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Tree-Ring Analysis of Timbers from Marlipins House, Shoreham-by-Sea High Street, Shoreham-by-Sea, West Sussex

Dr Martin Bridge

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Summary

This building, currently used as a museum, has a complex history, which dendrochronology has assisted in clarifying. The first floor is supported on Sampson posts and one of these was felled in the late thirteenth/early fourteenth century. The joists attached to the floor beam were felled earlier, AD 1169-97, and are probably re-used from an earlier structure.

A tie beam was felled after AD 1445, but is the only timber to date from the crown-post roof structure. A lower crossbeam dates to the period AD 1567-99, and represents a period of change to the roof structure in which the queen posts (re-used timbers) were probably inserted. These phases are represented by few timbers, and the interpretation therefore needs to be treated with caution.

Keywords

Dendrochronology
Standing Building

Author's address
Institute of Archaeology, University College London, 31-34 Gordon Square, London, WC1H 0PY. Tel: 020 7679 1540. Email:martin.bridge@ucl.ac.uk

Introduction

Marlipins House (NGR TQ 214 050; Fig 1) is a Scheduled Ancient Monument and grade II* listed building, currently being used as a museum. It is built of squared dressed stone and flint and has an early floor (stylistically dated to the fourteenth century) and collar-purlin roof, supported on crown-post ends. It is thought that the primary phase of the building, only represented by stone fabric, dates to the twelfth or thirteenth centuries, and it was reputedly a customs house.

The local English Heritage inspector, Judith Roebuck, requested a dendrochronological investigation to aid the understanding of the chronological development of the building as part of a wider study to inform a programme of repairs. The roof, and the first- floor joisting and Sampson posts were the main focus of the English Heritage brief. A survey of the building had recently been carried out by David Martin (Archaeology South East) which gave background information for this study.

It was revealed during my visit that Roland Harris had sampled in the roof some ten years or so earlier and had not been able to date the timbers at that time. Subsequent correspondence took place in order that any information gained in that study could be incorporated here, although nothing was finally forthcoming.

Methodology

The site was visited in June AD 2002, when the timbers were assessed for their potential use in dendrochronological study. Oak timbers with more than 50 rings, traces of sapwood, and accessibility were the main considerations in the initial assessment. Those 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 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 utilizing a binocular microscope with the sample mounted on a travelling stage with a linear transducer linked to a PC. The software used in measuring and subsequent analysis was written by Ian Tyers (1999).

Ring sequences were plotted to allow visual comparisons to be made between sequences on a light table. This activity also acts as a measure of quality control in identifying any errors in the measurements when the samples crossmatch. Statistical comparisons were made using Student's *t*-test (Baillie and Pilcher 1973; Munro 1984). The *t*-values quoted below were derived from the original CROS program (Baillie and Pilcher 1973). Those *t*-values in excess of 3.5 are taken to be indicative of acceptable matching positions provided that they are supported by satisfactory visual matches, and give consistent matching positions.

When crossmatching between samples is found, their ring-width sequences are meaned 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, which 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 rings available on each sample.

Interpretation of these dates then has to be undertaken to relate these findings to the construction date of the phase under investigation. An important aspect of this interpretation is the estimate of the number of sapwood rings missing. In this instance, the sapwood estimates are based on those proposed for this area by Miles (1997), in which 95% of samples are likely to have from 9 to 41 sapwood rings. Where bark is present on the sample the exact date of felling of the tree used 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).

