

CHURCH OF ST LAWRENCE, CHURCH LANE,
MICKLETON, GLOUCESTERSHIRE
TREE-RING ANALYSIS OF TIMBERS
FROM THE BELLFRAME

SCIENTIFIC DATING REPORT

Martin Bridge



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Dr M C Bridge

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SUMMARY

A total of eight samples were taken from the bellframe and its supporting timbers. Several of these had well in excess of 100 rings, and some series matched each other. Comparisons with dated reference material failed to date any of the series, and the timbers remain undated.

CONTRIBUTORS

Dr M C Bridge

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INTRODUCTION

This church is located in the village of Mickleton, about 5km north of Chipping Campden (Figs 1 and 2). It has a ring of eight bells, of which three hang in an upper tier of cast iron and steel installed by Taylors of Loughborough in 1954. The remaining five bells hang in a timber frame, stylistically dating to around 1800 according to the English Heritage bellframe specialist Graham Pledger. A recent recommendation to replace this timber-framed bellframe led to a request from Graham Pledger to attempt to date the structure to provide more information on the history of the frame and hence inform consideration of the recommendation. The three large north-south foundation beams supporting the bellframe were thought possibly to pre-date the bellframe itself, and these were included in the dendrochronological brief for assessment and sampling.

METHODOLOGY

The timbers were assessed and sampling was carried out in October 2010. In the initial assessment, accessible oak timbers with more than 50 rings and where possible traces of sapwood were sought, although slightly shorter sequences are sometimes sampled if little other material is available. 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.

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.

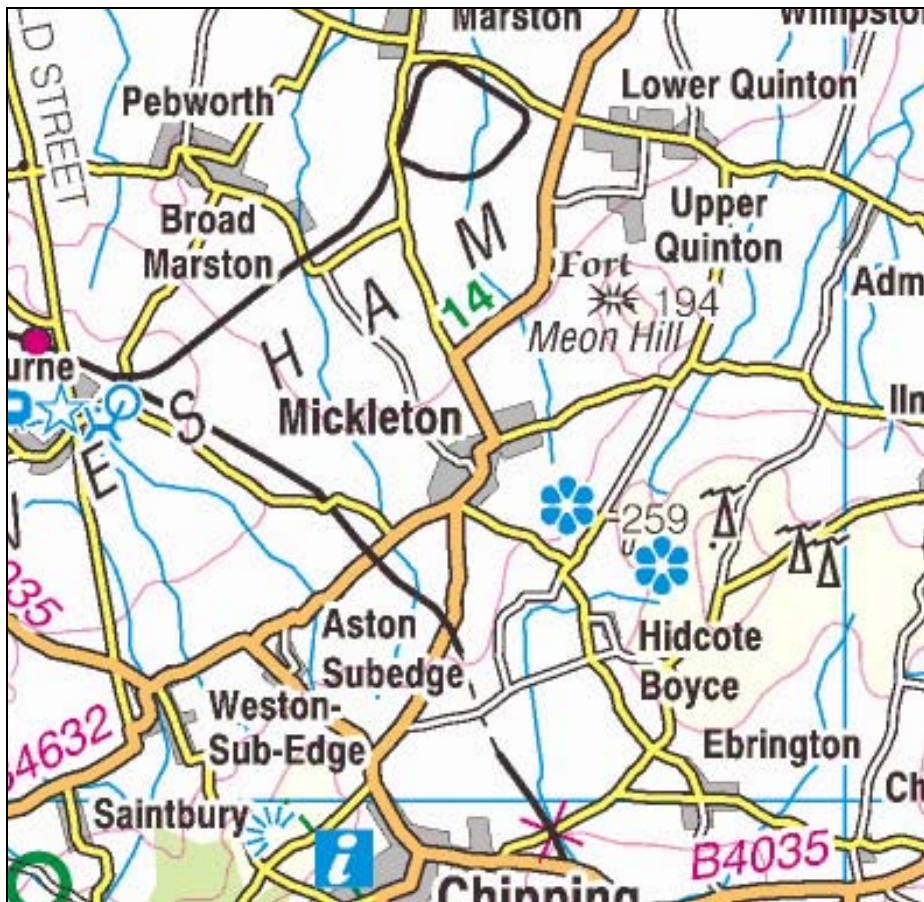


Figure 1: Map to show the location of Mickleton. © Crown Copyright. All rights reserved. English Heritage 100019088. 2012

