

# CHURCH OF ST MARY AND ST MILBURGH, OFFENHAM, WORCESTERSHIRE TREE-RING ANALYSIS OF TIMBERS FROM THE TOWER ROOF

SCIENTIFIC DATING REPORT

Martin Bridge



CHURCH OF ST MARY AND ST MILBURGH,  
OFFENHAM, WORCESTERSHIRE

TREE-RING ANALYSIS OF TIMBERS  
FROM THE TOWER ROOF

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## **SUMMARY**

Sampling of the roof structure of the tower at the Church of St Mary and St Milburgh was curtailed when the three most promising timbers that were sampled were found to contain fewer rings than expected. None of the three tree ring series matched each other, and neither could they be dated individually against dated reference material. The timbers therefore remain undated and hence provide no dating evidence for this part of the church.

## **CONTRIBUTOR**

Dr M C Bridge

## **ACKNOWLEDGEMENTS**

The sampling and analysis of these timbers was funded by English Heritage (EH), and requested by Chris Miners (EH Historic Buildings Architect). The work was commissioned by John Meadows (EH Scientific Dating Team). I am grateful to the secretary to the PCC, Alex Christison for arranging access, and accompanying me on site. Cathy Tyers (Sheffield University) and John Meadows (EH) are thanked for their comments on an earlier draft of this report.

## **ARCHIVE LOCATION**

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## INTRODUCTION

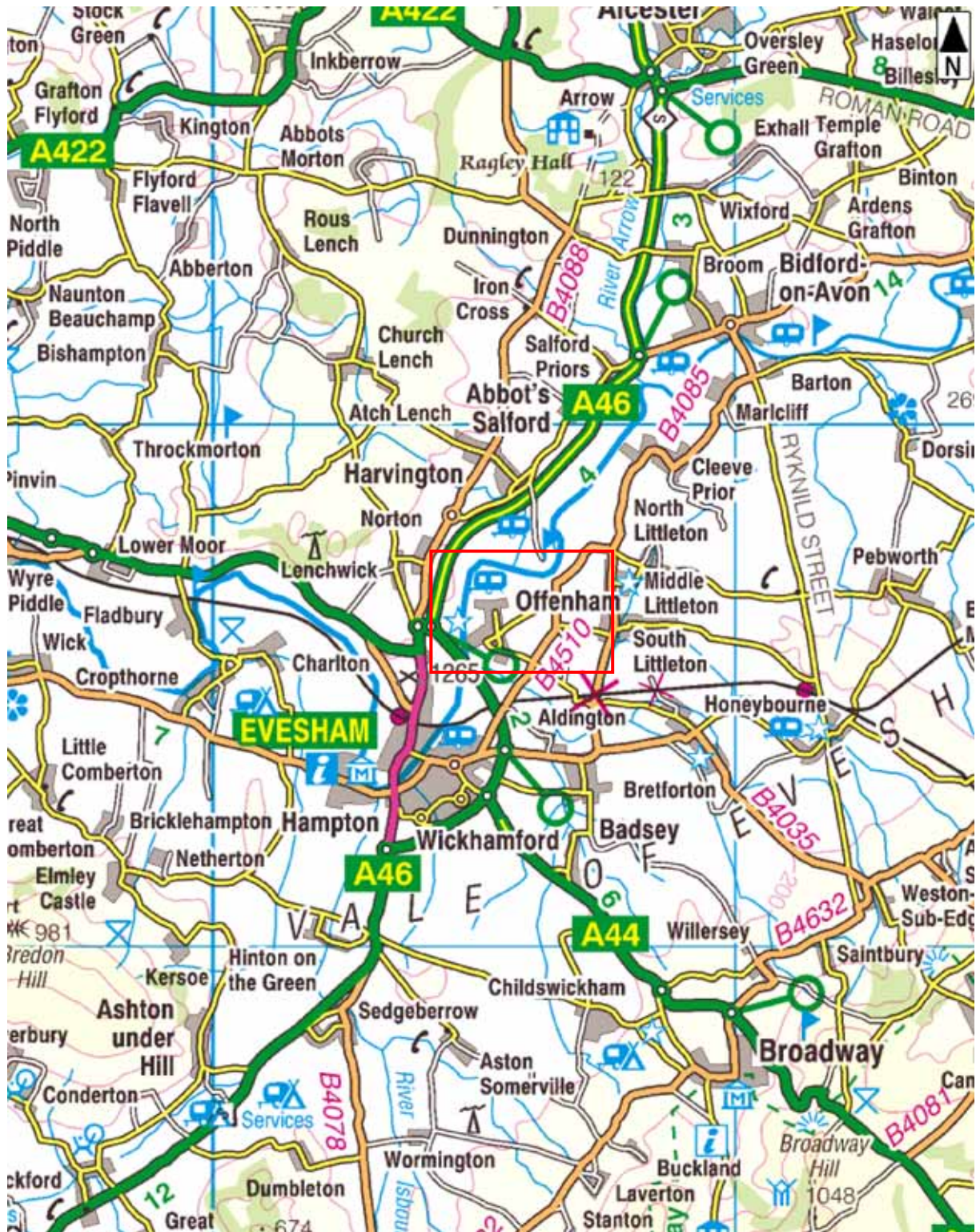
This church is located in the village of Offenham, some 4km north-east of central Evesham (Figs 1 and 2). The tower is thought to be of fifteenth-century construction, whilst the rest of the church was rebuilt in the nineteenth century. The roof to the tower is of simple construction, with coupled rafters sat on wallplates and two swept tiebeams set against the roof gable stonework. It is not clear whether the roof is the original fifteenth-century build, or whether it may have been reset or imported from another structure. Dendrochronological dating was requested by the English Heritage Historic Buildings Architect, Chris Miners, to inform decisions over the roof repairs being carried out at the time of the investigation.

