Centre for Archaeology Report 005-2006

# Tree-Ring Analysis of Timbers from Howbury Barn, Moat Lane, Slade Green, London Borough of Bexley

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## Summary

Seven cores and one photograph were taken from accessible timbers in this ten-bay brick-built barn. Only three samples had a sufficient number of rings to justify further analysis, and these series did not match each other, nor did they give consistent matches with dated reference material. The roof therefore remains undated.



**Keywords**
Dendrochronology
Standing Building



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## Introduction

This long red-brick barn (NGR TQ 526 767; Fig 1) is thought stylistically to date from the first half of the seventeenth century or before. The roof structure is timber-framed, consisting of ten bays, with weather-boarded gable ends. Two projecting wagon porches appear to be part of the original structure. An extension on the north side, between the two main entrances, appears to be a nineteenth- or early twentieth-century century addition, and was of no further interest. The roof trusses support three tiers of purlins, the lower two being tenoned into the principal rafters and the upper own clasped. The tie beams are supported by braces tenoned to timber wall pieces, which are themselves supported on timber corbels built into the walls (Fig 2). The wall plates have edge-halved scarf joints. Dendrochronological dating was sought to inform an application for grant aid to this Building at Risk.

## Methodology

The site was visited in May 2005. In the initial assessment, accessible oak timbers with more than 50 rings and traces of sapwood were sought. Those building timbers judged to be potentially useful were cored using a 15mm auger attached to an electric drill. The cores were glued to wooden laths, labelled, and stored for subsequent analysis. One timber had a clean cut end, and this was photographed along with a crude scale (Fig 3). Subsequent analysis of this sample was by measuring direct from the photograph.

The cores were prepared for measuring by sanding, using an electric belt-sander with progressively finer grit papers down to 400 grit. Any further preparation necessary, eg where bands of narrow rings occurred, was done manually. Suitable samples had their tree-ring sequences measured to an accuracy of 0.01, mm using a specially constructed system utilising a binocular microscope with the sample mounted on a travelling stage with a linear transducer linked to a PC, which recorded the ring widths into a dataset. The software used in measuring and subsequent analysis was written by Ian Tyers (1999). Cross-matching and dating was accomplished by a combination of visual matching and a process of qualified statistical comparison by computer. The ring-width series were compared for statistical cross-matching, using a variant of the Belfast CROS program (Baillie and Pilcher 1973). Ring sequences were plotted to allow visual comparisons to be made between sequences on a light table. This method provides a measure of quality control in identifying any errors in the measurements when the samples cross-match.

In comparing one sequence or site sequence against another, *t*-values over 3.5 are considered significant, although in reality it is common to find *t*-values of 4 and 5 which are demonstrably spurious because more than one matching position is indicated. For this reason, it is necessary to obtain some *t*-values of 5, 6, and higher, and for these to be well replicated from different, independent chronologies and with local and regional chronologies well represented, unless the timber is imported. Where two individual sequences match with a *t*-value of 10 or above, and visually exhibit exceptionally similar ring patterns, they most likely came from the same parent tree.

When cross-matching between samples is found, their ring-width sequences are averaged to form an internal 'working' site mean sequence. Other samples may then be incorporated after comparison with this 'working' master until a final site sequence

is established. This is then compared with a number of reference chronologies (multi-site chronologies from a region) and dated individual site masters in an attempt to date it. Individual long series which are not included in the site mean(s) are also compared with the database to see if they can be dated.

The dates thus obtained represent the time of formation of the measured rings in each sample. These dates require interpretation for the construction date of the phase under investigation to be determined. An important aspect of this interpretation is the estimate of the number of sapwood rings missing. The sapwood estimates used here are based on those proposed for this area by Miles (1997), in which 95% of oaks contain 11–41 rings. Where complete sapwood or bark is present, the exact date of tree felling may be determined.

The dates derived for the felling of the trees used in construction do not necessarily relate directly to the date of construction of the building. However, evidence suggests that, except in the re-use of timbers, construction in most historical periods took place within a very few years after felling (Salzman 1952; Hollstein 1965).


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**Figure 1:** Map showing the location of Howbury Barn (circled in blue).

## Results and Discussion

Sampling was limited by access, many of the timbers being to high to access via a ladder. A platform in the western-most two bays allowed some access to timbers in these bays, although its floor was unsafe in parts. Access was not available on this visit to the tiebeams other than those at the western end, although these appear from ground level to be made from fast-grown trees, as perhaps can be seen in the photograph (Fig 2). It was felt that sufficient sampling was possible on this visit to show the general nature of the timbers and therefore the likelihood of a second visit, with a means of accessing the high timbers, resulting in more positive results. After discussion with members of the Scientific Dating Team, English Heritage, it was decided that further sampling could not be justified at this stage.

