the contractor's timetable thereafter.

5.4 Project Team and Facilities

- 5.4.1 The project will be managed by Diana Sproat MClfA, Project Manager for Built Heritage Services (Scotland) and both the pre-removal and removal monitoring surveys will be undertaken by Stuart Mitchell, Senior Project Officer and Buildings Archaeologist. The detailed measured survey will be processed and compiled by Kai Wallace, Project Officer, overseen by Jamie Humble, Project Manager. The on-site dendrochronological assessment will be undertaken by Dr Anne Crone.

6 Conditions and Clarifications

- 6.1 Where AOC is not the main contractor on a site the main contractor's Risk Assessment will have primacy over the AOC document given that:
- The main contractors' risk assessment is aware of, and takes account of, AOC's working practices – ie, it does not compromise normal and safe archaeological procedure as set out in our Written Scheme of Investigation and Risk Assessment;
 - AOC was notified of the full suite of hazards present prior to arriving on site;
 - There is a proper induction and monitoring process in place and AOC staff have been through this process;
 - There is no significant conflict between AOC H&S procedures and those proposed by the main contractor;
 - AOC are made aware of new threats or hazards as they arise during the course of our on-site involvement.
- 6.2 The client is solely responsible for all aspects of site security.
- 6.4 There may on occasions be other unusual circumstances which have not been included in the programme, including unavoidable delays due to extreme weather, vandalism, etc, which may hinder the timetable and scheduling of the work.

7 References

7.1 Bibliographical references

ALGAO 2013 *Historic Building Guidance for Curators, Consultant and Contractors*.

https://www.algao.org.uk/sites/default/files/documents/ALGAO_Scotland_Buildings_Guidance_2013.pdf

ClfA 2014 *Standard and Guidance for the Creation, Compilation, Transfer and Deposition of Archaeological Archives*.

https://www.archaeologists.net/sites/default/files/ClFAS&GArchives_2.pdf

ClfA 2019 *Standard and Guidance for the Archaeological Investigation and Recording of Standing Buildings and Structures*.

https://www.archaeologists.net/sites/default/files/ClfAS%26GBuildings_2.pdf

Clanfield, I 2025 *PIC111 Stirling Castle Lion's Den: Assessment of Deteriorated Lintols in the West Range*. HES: Edinburgh [see Appendix 1]

Historic England 2016 *Understanding Historic Buildings: A Guide to Good Recording Practice*.

<https://historicengland.org.uk/images-books/publications/understanding-historic-buildings/heag099-understanding-historic-buildings/>

Appendix 1: PIC111 Stirling Castle Lion's Den Assessment of Deteriorated Lintols in West Range (Clanfield 2025)

HISTORIC ENVIRONMENT SCOTLAND

Cultural Resources Team Assessment

PIC111 Stirling Castle Lion's Den Assessment of Deteriorated Lintols in West Range

1 Introduction

Stirling Castle is a strongly fortified medieval and later royal castle occupying a volcanic outcrop which commands the upper Forth valley. Within the castle are three main enclosures: the outer defences (on the main line of approach); the main enclosure (at the summit of the rock) bounded in the south by the Forework and encircled by a defensive wall; and to the north of it is the Nether Bailey. The principal buildings for royal occupation form a square known as the Inner Close and are enclosed by the King's Old Building, the Great Hall, the Chapel Royal and the Palace. The Palace is formed of four ranges, enclosing a central courtyard, the Lion's Den.

In the West range of the Palace, at vault level, wooden lintols in four locations have been identified as requiring replacement, as decay has led to them having no structural integrity, and there is a short bearing at the ends. The timber lintols above the steps in area B.11 (Fig 1) are bowing and have significant rot (Fig 2), and the lintols above the windows W:B.18, W:B.19 and W:B.20 in B.12 are also deteriorated (Fig 3).

The lintols have been propped and the area above barriered off to avoid loading. Removal of the decayed lintols and replacement with concrete lintols has been proposed. The extent of these repair works means the age and significance of the timbers and surrounding masonry need to be taken into consideration.