## METHODOLOGY

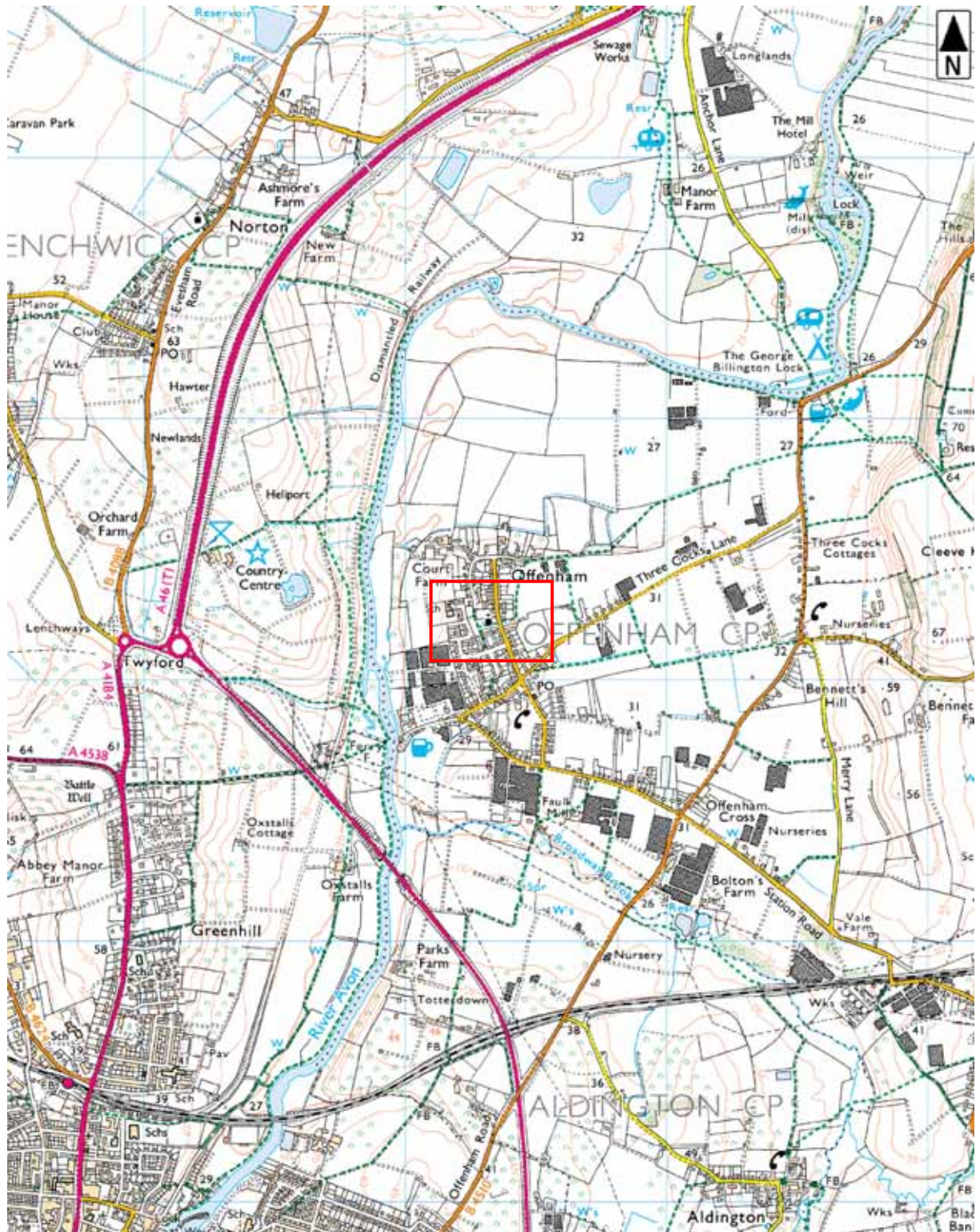
The timbers were originally assessed and sampling was carried out in May 2008. Sampling was far more limited than had been initially expected. Cores were taken from *in-situ* timbers from the tower roof using a 15mm auger attached to an electric drill. The cores were glued to wooden laths, labelled, and stored for subsequent analysis.

The cores were polished on a belt sander using 80 to 400 grit abrasive paper to allow the ring boundaries to be clearly distinguished. The samples had their tree-ring sequences measured to an accuracy of 0.01mm, 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 (2004). Cross-matching was attempted 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 potential errors in the measurements when the samples cross-match.