Eight oak (*Quercus* spp.) timbers were cored, the details being recorded in Table 1, and illustrated in Figure 4. In two cases the cores broke up and were not examined further, other than to assess the approximate number of rings in each. There were too few rings to justify taking a second core from these two timbers. Timbers in the porches were also assessed. These looked to be contemporaneous with the main roof timbers, and none were judged to have sufficient rings to make them worthwhile sampling.

Only two cores and the photograph were considered suitable for further analysis and had their ring sequences measured, the details being shown in Table 1. No acceptable cross-matching was found between these rather short sequences. The series were compared with the database of dated material, but no acceptable matching was found, and the timbers remain undated.

It is possible that the tiebeams may contain sufficient rings to enable dendrochronological dating, although the chances of this seem relatively poor. Should subsequent repair and renovation work be carried out and access to the timbers be more readily available, a closer inspection of the roof timbers, particularly the tiebeams, is recommended.

**Table 1:** Details of oak (*Quercus* spp.) timbers sampled from Howbury Barn. Trusses are numbered from the west end

| Sample Number | Timber and position | No of rings | Mean width (mm) | Mean sens (mm) | Sapwood complement |
|---|---|---|---|---|---|
| **HOW01** | Principal rafter 1 north | 65 | 1.91 | 0.27 | 1 |
| **HOW02** | Principal rafter 2 north | <45 | NM | - | - |
| **HOW03** | Principal rafter 2 south | <45 | NM | - | - |
| **HOW04** | Rafter, first east of 03 | <45 | NM | - | - |
| **HOW05** | North post, truss 2 | 47 | 3.20 | 0.19 | 8 |
| **HOW06 photo*** | Corbel, truss 7 south | 53 | 3.14 | 0.23 | 12C |
| **HOW07** | South post, truss 8 | <45 | NM | - | - |
| **HOW08** | South post, truss 7 | Φ | NM | - | - |
| **HOW09** | North post, truss 3 | Φ | NM | - | - |

Key: h/s bdry = heartwood/sapwood boundary - last heartwood ring date; NM = not measured; mean sens = mean sensitivity; C = complete sapwood.
* - see Figure 3
Φ = Cores broke up and it was not possible to determine the number of rings

**Figure 2:** View from the platform at the west end, looking east


**Figure 3:** Photograph of **HOW06**, the corbel to truss 7 on the south side

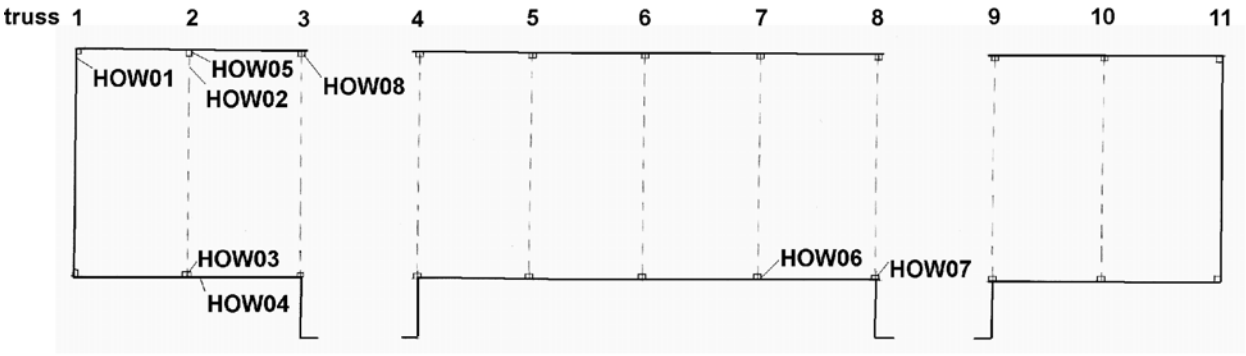


**Figure 4:** Sketch plan showing the approximate locations of the timbers sampled for dendrochronology. The trusses are numbered from the west (left) end

## Acknowledgements

This work was commissioned by Derek Hamilton of the Scientific Dating Service, English Heritage. Richard Bond (formerly of English Heritage) supplied the sketch plan used as a basis for Figure 4, and assisted my work in the field. John Meadows (English Heritage) and Cathy Groves (Sheffield University) made useful comments on an earlier draft of this report.

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