In addition, the external stone lintol to W:B.19 has a vertical crack in the centre (Fig 4). The proposed repair is the insertion of a 10mm thick bronze bar in the mortar joint below the lintol, with 150mm bearing on either side.



Fig 1. Plan of the vault level of the buildings surrounding the Lion's Den. The timber lintols are within B.11, at the west end of the room, and above windows W:B.18, W:B.19 and W:B.20 in B.12.



Fig 2. Image of the timber lintols in B.11. Decay is visible and the poor condition is evident. Photograph taken by Lewis Brunton.



Fig 3. Timber lintols in B.12. This wood is spongy to the touch and decay has been principally at the ends of the timber, leaving the bearing very short.



Fig 4. W:B.19. A vertical crack is visible near the centre of the stone lintol.

2 Historical background

The earliest known documentary evidence for Stirling Castle is in the reign of Alexander I (1107–1124) when a chapel in the castle was dedicated to St Michael. In the 1500s James IV oversaw a period of building at the castle which included the construction of the King's old building, chapel royal and great hall.

The building of the Palace was part of an intensive campaign of building by James V during the latter part of his rule, 1528–42. It was begun in 1538, on a site that appears to have been occupied by an existing range of royal apartments, and the present west range may partly incorporate elements of this earlier palace.

The first part of James V's building campaign involved the partial demolition of the existing buildings on the site, though the vaults of the earlier building were retained, the floor level over these vaults providing a building platform for further work. This series of vaulted basements, acted as service cellars for the suites of royal apartments on the first-floor, or principal level.

Major alterations were carried out in the seventeenth century by the earl of Mar to the upper floor, and changes were made to the windows in 1679, certainly on the principal floor, and possibly throughout the palace.

In the 18th and 18th centuries the castle's primary function was as a military base, and by the early 19th century much of the principal floor of the Palace had been converted into barracks, with a canteen in the east range of the vaults. The use of the Palace as barracks saw significant alterations to the building.

Plans of area B.11 and B.12 in 1741 (labelled G in Fig 5) show three small openings along the wall where there are now four openings: W:B.18, 19, and 20 and a doorway. The windows in the plan are significantly smaller than the present openings and are likely to be closer in size and plan to the original 16th century structure.