In comparing one sample or site master against other samples or chronologies,  $t$ -values over 3.5 are considered significant, although in reality it is common to find demonstrably spurious  $t$ -values of 4 and 5 because more than one matching position is indicated. For this reason, dendrochronologists prefer to see some  $t$ -value ranges of 5, 6, and higher, and for these to be well replicated from different, independent chronologies with both local and regional chronologies well represented, except where imported timbers are identified. Where two individual samples match together with a  $t$ -value of 10 or above, and visually exhibit exceptionally similar ring patterns, they may have originated from the same parent tree. Same-tree matches can also be identified through the external characteristics of the timber itself, such as knots and shake patterns. Lower  $t$ -values however do not preclude same-tree derivation.



*Figure 1. Map to show the location of Offenham (based on the Ordnance Survey map with permission of the Controller of Her Majesty's Stationery Office, ©Crown Copyright)*



*Figure 2. Map showing the location of the church within its immediate environs (based on the Ordnance Survey map with permission of the Controller of Her Majesty's Stationery Office, ©Crown Copyright)*

## Ascribing felling dates and date ranges

Once a tree-ring sequence has been firmly dated in time, a felling date, or date range, is ascribed where possible. With samples which have sapwood complete to the underside of, or including bark, this process is relatively straightforward. Depending on the completeness of the final ring, ie if it has only the spring vessels or early wood formed, or the latewood or summer growth, a precise felling date and season can be given. If the sapwood is partially missing, or if only a heartwood/sapwood transition boundary survives, then an estimated felling date range can be given for each sample. The number of sapwood rings can be estimated by using an empirically derived sapwood estimate with a given confidence limit. If no sapwood or heartwood/sapwood boundary survives then the minimum number of sapwood rings from the appropriate sapwood estimate is added to the last measured ring to give a *terminus post quem* (*tpq*) or felled-after date.

A review of the geographical distribution of dated sapwood data from historic timbers has shown that a sapwood estimate relevant to the region of origin should be used in interpretation, which in this area is 11–41 rings (Miles 1997). It must be emphasised that dendrochronology can only date when a tree has been felled, not when the timber was used to construct the structure or object under study.

## RESULTS AND DISCUSSION

Fewer timbers than expected were sampled. An assessment of the timbers suggested that they were rather marginal for dendrochronological dating, because they looked to have only 60–70 rings maximum, but some retained complete sapwood, and the decision was taken to sample the most promising-looking timbers. However, it soon became apparent that the inner rings of the timbers were much more widely spaced than those near the surface, and the sapwood was so degraded that it could not be kept intact on coring. Sampling was therefore curtailed after the first three cores, from the most promising timbers, were seen to have fewer rings than expected. The west wallplate was not accessible, and the rafter couples contained too few rings.

Basic information about the samples taken is presented in Table 1.

**Table 1. Details of the samples taken for dendrochronology**

Sample	Description	Rings	Sapwood	Mean ring-width (mm)	Date of measured sequence (AD)
off01	East wallplate	54	h/s*	1.30	unknown
off02	North tie (reused)	52	h/s	1.66	unknown
off03	South tie (reused)	58	-	0.94	unknown

h/s = heartwood-sapwood boundary

\* NB complete sapwood was present on this timber, but so decayed that it could not be successfully sampled

These three relatively short sequences did not give satisfactory cross-matches with each other, neither did the individual sequences give acceptable consistent matches against the dated reference material, and they therefore remain undated. The tiebeams appeared to have been reused in their present positions, but at least one of them was thought to have come from a previous bellframe within the tower. The data for the measured sequences can be found in the Appendix.

## BIBLIOGRAPHY

Baillie, M G L, and Pilcher, J R, 1973 A simple cross-dating program for tree-ring research, *Tree Ring Bulletin*, **33**, 7–14

Miles, D H, 1997 The interpretation, presentation, and use of tree-ring dates, *Vernacular Architect*, **28**, 40–56

Tyers, I, 2004 *Dendro for Windows Program Guide 3rd edn*, ARCUS Report, **500b**

## APPENDIX

Ring width values (0.01 mm) for the sequences measured

off01

137	142	126	75	79	82	53	69	176	127
256	150	130	146	203	151	171	277	159	136
116	91	86	134	99	100	105	91	135	92
171	174	110	157	103	107	129	151	214	171
185	124	179	126	103	39	46	64	73	158
186	109	129	108						

off02

147	114	115	102	169	142	55	95	109	191
118	137	83	103	158	203	290	225	336	156
103	120	113	98	114	92	83	127	141	83
96	78	516	492	557	234	195	153	286	138
103	99	109	190	161	246	127	353	148	83
64	97								

off03

135	143	123	103	75	115	119	161	183	168
105	101	121	87	93	78	56	63	60	57
45	57	41	78	61	128	190	131	124	106
121	116	90	101	66	48	60	101	56	56
86	104	69	57	68	100	123	86	52	89
55	63	54	102	70	60	81	232		



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