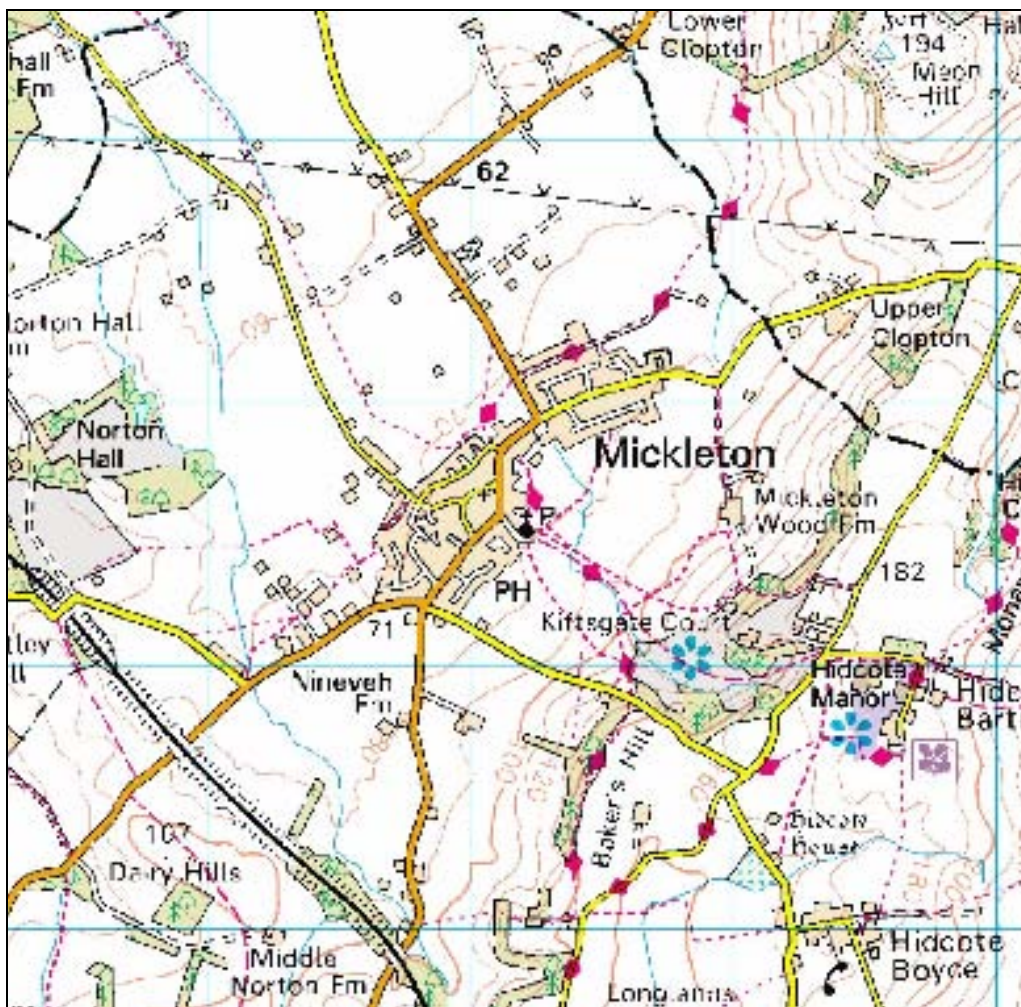


Figure 2: Map showing the location of the church within its immediate environs. © Crown Copyright. All rights reserved. English Heritage 100019088. 2012

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 9–41 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

Basic information about the samples taken is presented in Table 1 and their location within the structure is illustrated in Figures 3 and 4. All samples were measured and the data for each of the individual series presented in the Appendix.