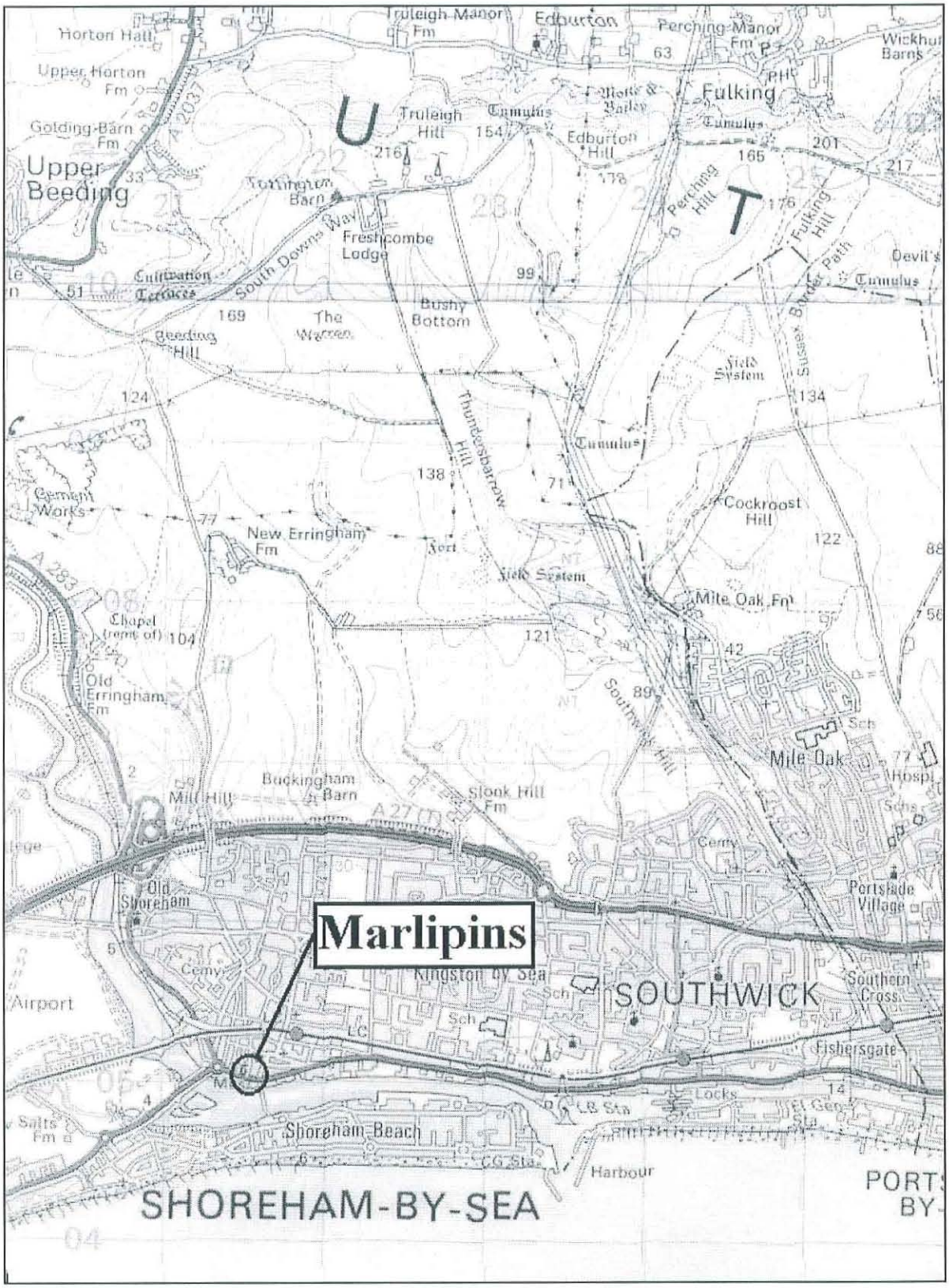

Figure 1: Map showing the general location of Marlipins (based on the Ordnance Survey map

