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Summary

A tree-ring dating programme commissioned timbers from the farmhouse at Cooper's Bank Farm, Dudley. Unfortunately, tree-ring analysis provides no dating evidence for these timbers.

Keywords

Dendrochronology
Standing Building

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TREE-RING ANALYSIS OF TIMBERS FROM COOPER'S BANK FARM, DUDLEY, WEST MIDLANDS

Introduction

This document is a technical archive report on the tree-ring analysis of oak timbers from Cooper's Bank Farm, Dudley (NGR SO91629048; Fig 1). The site comprises a Grade II listed house, and associated farm buildings, on a deserted settlement site which is a scheduled ancient monument. A dendrochronological survey of the building was requested by Richard Bond and John Yates of English Heritage to elucidate the historical development of the house and therefore inform a listed building consent application, potential listing upgrade, and proposed building alterations.

Sampling was requested from principal cross frames comprising three frames including trenched purlin roof trusses – two in the main east-west range, and one in the front north-south range; a staircase of apparent seventeenth-century style; floor frames, some of which appeared to have been reused, repositioned or inserted at a later date; and roof timbers comprising rafters, purlins, and ridge-pieces in both ranges of the farmhouse.

It is beyond the dendrochronological brief to describe the building in detail or to undertake the production of detailed drawings. As part of a multifaceted and multidisciplinary study of the building, elements of this report may be combined with detailed descriptions, drawings, and other technical reports at some point in the future to form either a comprehensive publication or an archive deposition on the building. The conclusions may therefore have to be modified in the light of subsequent work.

Methodology

Methods employed at the Lampeter Dendrochronology Laboratory in general follow those described in English Heritage (1998). Details of the methods used for the dating of this building are described below.

A tour of the building was made in the company of the present owner and Richard Bond from English Heritage in order to identify those oak timbers with the most suitable ring sequences for analysis. Those with more than 50 annual rings and some survival of the original sapwood and bark-edge were sought. The dendrochronological sampling programme attempted to obtain cores from as broad a range of timbers, in terms of structural element types, scantling sizes, and carpentry features, as was possible within the terms of the request whilst also meeting health and safety requirements.

The complete sequences of growth rings in the samples that were selected for dating purposes were measured to an accuracy of 0.01mm using a micro-computer based travelling stage (Tyers 1999). Cross-correlation algorithms (Baillie and Pilcher 1973; Munro 1984) were employed to search for positions where the ring sequences were highly correlated. The ring sequences were plotted electronically and exported to a computer graphics software package (Coreldraw™ v.8) to enable visual comparisons to be made between sequences at the positions indicated and, where these were satisfactory, new mean sequences were constructed from the synchronised sequences. The *t*-values reported below are derived from the original

CROS algorithm (Baillie and Pilcher 1973). A *t*-value of 3.5 or over is usually indicative of a good match, although this is with the proviso that high *t*-values at the same relative or absolute position must be obtained from a range of independent sequences, and that satisfactory visual matching supports these positions.

All the measured sequences from this assemblage were compared with each other and any found to cross-match were combined to form a site master curve. These, and any remaining unmatched ring sequences were tested against a range of reference chronologies, using the same matching criteria: high *t*-values, replicated values against a range of chronologies at the same position, and satisfactory visual matching. Where such positions are found these provide calendar dates for the ring-sequence.

The tree-ring dates produced by this process initially only date the rings present in the timber. The interpretation of these dates relies upon the nature of the final rings in the sequence. If the sample ends in the heartwood of the original tree, a *terminus post quem (tpq)* for the felling of the tree is indicated by the date of the last ring plus the addition of the minimum expected number of sapwood rings which are missing. This *tpq* may be many decades prior to the real felling date. Where some of the outer sapwood or the heartwood/sapwood boundary survives on the sample, a felling date range can be calculated using the maximum and minimum number of sapwood rings likely to have been present. The sapwood estimates applied throughout this report are a minimum of 10 and maximum of 46 annual rings, where these figures indicate the 95% confidence limits of the range. These figures are applicable to oaks from the British Isles (Tyers 1998). Alternatively, if bark-edge survives, then a felling date can be directly utilised from the date of the last surviving ring. The dates obtained by the technique do not by themselves necessarily indicate the date of the structure from which they are derived. It is necessary to incorporate other specialist evidence concerning the re-use of timbers and the repairs of structures before the dendrochronological dates given here can be reliably interpreted as reflecting the construction date of phases within the structure.