Table 1: Details of the samples taken for dendrochronology

Sample	Description	Rings	Sapwood	Mean ring-width (mm)	Date of measured sequence (AD)
lwm01	East foundation beam	111	h/s	1.31	unknown
lwm02	Centre foundation beam	104	19?C	1.46	unknown
lwm03	East top-frame Pit 6	223	?h/s	0.85	unknown
lwm04	Cross-brace at north-east end of Pit 6 rising to south	117	?h/s	0.60	unknown
lwm05	Sill beam to north side Pit 6	160	-	1.23	unknown
lwm06	Vertical post to north-east side of Pit 8	59	-	1.37	unknown
lwm07i	East-most cross-brace on south frame to Pit 8	113	-	0.95	unknown
lwm07ii	ditto	69	-	0.87	unknown
lwm08	Sill beam at west end Pit 8	55	?h/s	1.27	unknown

h/s = heartwood-sapwood boundary, C = complete sapwood

Some of these long series matched each other well, eg 03 and 05 ($t = 7.0$, 141 years overlap), 05 and 06 ($t = 5.6$, 59 years overlap) and 04 and 07i ($t = 6.3$ with 80 years overlap) and various combinations of series were formed before attempting to date the series. None of the individual or combined series gave acceptable matches against independently dated reference material, and the timbers remain undated.

This lack of conclusive cross-matching was unexpected, given the length of the series and their apparent 'normal' growth characteristics with no evident unusual patterns resulting from management or disease. At the time of sampling, although the foundation beams were thought to be of a potentially slightly earlier date, the bellframe timbers were taken to be a coherent assemblage of similar timbers, assumed to have most likely come from the same source and have been cut at about the same time. It is surprising therefore that there were not more matches between the sample sequences. Long series such as these, with no evident growth anomalies, do generally date well now that well-replicated site chronologies are available for both different areas and different times. The only slightly unusual characteristic of the series sampled are that the ring widths tend to be slightly narrower than are usually encountered in this area. Given that stylistically the frame was

thought to date to around 1800, it is possible that the timbers had been imported, and although unsuccessful comparisons have been made with chronologies from Europe and North America, this process will continue in the hope of eventually dating the timbers.