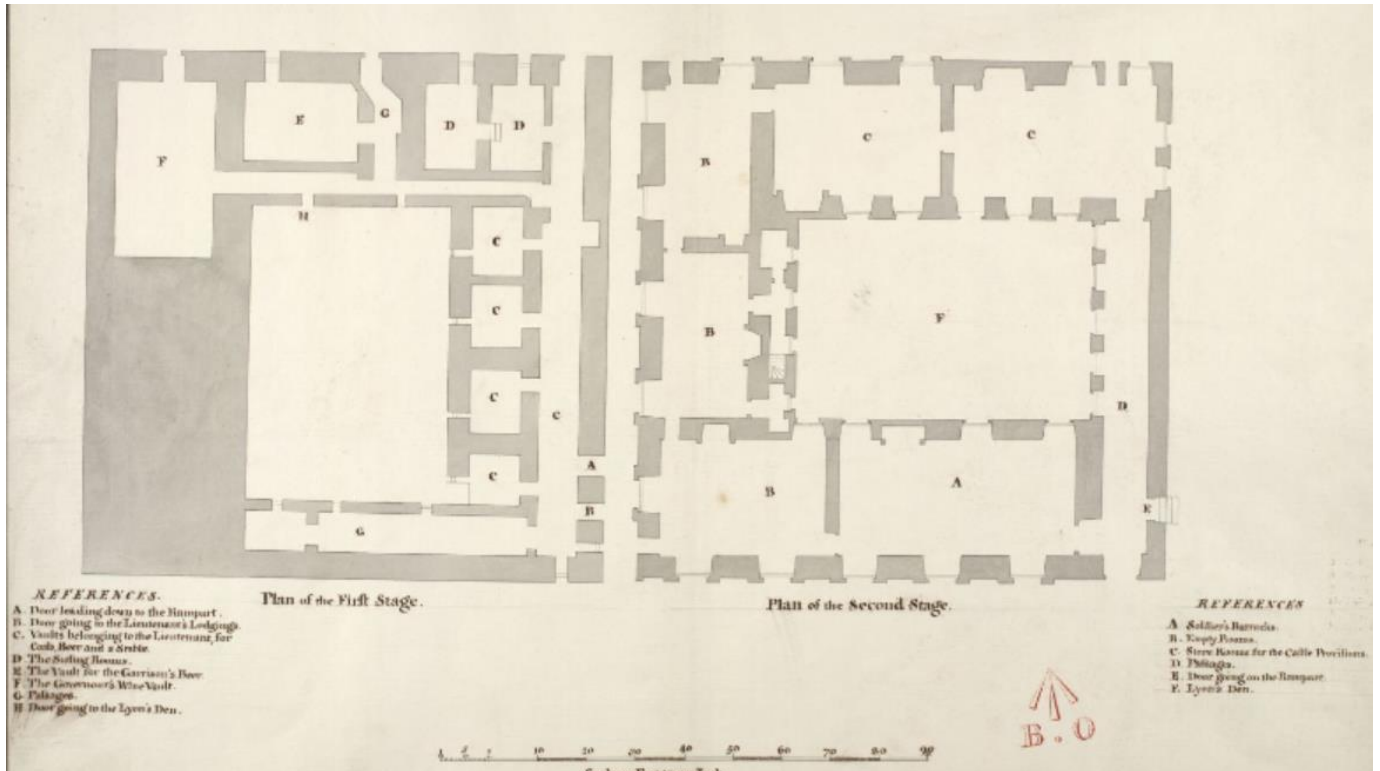


Fig 5. This plan from 1741 shows only three small opening in the wall where the windows now are (G – Passages, in the left-hand plan). The windows were widened after 1741 and the lintols probably put in to support this. Reproduced with kind permission of the trustees of the National Library of Scotland (<https://maps.nls.uk/view/00002707>)

The OS map of 1858 (Fig 6) shows a different arrangement of openings off the Lion's Den to both the current arrangement and the 1740s arrangement shown above. In comparison to the modern plans, both of these historic plans show much narrower openings than the present windows and that the window splays internally are a different width and different angle to those at present, clearly demonstrating that the window openings have been remodelled. If both the 1741 and 1858 plans are accurate, this suggests at least three different arrangements of windows here between the early 18th century and today.



Fig 6. OS map, surveyed 1858. This shows a different arrangement of openings off Lion's Den to the current arrangement and the 1741 arrangement. Reproduced with kind permission of the trustees of the National Library of Scotland (<https://maps.nls.uk/view/74416799>)

A cookhouse was added to the West side of the building before 1814, with an extension, possibly a staircase, added by 1847. In 1854 the building was converted to an ablution house and a rectangular water tank was mounted on a stone footing to the south of the ablution house, which is visible in the War Office plan of the castle from 1866 (Fig 7). Alterations including addition of doorways to accommodate access were made around the time of this conversion, which may have included the alterations to the windows and structure of the vaults. The building was converted back to a cookhouse in 1900, and a small porch on the north side linked it with the palace vaults. It was demolished in 1970.

Some alterations in the 19th century made critical structural interventions into the medieval vaults, including in the late 18th-19th century when the ceiling in B.11 was raised and reconstructed with timber beams. While there is map evidence to indicate significant changes in the vault level of the west range throughout the 19th century, at present there is not much detail on what was changed, precise dates, or why this was done. A standing building survey was carried out as part of the investigations in the Palace in 2003-8, but the phased plans do not fully represent the complexity of the interventions, and dates for the windows do not fully agree with historical maps.