Results

The relatively short tree-ring sequences observable during the assessment in many of the original timbers restricted the number of suitable timbers available for sampling. However following on-site discussions with Richard Bond a total of eighteen samples were attempted (Figs 2-6) from the most promising timbers, of which nine were subsequently rejected (Table 1). This was largely due to samples having insufficient rings, although breakage of cores also proved a problem at this site.

The remaining nine samples were measured and the resultant ring sequences compared. Crossmatching was not identified between any of the samples. The raw sequences were then compared with dated reference chronologies from throughout the British Isles and northern Europe. However consistent significant computer correlations were not obtained for any of the nine individual ring sequences. Consequently no dendrochronological dating evidence has been obtained for any of the four areas of the building under investigation.

The lack of successful crossmatching may be attributed to a number of factors. These include the relative shortness of several of the sequences and the presence of bands of very narrow rings in a number of samples which may have precluded correct ring discrimination and measurement (Fig 7). The inability to crossmatch two samples (**02** and **03**) from the same timber suggests that this latter factor must be significant. The presence of narrow rings could be the result of environmental factors or woodland management practices such as pollarding (cf Rackham 1993, fig 35).

Acknowledgements

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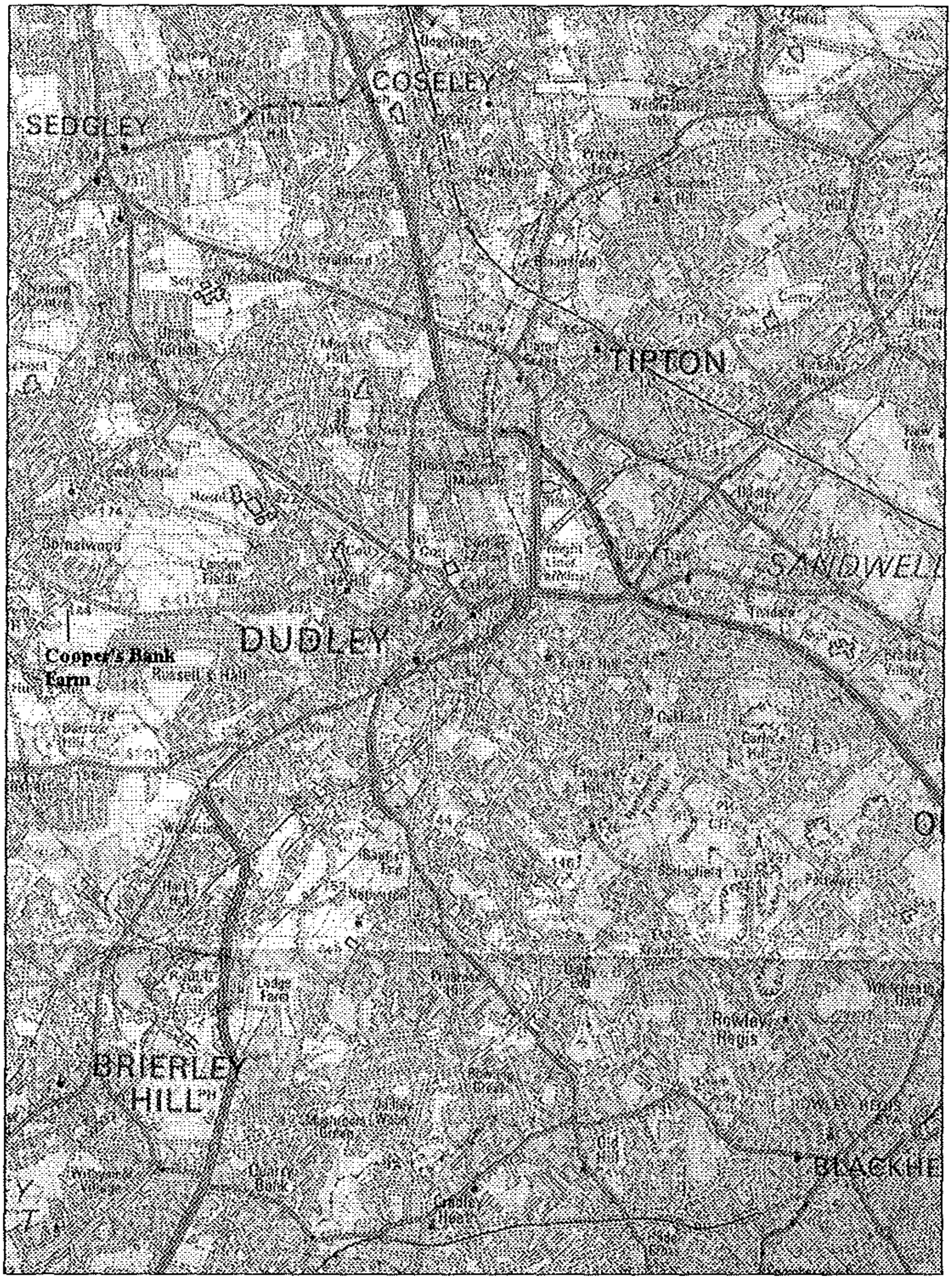