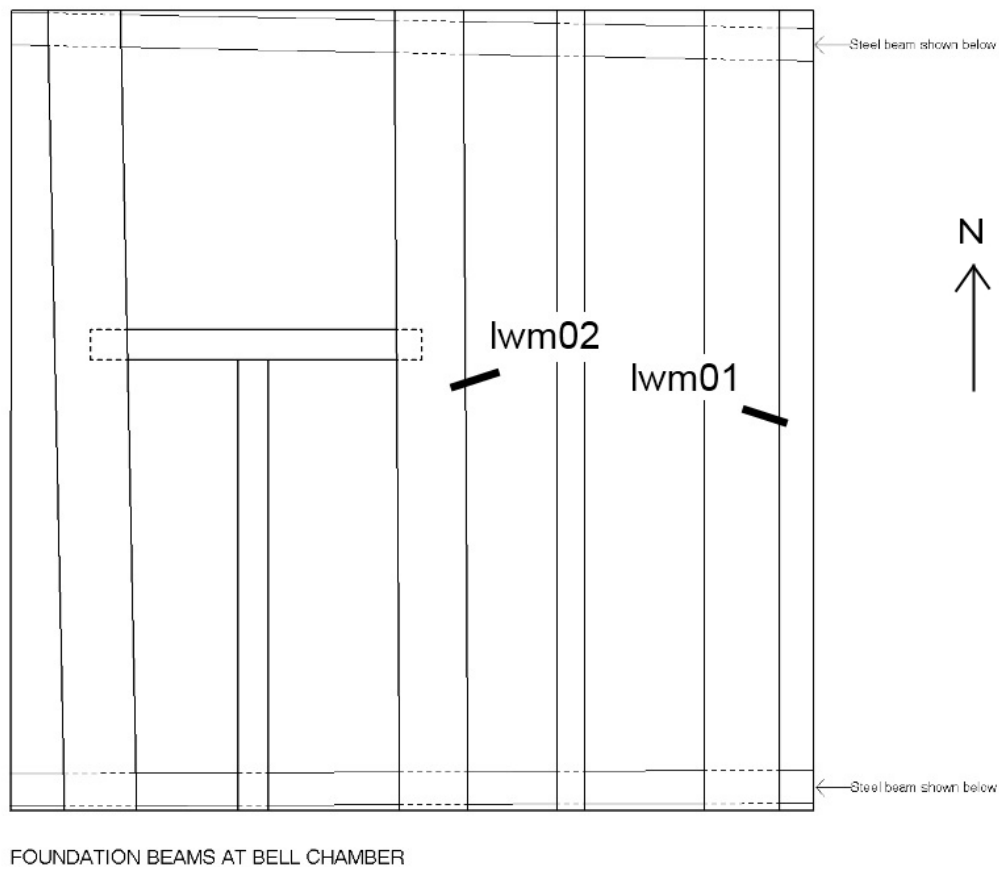


Figure 3: Plan of the foundation beams, showing the approximate locations of samples taken for dendrochronology, adapted from an original drawing by Nick Joyce Architects LLP

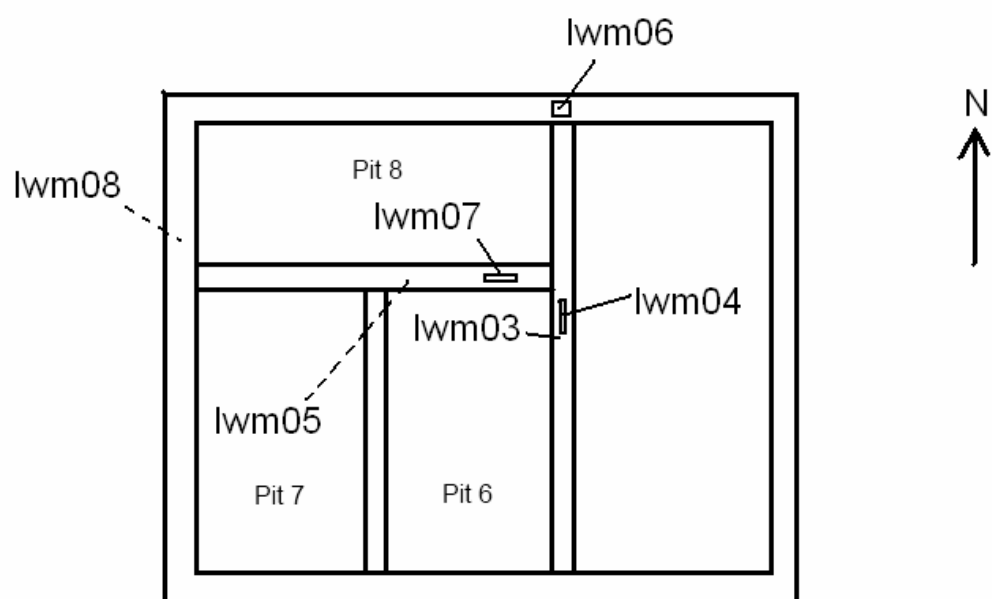


Figure 4: Sketch plan of the bellframe indicating the approximate positions of timbers sampled for dendrochronology. Dotted lines show timbers at sill level

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APPENDIX

Ring width values (0.01mm) for the sequences measured

lwm01

604	416	223	120	135	116	178	231	131	430
405	326	345	188	198	269	259	216	303	302
193	201	108	95	117	158	159	223	196	176
119	104	214	185	214	172	209	179	178	217
235	306	158	217	172	219	134	145	122	120
123	118	103	130	130	137	56	77	123	102
128	156	149	166	175	157	112	64	52	53
50	41	25	48	36	32	29	33	40	43
47	35	55	59	29	38	39	39	27	44
34	42	37	27	29	35	24	26	26	36
34	27	24	29	28	35	45	50	56	64