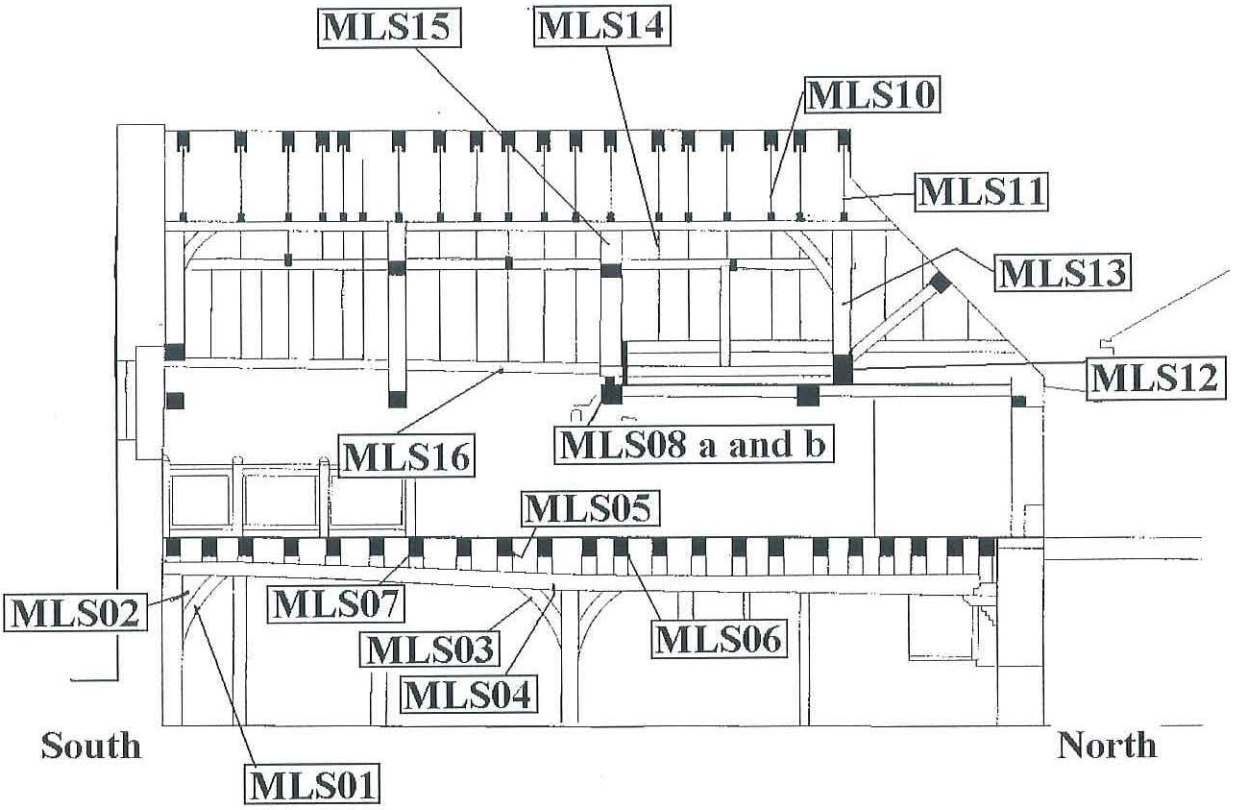

Figure 2: Longitudinal section through Marlipins House showing the timbers sampled for dendrochronology (adapted from an original drawing by David Martin)

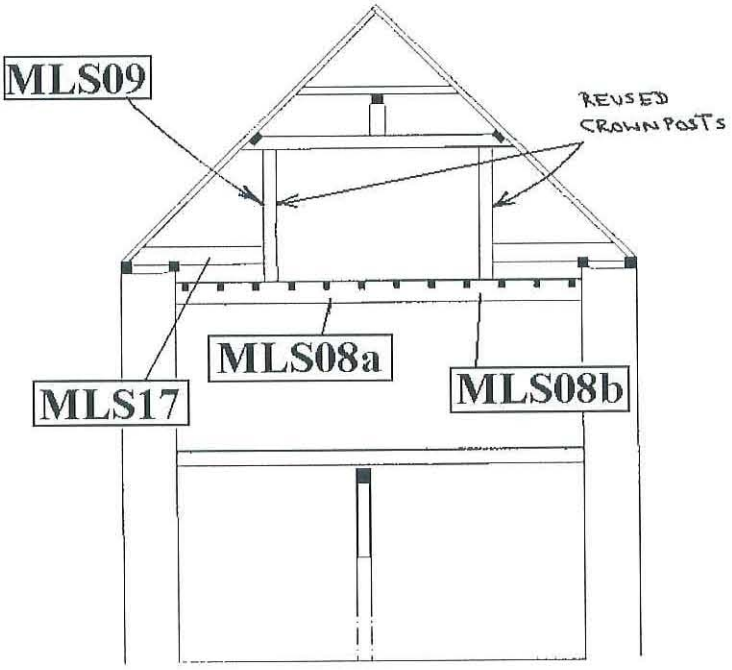

Figure 3: Cross-section through Marlipins House, showing the form of the central truss and the timbers sampled (adapted from an original by David Martin)

Results

All the timbers investigated were of oak (*Quercus* sp.). Many timbers were rejected from all phases of the building as they had less than 50 rings and no traces of sapwood. The most promising looking timbers only were sampled, and of these, seven turned out to have less than 50 rings. Details of the samples taken are given in Table 1, and the locations are illustrated in Figures 2 and 3. Two samples were taken from the lower crossbeam (MLS08) as the first broke in several places during coring.