Figure 1 Location of Cooper's Bank Farm, near Dudley, West Midlands.

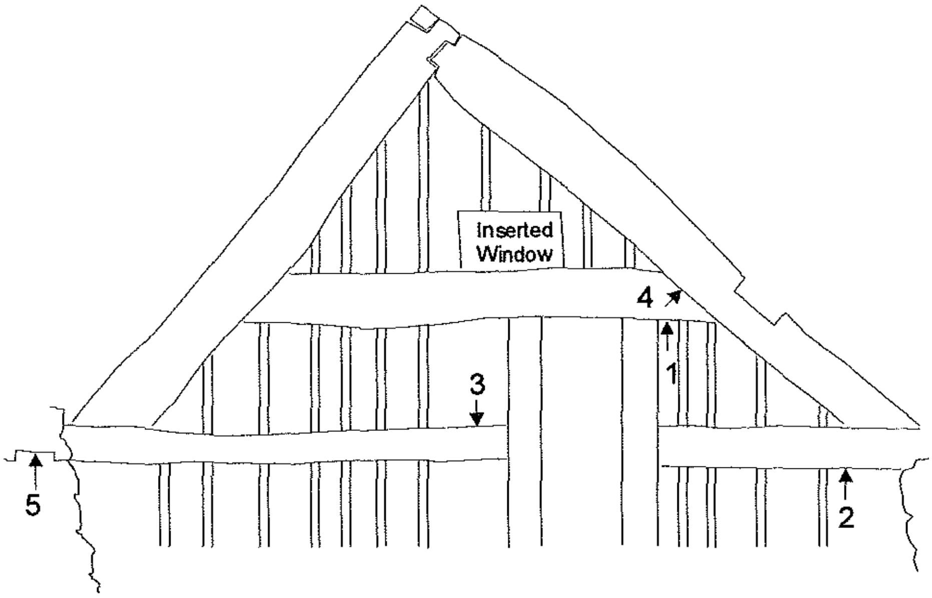

Figure 2 Location of samples from central truss, east-west range