61

lwm02

57	45	32	47	61	90	120	94	180	218
325	275	62	63	78	160	149	139	151	135
125	170	177	281	295	238	294	277	298	205
236	393	354	324	340	360	334	241	90	58
130	149	233	153	144	213	154	141	83	67
83	74	121	144	104	198	101	145	142	166
195	192	148	127	158	160	149	130	120	104
104	145	141	77	126	113	121	173	135	53
77	60	73	95	100	121	94	95	92	133
126	107	97	72	62	137	83	64	74	88
108	84	83	109						

lwm03

71	73	59	54	71	68	34	42	50	54
59	63	66	76	51	82	92	81	67	70
53	52	64	49	65	60	49	44	57	61
61	87	65	68	55	66	62	74	67	80
71	178	183	107	51	61	45	34	49	48
57	59	55	50	73	70	75	60	60	58
64	37	46	45	57	43	62	55	51	40
47	57	46	36	46	39	51	62	55	57
136	82	60	64	62	80	100	76	76	66
70	85	65	88	99	89	82	102	94	104
102	89	71	71	74	95	83	99	73	97
102	105	77	86	85	79	86	89	87	78
85	98	120	93	74	117	121	84	81	95
107	99	99	110	115	119	102	88	74	80
58	87	73	88	96	76	83	94	90	98
81	102	113	100	105	107	94	89	92	100
118	104	98	121	112	117	95	78	107	118
107	119	120	109	109	82	76	94	109	106
99	109	105	80	95	92	94	108	105	114
102	113	103	103	126	127	106	127	111	122
100	101	106	113	115	110	101	115	99	89
103	143	121	134	122	135	97	106	103	112
131	109	127							

lwm04

155	126	156	109	78	76	63	73	52	55
53	46	57	68	56	50	65	44	32	34
37	43	44	46	65	56	67	80	84	101
62	68	64	54	79	61	62	77	41	42
49	37	34	44	41	36	42	44	49	41
44	51	65	72	61	49	79	84	78	67
59	48	42	52	75	82	80	50	66	43
52	45	64	53	57	55	58	46	49	48
60	53	48	48	46	35	55	48	62	46
50	48	66	43	53	41	51	58	49	51
67	62	59	57	75	80	61	81	67	69
67	76	68	52	66	76	84			

lwm05

145	121	88	113	105	77	80	180	114	105
67	84	111	95	55	79	55	61	66	62
64	65	67	65	73	91	52	107	139	133
129	83	74	87	78	67	54	36	35	43
53	53	52	85	99	80	84	116	141	114
134	126	157	143	174	166	132	152	122	124
110	115	135	132	127	139	121	153	136	179
175	167	120	118	94	125	118	112	125	119
133	133	146	169	127	119	141	154	139	150
157	135	122	73	65	72	100	113	118	143
150	141	140	155	177	167	197	187	185	178
167	167	185	156	174	177	179	167	171	176
163	172	167	166	152	148	170	180	164	194
149	173	181	184	160	152	141	133	152	91
94	134	131	139	135	101	111	116	120	133
107	95	107	93	108	97	108	120	101	112

lwm06

82	111	114	134	156	171	170	153	167	183
168	173	214	204	185	211	215	199	164	141
171	149	150	145	164	153	142	146	134	149
118	115	146	138	141	183	121	115	131	168
128	121	116	117	119	75	72	86	107	121
82	81	71	92	106	113	100	94	103	

lwm07i

141	118	106	86	73	85	84	77	83	84
77	101	98	64	141	97	92	118	131	129
108	108	111	80	78	91	134	97	73	96
116	113	105	133	117	122	107	97	120	95
112	61	72	70	66	77	97	98	96	114
84	70	75	106	95	131	111	160	90	98
112	123	125	108	110	92	92	137	100	92
115	73	57	50	64	72	95	76	74	90
84	82	78	93	91	139	148	101	87	102
112	95	90	95	105	65	73	75	102	94
73	65	89	82	83	85	85	93	85	77
87	58	69							

lwm07ii

68	85	79	88	76	92	92	90	86	84
62	70	63	75	66	55	73	93	55	83
73	83	91	104	103	120	83	91	68	86
81	91	96	125	110	106	96	99	99	109

78	90	97	110	127	94	78	97	119	73
89	97	117	99	112	93	98	84	104	78
54	68	70	79	45	81	74	73	79	
lwm08									
118	174	157	156	118	125	97	119	80	116
107	93	125	113	129	145	106	121	156	141
164	137	146	134	117	68	76	80	81	117
121	146	115	92	115	144	127	160	165	147
133	158	158	139	177	138	150	128	110	113
119	119	145	116	128					



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