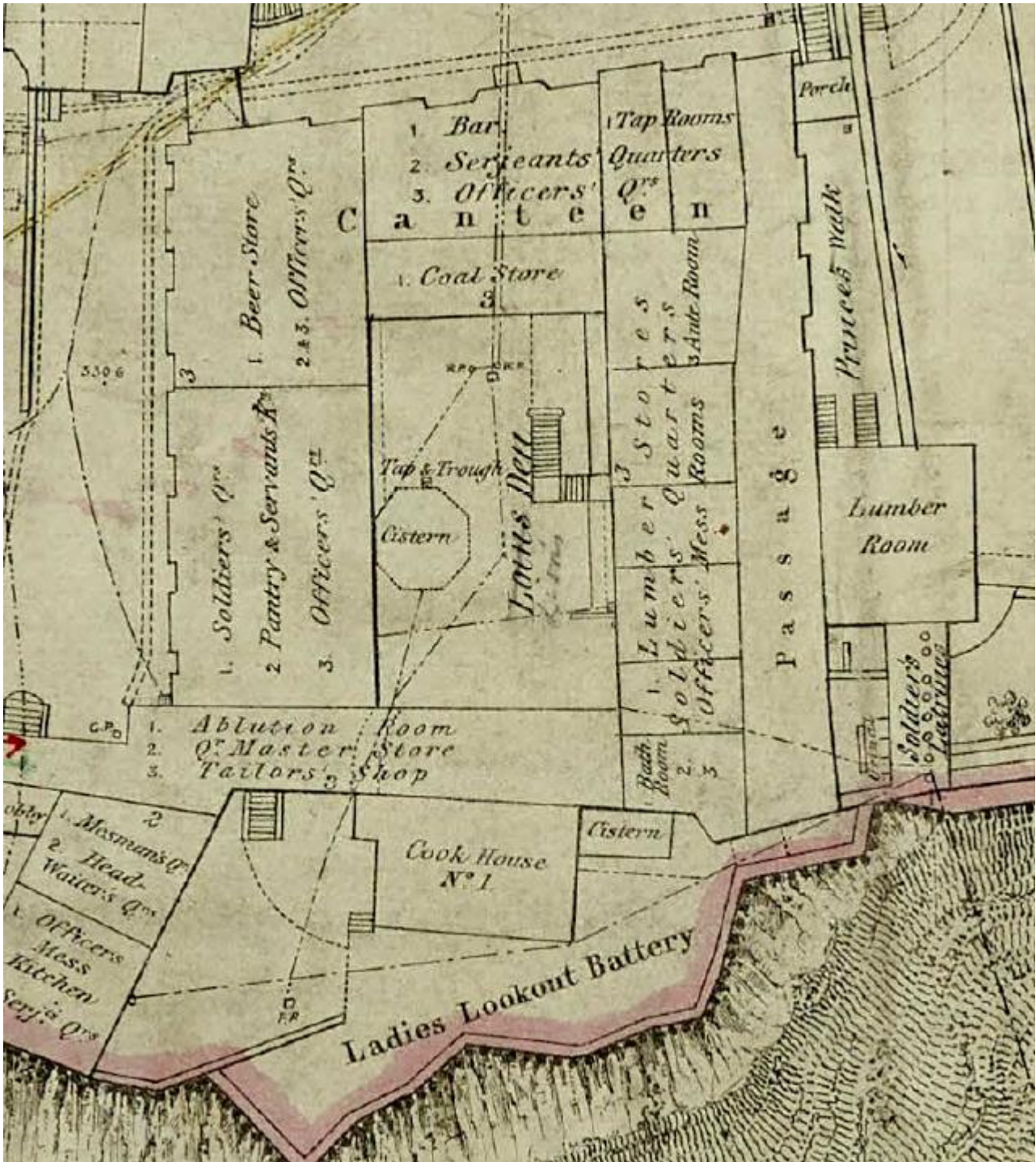


Fig 7. The War Office plan of Stirling Castle, surveyed in 1866, shows the building on the side of the West range added by the military for use as a cookhouse and later an ablutions house (HES archive)

In the 19th century the north end of the King's Old Building was rebuilt by Robert Billings, following a fire in 1855. Work began in 1857. The profile of the bolection moulding and the tooling on the stonework around W:B.18, 19 and 20 appears to match the windows installed by Billings in the King's Old Building, and it is possible these openings in their current form date to around the same period in the late 19th century.