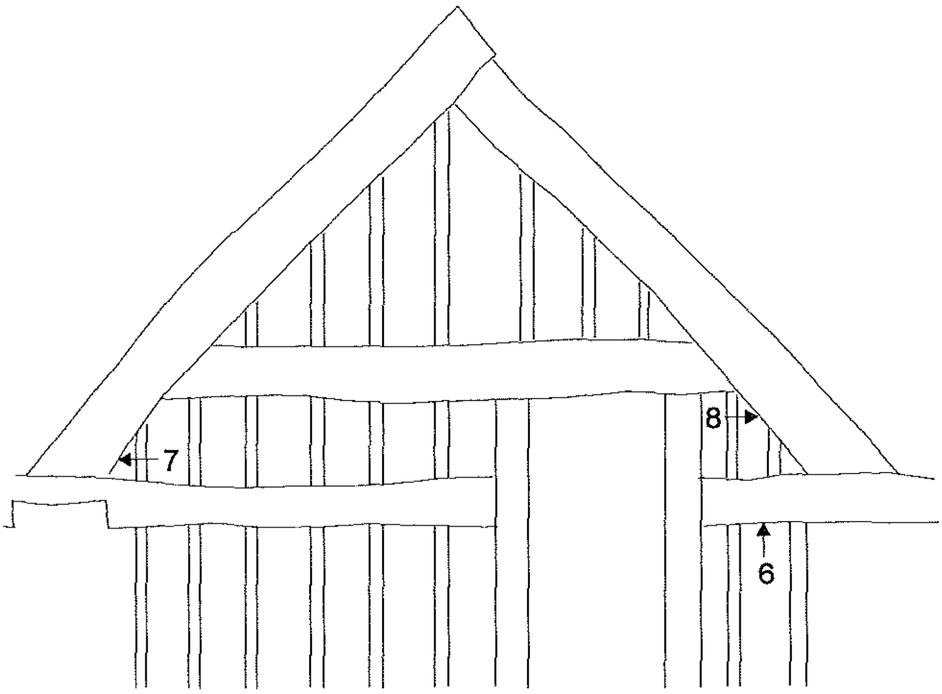

Figure 3 Location of samples from western truss, east-west range

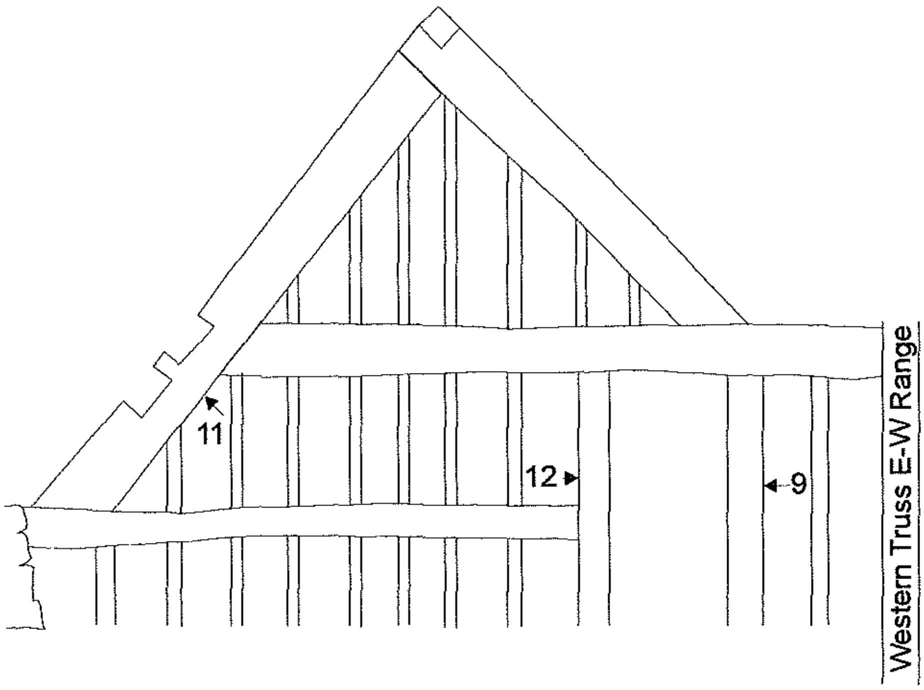