Crossmatching between individual samples did not yield many results, although samples MLS05 and MLS07 were found to crossmatch (t = 4.4, 67 years overlap). Both samples had been dated independently before this match was accepted. They were combined to give a 91-year sequence MLS0507m (Fig 4) which was subsequently dated to the period AD 1075-1165, the best evidence being shown in Table 2. The data for MLS0507m are given in the appendix at the end of this report.

Other timbers were dated individually. Sample MLS02 (south Sampson post) dated to the period AD 1192 – 1267 (Table 3), whilst the beam it supports (MLS04) gave strong matches at two different positions in the late thirteenth century, but could not be dated. The dating evidence for sample MLS02 is given in Table 3. Sample MLS12, the north tie beam, dates to AD 1378-1436 (Table 4), whereas sample MLS08, the lower crossbeam, dates to AD 1474-1566 (Table 5). The ring width data for each of the above samples are given in the appendix at the end of this report.

Despite other samples having similarly long series, they failed to show consistent crossmatching against reference material, and remain undated.

Table 1: Oak (*Quercus* spp.) timbers sampled from Marlipins. h/s represents the heartwood-sapwood boundary

Sample number	Origin of core	Total no of years	Average growth rate (mm yr^{-1})	Sapwood details	Date of sequence AD	Felling date of timber AD
Floor						
MLS01	Brace to south Sampson post	<50	unmeasured	-	undated	unknown
MLS02	South Sampson post	76	1.56	h/s	1192 - 1267	1276 - 1308
MLS03	South brace to central post	<50	unmeasured	-	undated	unknown
MLS04	Main floor beam	54	2.89	h/s	undated	unknown
MLS05	Joist 9	86	1.34	h/s?	1075 - 1160	1169 – 1201?
MLS06	Joist 12	<50	unmeasured	-	undated	unknown
MLS07	Joist 7	72	1.45	9	1094 - 1165	1165 – 97
Roof						
MLS08	Lower crossbeam	93	1.68	8	1474 - 1566	1567 – 99
MLS09	West re-used queen post	<50	unmeasured	-	undated	unknown
MLS10	Rafter 3 west	64	1.13	10	undated	unknown
MLS11	Rafter 1 west	75	1.34	h/s	undated	unknown
MLS12	North tie beam	59	1.91	-	1378 - 1436	after 1445
MLS13	North crown post	<50	unmeasured	-	undated	unknown
MLS14	Rafter 6 east	50	1.58	h/s	undated	unknown
MLS15	Stub crown post	<50	unmeasured	-	undated	unknown
MLS16	West wallplate	<50	unmeasured	-	undated	unknown
MLS17	West upper tie	74	2.43	h/s?	undated	unknown

Table 2: Dating of the oak site chronology MLS0507m

	MLS0507m AD 1075 - 1165	
Dated reference or site master chronology	*t*-value	Overlap (yrs)
London1175 (Tyers pers comm)	6.5	91
Ref6 (Fletcher 1977)	6.4	91
Southern England (Bridge 1988)	5.9	91
Hants97 (Miles pers comm)	5.5	91
Swan Lane, London (Groves and Hillam 1987)	6.9	91
Round Table, Winchester (Barefoot nd)	6.8	91
Billingsgate, London (Hillam 1987)	6.3	91
Glastonbury, Somerset (Bridge 2001a)	5.6	71
Westwick, Hertfordshire (Howard *et al* 1999)	5.2	91
Siddington, Gloucestershire (Groves and Hillam 1992)	5.2	44
Blackfriars, Gloucester (Hillam and Groves 1993)	4.9	90