The early 20th century saw the stripping and replastering of the interiors of all the principal rooms of the Palace, with areas of historic plaster remaining in the upper floor and roof spaces. The castle remained in use by the military until 1964. Alterations by the army were largely removed from the first floor of the palace, though are still present elsewhere.

Further alterations to the building were made in the 20th and 21st century during restoration and installation of services, including the installation of a lift in room B12.

There are no records of the wooden lintols in the West Range being replaced while the site has been in care.

3 Archaeological background

Archaeological investigation at Stirling Castle has been limited. Investigations have been carried out alongside conservation and presentation programmes, with the purpose of controlling their impact on buried archaeological remains.

Since the Stirling Castle Palace Project began in 1992, a small number of excavations have been carried out on the site, supplemented by standing building surveys and scientific analysis which have been integral to understanding of the development of the site.

1994: excavations were undertaken in the Lion's Den and North range which found the remains of a smaller, earlier building inside the North range, and structural remains in the courtyard predating the construction of the Palace in the 1540s. These excavations found a lot of disturbance in the Lion's Den from modern utility pipes and a large cistern to the south-east corner, 15.5m long by 4.25m wide, constructed as a water supply by the military in the 18th century.

1997-8: Excavations in the buildings south of the King's Old Building revealed the remains of a chapel beneath the Governor's kitchen with 14th century burials.

2003-2005: a programme of detailed investigation was carried out on the royal apartments. The work combined excavation and standing building recording to analyse the phases of building of the palace (Fig 6). This identified evidence for earlier windows in the upper part of the north, south and west façades of the Lion's Den. The windows took their present form following a heightening of the wall in the 18th century, though those on the west façade are likely to date from the alterations in the early 17th century. On the east side of the west range, the window frames were concluded to date from the early- to mid-18th century.

2004-2008: As part of the Stirling project, dendrochronological dating was carried out on timbers from across the palace, though none in the West range. It found that the bulk of the timbers were felled in 1538/39, with some earlier, around 1505. Dendrochronological analysis of the ceiling timbers of the principal floor has demonstrated that many were cut during the spring/summer of 1539, making it probable that the building of the principal floor started in 1538 or earlier.

Interior and exterior elevations were recorded in detail at this time. This investigation found that the windows in B.12 were widened in the early- to mid- 18th century, and the ceiling in B.11 was raised and reconstructed with wooden planks (Ewart, Murray and Hogg 2008: p50).



Fig 8. Phases of the building fabric, Ewart and Gallagher 2015: p64. V:17 and V:18 are areas B.11 and B.12 respectively. This does not seem to fully represent the complexity of the phases of alterations which have recently been identified in the vaults.

4 Assessment of significance

In the absence of any records for replacement of the timbers in the West Range, there is a strong likelihood that the lintols date to before Stirling Castle came into care. Assuming the window openings on the OS map of 1858 (Fig 6) are accurate, the current arrangement of the openings post-dates that survey, meaning the timber lintols were installed later than 1858. This was part of military interventions to the structure of the vaults, including raising the ceiling in B.11, and reconstructing it with wooden beams: most likely the timber lintols currently present.

The stone lintol above W:B.19 is likely to date to the mid- to late-19th century, based on close architectural similarity with the additions by Robert Billings to the King's Old Building.

While all of the lintols under consideration, both timber and stone, are from later interventions and not part of the original building fabric of the Palace, they show the history of the building and developments in its use. The appearance internally suggests that the facing stonework and part of the vault ceiling has been cut away to form bigger openings, apparently leaving the random rubble core exposed in places. This makes them significant in demonstrating historic interventions and phases of use of the building, and this must be taken into account when considering options for repair. Though these elements relate to a later phase of the Palace's development, they are nevertheless an important part of its past and one that is not fully understood at present.