Figure 4 Location of samples from central truss, north-south range

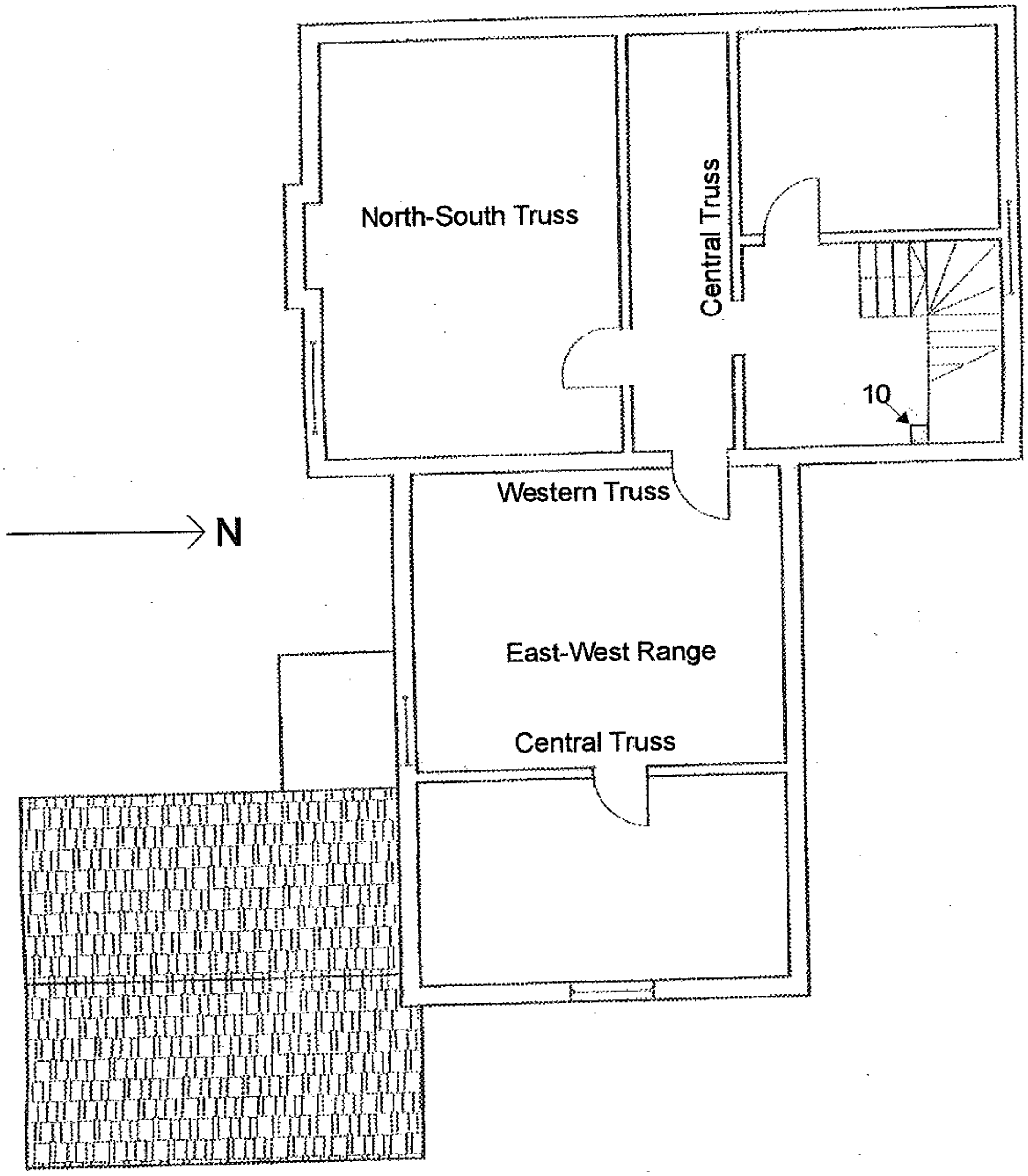

Figure 5 Location of roof trusses sampled and stair post sample location **(10)**