Table 3: Dating of the oak sample MLS02

	MLS02 AD 1192 - 1267	
Dated reference or site master chronology	*t*-value	Overlap (yrs)
Oxon93 (Miles pers comm)	5.9	76
Hants97 (Miles pers comm)	5.8	76
Southern England (Bridge 1988)	4.4	76
London1175 (Tyers pers comm)	4.3	76
Doulting, Somerset (Miles and Worthington 2000)	5.3	76
Odiham, Hampshire (Miles and Haddon-Reece 1996)	5.2	76
Church Street, Hereford (Tyers 1996)	4.6	76
Meare, Somerset (Bridge forthcoming)	4.3	76
Coxwell, Berkshire (Siebenlist-Kerner *et al* 1978)	4.2	76

Table 4: Dating of the oak sample MLS12

	MLS12 AD 1378-1436	
Dated reference or site master chronology	*t*-value	Overlap (yrs)
FEB2000 (Bridge 2000a)	5.5	59
Hants97 (Miles pers comm)	5.4	59
London1175 (Tyers pers comm)	4.6	59
Martin Tower, Tower of London (Bridge 1983)	5.5	58
Kingston, London (Bridge 2001b)	5.3	52
Goleigh, Hampshire (Miles and Worthington 1997)	5.1	59
Ford, West Sussex (Bridge 2000b)	4.8	59
Windsor, Berkshire (Hillam and Groves 1996)	4.7	59
Field Place Barn, West Sussex (Bridge 1993)	4.6	59

Table 5: Dating of the oak sample MLS08

	MLS08 AD 1474-1566	
Dated reference or site master chronology	*t*-value	Overlap (yrs)
FEB2000 (Bridge 2000a)	7.6	93
Hants97 (Miles pers comm)	6.8	93
Oxon93 (Miles pers comm)	6.7	93
London1175 (Tyers pers comm)	6.3	93
Kent (Laxton and Litton 1989)	5.7	67
Hill Hall 2, Kent (Bridge 2002)	7.4	91
Windsor, Berkshire (Hillam and Groves 1996)	6.2	93
Victoria Wharf, London (Tyers pers comm)	6.0	93
Oxford Prison (Miles and Haddon-Reece 1995)	5.8	78
Owston, Leicestershire (Howard *et al* 1998)	5.7	82
Catesby, Northamptonshire (Bridge 2000c)	5.6	93
Wimpole, Cambridgeshire (Bridge 1998)	5.4	93

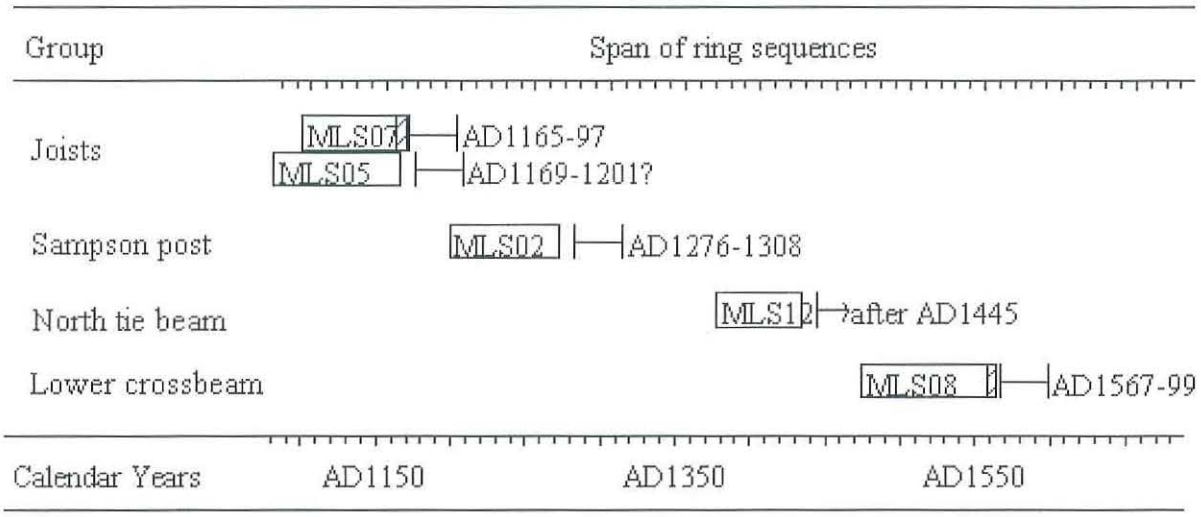

Figure 4: Bar chart showing the relative positions of each of the dated elements from Marlipins House, along with their interpreted felling dates

Interpretation and Discussion

The felling dates for each individual sample are given in Table 1 and shown in Figure 4.