5 Recommendation and Mitigation

The timber lintols are historically significant as they demonstrate the phases of alterations in the Palace, however, their poor condition is a risk to the structural stability of the surrounding masonry. Removal of the lintols is in the interest of the wider monument, as their poor condition means they are no longer capable of fulfilling a load bearing function and without replacement could lead to substantial loss of historic fabric. Therefore, their removal and replacement are necessary to support the longer-term preservation of the Palace.

A detailed measured survey and photographic record should be made of the timbers in situ and the surrounding stonework prior to removal. As removal of the timbers may expose further features and historic stonework, the timbers and their wider context should also be recorded after removal as far as this is practicable. We recommend that works to remove the timbers and all physical intervention relating to installation of the new lintols is carried out under archaeological monitoring. The timbers should be removed as carefully as possible to maximise their potential for any further analysis. It is recommended that a dendrochronologist is on site during removal to undertake preliminary assessment of their archaeological potential and feasibility for further analysis, however given the condition of the lintols we recognise that this may not be possible.

Should further analysis be feasible, the lintols should be safely retained and stored and further detailed archaeological analysis will be arranged by HES Cultural Resources Team. Longer-term retention of the lintols will be discussed with the collections unit and considered in line with the Found Fabric Guidelines and Acquisition Policy, but preservation by record is sufficient if the poor condition of the timbers means they are not suitable for acquisition.

The proposal for repair will require removal of plaster and masonry to allow for the replacement of the lintol at B.11 and the lintols in B.12. The plaster is not likely to be

historic, though the masonry in this area of the West Range has been identified as the original fabric from the late 15th - early 16th century and the 1540 building phase (Fig 6) so any material removed in the course of the repairs should be retained and restored to its condition prior to the work as far as possible. This intervention is necessary for the replacement of the lintols, and as the proposed method will restore the historic masonry in place after replacement of the lintols, it would have minor residual aesthetic impact on the historic fabric while maintaining the cultural significance of the Palace overall. Cultural Resources Team should be consulted on the proposed method of down taking and removal and on any changes that may arise during these works to ensure that adequate mitigation is in place and any disturbance to historic fabric is minimised.

As the proposed stabilisation to the stone lintol at W:B.19 retains the lintol in situ, the proposed method would not be conspicuous so minimises physical and visual impact, while allowing for retention of historic masonry and contributing towards longer term conservation of the building as a whole.

Following the mitigations set out above, the works would have a minimal impact on the monument's cultural significance.

Isabel Clanfield

Cultural Resources Advisor

February 2025

Updated March 2025

Bibliography

Crone, A. (2008) *Stirling Castle Palace, Archaeological and Historical Research 2004-2008: Dendrochronological Analysis of Oak and Pine Timbers*. Historic Scotland.

Ewart, G. and Gallagher, D. (2015) *'With Thy Towers High': The Archaeology of Stirling Castle and Palace*. Historic Scotland.

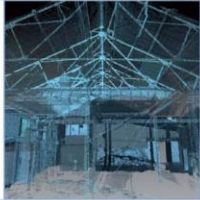
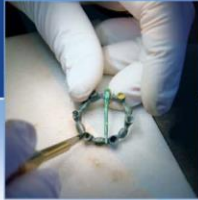
Ewart, G., Murray, D. and Hogg, S. (2008) *Stirling Castle Palace, Archaeological and Historical Research 2004-2008: Interior and Exterior Elevations*. Historic Scotland.

Historic Scotland (2003) *Stirling Castle Palace: Condition survey*. Unpublished.

Historic Scotland (2020) *Statement of Significance, Stirling Castle*.

Historic Scotland (2023) *Foreman's Reports for Stirling Castle*. Unpublished.

Kirkdale Archaeology (2004) *Excavations in Stirling Castle 1992-97*. Report produced for Historic Scotland.



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