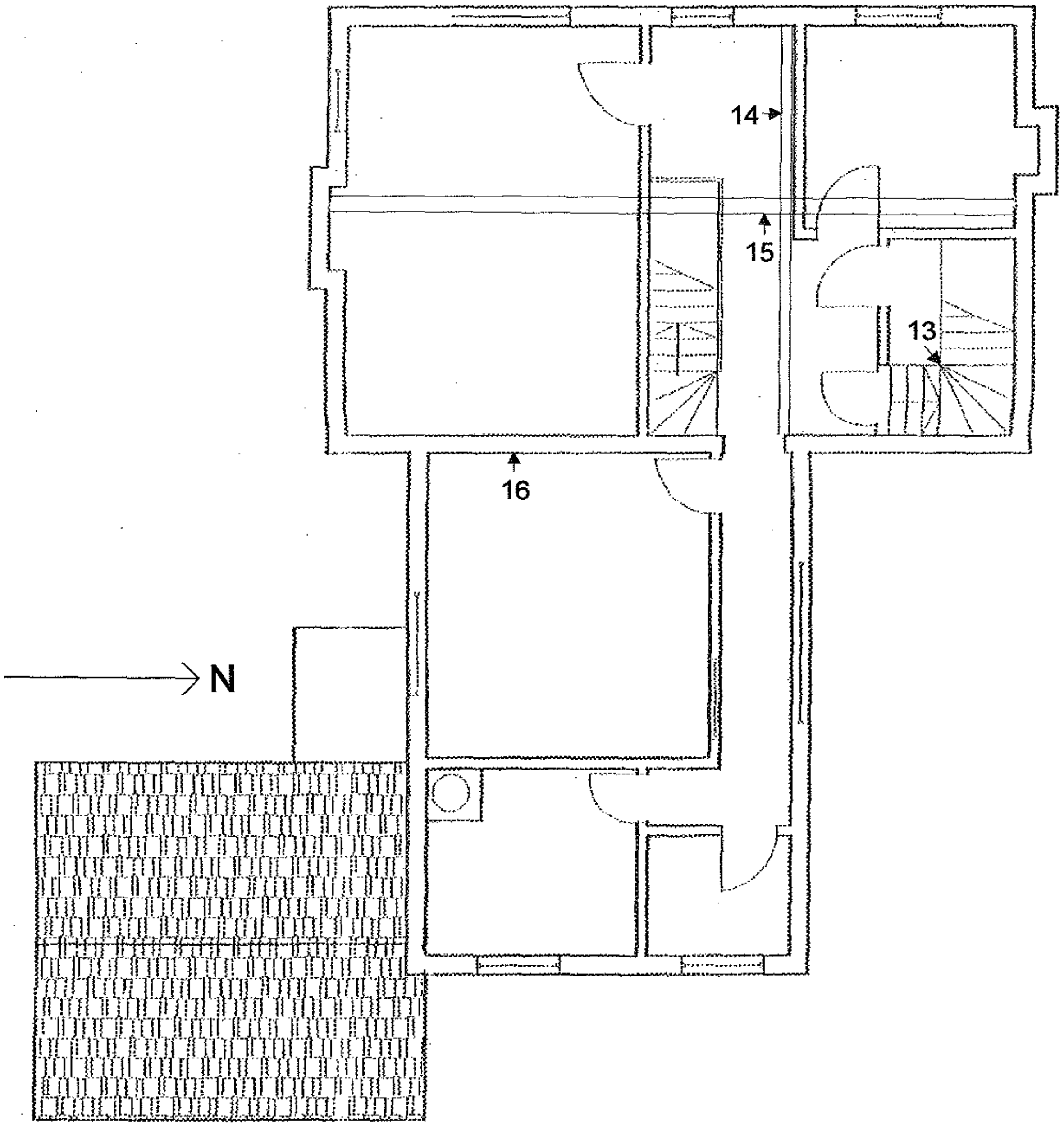

Figure 6 Location of samples taken at first-floor ceiling level

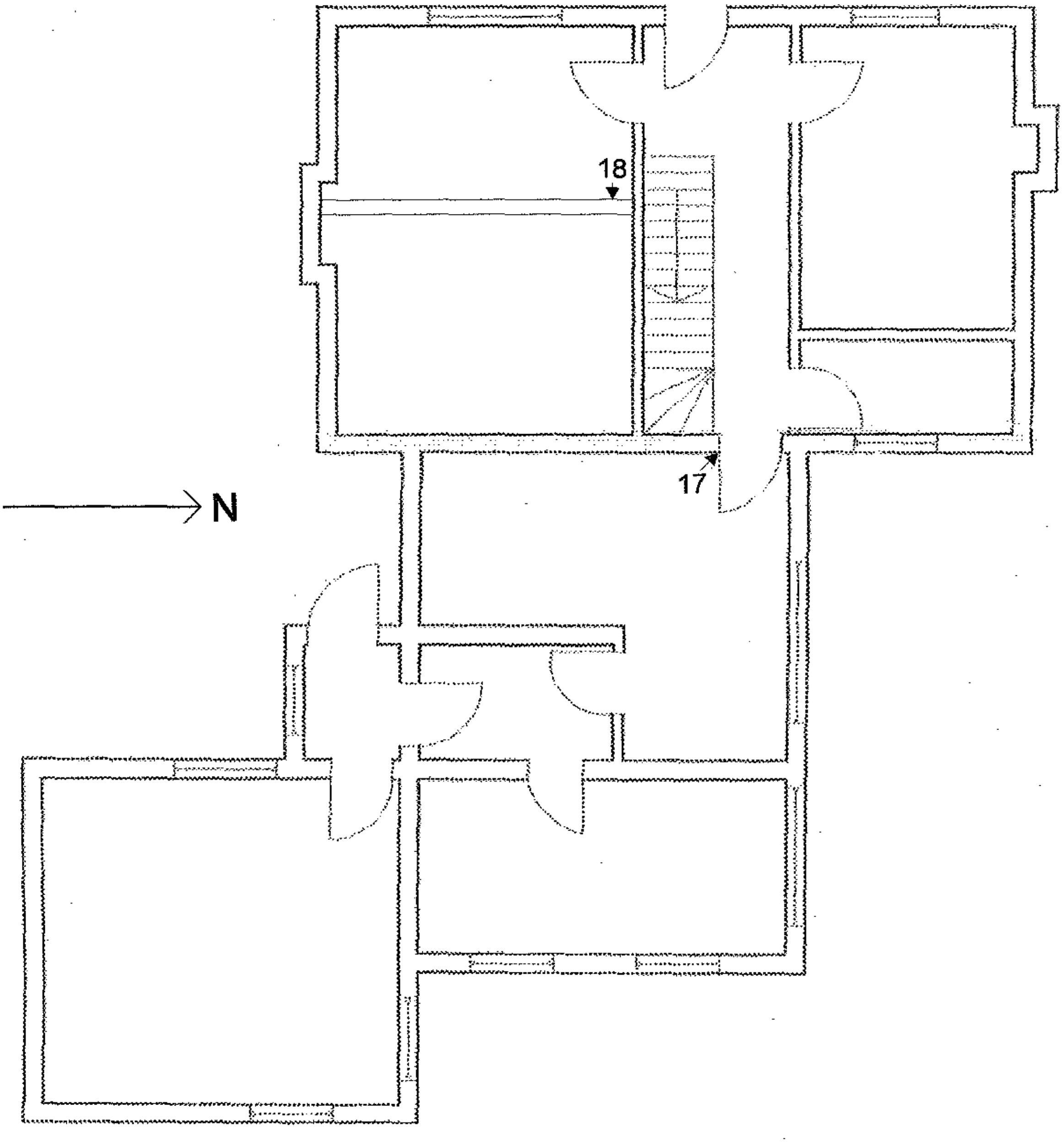

Figure 7 Location of samples taken at ground-floor ceiling level

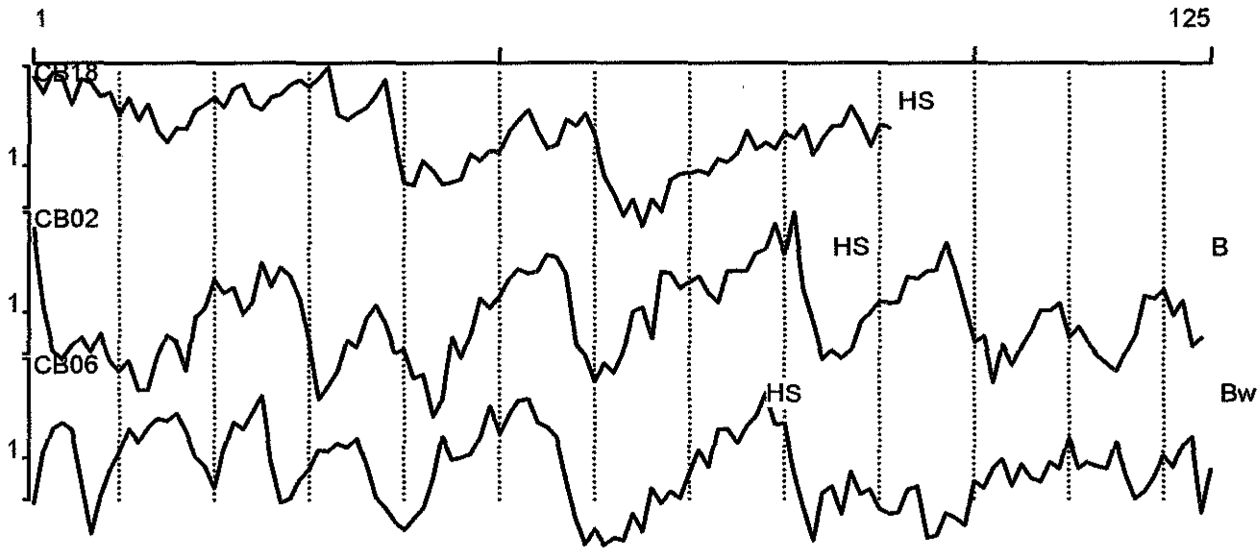

Figure 7 Ring-widths for three samples taken at Cooper's Bank Farm, Dudley. The recurrence of bands of narrow rings with gradual recovery of average growth could be indicative of pollarding

Table 1

List of samples

Core No	Origin of core	Cross-section size (mm)	Cross-section of tree	Total rings	Sapwood rings	ARW mm/year	Date of sequence
01	Collar. Central truss east-west range	225 x 97	Half	<50	B	-	Unmeasured
02	Beam. Central truss east-west range	190 x 130	Half	124	37+B	1.10	Undated