The disparate nature of the dendrochronological results means that there is a need to rely heavily on the survey to determine their most likely interpretation. All suitable timbers were sampled and consequently there is no potential for further sampling to further unravel the complex history of this building.

One Sampson post, at the southern end of the building, dated, and was felled in the period AD 1276-1308. The beam it supports could be of similar age, but it is different in nature, having much faster growth (Table 1). Two statistically-strong matching positions were found for this short, 54-year sequence, in the late thirteenth century, but neither was judged acceptable at this stage. It would be useful to have other timbers from this period to be able to give a better indication of whether or not these two timbers should be considered as a single phase, but no suitable timbers were found.

Two dated joists attached to the early fourteenth-century main floor beam appear contemporaneous, and are earlier, AD 1169-97. These probably represent re-used timbers.

The north tie beam was felled some time after AD 1445, but no other timbers from this phase dated. The lower crossbeam dates from the period AD 1567-99. This may represent a period of change of the roof structure, the queen posts on this truss having been recognised as re-used timbers (Martin pers comm). Dating evidence for the roof is therefore somewhat sparse. Further sampling is unlikely to yield more results as the other timbers were rejected as having too few rings.

Acknowledgements

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Appendix: Ring width data for the site chronology MLS0507m, and data series

ring widths (0.01mm)										no. of trees									
MLS0507m AD 1075-1165																			
54	53	63	50	69	48	57	53	60	55	1	1	1	1	1	1	1	1	1	1
83	71	65	61	73	61	62	81	78	93	1	1	1	1	1	1	1	1	1	1
79	87	109	131	127	127	115	150	207	165	2	2	2	2	2	2	2	2	2	2
192	182	249	233	231	201	230	221	208	196	2	2	2	2	2	2	2	2	2	2
204	201	130	130	98	89	64	145	171	167	2	2	2	2	2	2	2	2	2	2
156	139	131	134	112	148	134	148	130	121	2	2	2	2	2	2	2	2	2	2
126	110	105	133	104	161	121	127	111	109	2	2	2	2	2	2	2	2	2	2
120	114	126	143	144	113	119	97	147	119	2	2	2	2	2	2	2	2	2	2
118	168	142	131	163	150	96	93	81	88	2	2	2	2	2	2	1	1	1	1
106										1									
MLS02 AD 1192-1267																			
142	267	169	245	319	225	133	121	120	172										
180	188	133	186	121	128	170	192	157	125										
134	135	175	188	154	108	95	91	85	152										
141	132	142	155	160	149	175	268	224	185										
144	146	183	200	150	222	246	224	281	171										
201	188	150	156	143	157	142	158	118	115										
130	164	105	152	112	139	96	134	162	161										
132	97	68	51	69	65														
MLS04 undated																			
176	388	346	347	292	312	433	484	344	493										
453	338	377	332	279	296	309	282	335	328										
260	261	315	302	281	306	292	335	318	292										
243	352	290	242	259	224	333	265	253	192										
231	194	194	237	240	245	255	221	160	215										
214	165	225	271																
MLS12 AD 1378-1436																			
28	42	49	31	41	34	23	25	39	36										
60	81	96	100	152	183	187	269	235	366										
329	308	265	198	116	163	250	223	309	227										
275	241	220	269	245	216	167	177	111	104										
184	130	176	190	135	226	411	450	229	217										
239	248	170	362	386	249	341	280	145											
MLS08 AD1474-1566																			
334	381	149	136	235	287	251	258	244	208										
206	214	247	276	315	308	335	224	163	233										
266	204	220	166	135	161	139	141	140	140										
153	158	160	195	169	186	151	104	121	111										
132	180	139	85	120	139	90	143	197	117										
167	150	168	111	160	144	80	138	68	86										
155	290	265	183	163	156	133	221	114	116										
98	112	127	108	156	184	142	159	128	132										
102	199	119	106	116	121	112	111	149	148										
120	110	120																	