03	Beam. Central truss east-west range	195 x 125	Half	164	+?HS	1.08	Undated
04	Northern principal rafter. Central truss east-west range	220 x 95	Half	<50	B	-	Unmeasured
05	Wall plate (tenon) at join with beam. Central truss east-west range	190 x 95	Half	54	+?HS	1.85	Undated
06	Beam. Western truss east-west range	195 x 115	Half	125	45+Bw	0.97	Undated
07	Southern principal rafter. Western truss east-west range	270 x 100	Half	<50	-	-	Unmeasured
08	Northern principal rafter. Western truss east-west range	250 x 110	Half	58	20+1s	2.72	Undated
09	Doorpost. Central truss north-south range	170 x 100	Quarter	<50	-	-	Unmeasured
10	Stair post	165 x 160	Quarter	51	+HS	2.76	Undated
11	Western principal rafter. Central truss north-south range	275 x 100	Half	<50	-	-	Unmeasured
12	Doorpost. Central truss north-south range	160 x 100	Quarter	<50	-	-	Unmeasured
13	Stair post	160 x 160	Quarter	<50	-	-	Unmeasured
14	Beam. First-floor ceiling on line with central truss north-south range	250 x 110	Half	57	+HS	3.34	Undated
15	Beam (later phase?) first-floor ceiling	250 x 230	Whole	<50	-	-	Unmeasured
16	Beam first-floor ceiling on line with western truss east-west range	240 x 110	Half	<50	-	-	Unmeasured
17	Door post. Ground floor	170 x 120	Quarter	62	20++½ Bs	2.57	Undated
18	Beam. Ground-floor ceiling	270 x 230	Whole	91	+HS	1.98	Undated

Total rings = all measured rings
Sapwood rings: H/S heartwood/sapwood boundary, ?H/S possible heartwood/sapwood boundary, B bark, Bw bark winter felled, +½Bs plus unmeasured partial ring summer felled
ARW = average ring width of the measured rings