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DENDROCHRONOLOGICAL ANALYSIS OF TIMBER FROM EASTGATE, BEVERLEY, 1984. FILE 1836

Cathy Groves

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Summary

Timbers from medieval structures excavated at Eastgate, Beverley, during 1984 were sampled for tree-ring analysis with a view to providing a more precise dating framework for the site. Thirty-four of the 177 samples were species other than oak and these were identified. The oak samples produced a site master curve covering the period AD 858-1310. Over half of the measured oak timbers were dated, thus providing probable dates of construction for many of the structures.

Author's address :-

Dendrochronology Laboratory Department of Archaeology and Prehistory University of Sheffield SHEFFIELD S10 2TN

0742 768555 x6082



<u>Dendrochronological Analysis of Timbers from Eastgate, Beverley,</u> 1984

INTRODUCTION

In 1984 a large number of medieval timbers were revealed when excavations were carried out by the Humberside Archaeological Unit at Eastgate (site code - BE84) in Beverley. A total of 177 timbers were sampled for dendrochronological analysis. Archaeological evidence indicated that there were at least eleven phases which date from <u>circa</u> 10/11th century to <u>circa</u> 14th century, phase A being the earliest and L the latest phase from which timbers were obtained. The timbers were associated with various features and structures, ranging from layers including wood fragments to drains and earth fast post buildings (Table 1).

Eastgate is one of a series of excavations in Beverley carried out by the Humberside Archaeological Unit during 1979-1984. Much of the excavation programme has centred around the site of the Minster (Figure 1). Three of these excavations, Hall Garth bridge (Hillam 1981), Dyer Lane (Groves & Hillam 1985) and Lurk Lane (Groves & Hillam in prep) revealed timbers which have been the subject of previous dendrochronological studies. Timbers from Hall Garth bridge and Dyer Lane were successfully dated, producing two chronologies spanning the periods AD 1002-1324 and AD 903-1183 respectively. Due to the close proximity of the sites it was expected that the two chronologies would crossmatch but this was not so. The timbers from Lurk Lane, thought to be 11th or 12th century, did not date even though two different chronologies existed for Beverley, and crossmatching between individual ring sequences from the site is virtually non-existant.

Due to the problems previously encountered with analysis of medieval timbers from sites in Beverley a pilot study was carried out on 19 samples from Eastgate to evaluate their suitability for tree-ring dating (Hillam & Groves 1985). Six of the samples were dated so analysis of the remaining 158 samples was carried out.

The aims of the study were firstly to date the structures and phases and thereby produce a third chronology for Beverley, and secondly to resolve some of the problems that occur with medieval timbers from Beverley. The timbers forming the pilot study are also re-examined and discussed in this report.

METHOD

The samples were deep frozen for a minimum of 48 hours to consolidate the wood and therefore to provide a firmer cross sectional surface. The cross section was prepared with a Surform plane, whilst the wood was still frozen, to produce a surface on which each annual growth ring is clearly defined. Occasionally further cleaning with a sharp knife was also required.

At this stage the samples were divided into oak (Quercus spp) and non-oak. Oak is relatively easily identified due to the presence of distinct ring porous annual growth rings and wide medullary rays running radially from pith to bark (eg Schweingruber 1978: 144). The non-oak samples were identified by taking thin sections from the transverse, radial and tangential planes, and examining them under a microscope. All non-oak and any oak samples with unclear ring sequences or with insufficient rings (tree-ring sequences of less than 30 are generally not unique and so cannot be crossmatched reliably) were considered unsuitable for dating purposes and were therefore not measured.

The ring widths are measured by placing the sample on a travelling stage connected to an Apple II microcomputer (Hillam 1985: figure 4). The sample is observed through a low power (10x) binocular microscope. As each ring is traversed a signal is sent to the microcomputer. The width of each ring, in units of 0.02mm, is automatically recorded in the microcomputer's memory and displayed on the VDU. When the ring sequence of a sample has been measured it can be printed out and also stored on a floppy disk.

The sequence of ring widths of each sample is represented as a graph, known as a tree-ring curve, on transparent semi-logarithmic paper. The tree-ring curves are compared together visually by superimposing two curves, sliding one curve past the other and searching for similarities in the patterns of wide and narrow rings which would indicate that the timbers had some period of growth in common. As well as the visual matching, a computer program (Baillie & Pilcher 1973) is also used It measures the amount of similarity between for crossmatching. two ring sequences by calculating the value of Student's t for each position of overlap. Generally a t-value of 3.5 or over is acceptable if it is accompanied by a good visual match. Computer matching must always be checked visually before it can be accepted, since spurious results occasionally occur.

It is usual for curves from a particular context or phase to be compared against each other initially. A site/phase master curve is then produced from any matching curves by taking an average of their ring widths. A master curve is more likely to produce a date than the ring sequence of a single sample when compared with a dated reference chronology. This is because the master curve enhances the common climatic signal but reduces the "background noise" resulting from the local growth conditions of individual trees. However the pilot study had indicated that crossmatching was likely to be very poor between samples from individual phases. Consequently all individual ring sequences were compared directly with various reference chronologies (see Appendix 1 for details). The most commonly used reference chronologies were Dyer Lane, East Midlands (Nottingham tree-ring group, unpublished) and England (Baillie & Pilcher pers comm).

When dating relies upon the individual sequences being compared directly with reference chronologies, samples with more than 50 rings are usually prefered. Any high <u>t</u>-values were checked visually and sequences which gave consistent dates were averaged together to produce phase master curves and finally a site master curve. All dated ring sequences from each phase were also compared against each other as before.

The results only date the rings present in the timber and therfore do not necessarily represent the felling date of the timber. Sapwood, the outer part of a tree, is very important in the determination of felling dates. In oak, it is easily differentiated from the heartwood, usually by its colour, but also because the large springwood vessels of the sapwood are hollow, whist those of heartwood are filled with tyloses (Jane 1970: 38).

If the sapwood on a sample is complete the exact felling year can be given. However, because the amount of sapwood in an oak tree is relatively constant, it is possible to estimate the felling year even if only one ring of sapwood has been A recent study shows that the 95% confidence limits preserved. for the number of oak sapwood rings for British trees older than 30 years, are 10-55 rings, ie 19 out of every 20 samples examined are likely to have more than 10 and less than 55 sapwood rings (Hillam et al forthcoming). This sapwood estimate is used throughout the report. Where sapwood has been completely removed, which frequently occurs due to its susceptability to fungal and insect attack, the addition of the minimum sapwood allowance (10 rings) to the date of the last measured heartwood ring produces the probable terminus post quem for felling. As the number of missing heartwood rings is unknown, the actual felling date may be much later. The estimation of felling dates can sometimes be further refined by grouping together timbers from the same context or structure.

Construction usually followed soon after felling since in medieval times timber was rarely seasoned (see for example

Hollstein 1980 or Rackham 1976). At this stage of tree-ring analysis, however, factors such as stockpiling or timber re-use must also be considered, since they might affect the interpretation of the tree-ring dates. Thus, whilst the production of dates is a completely independent process, their interpretation can be refined by studying other archaeological evidence.

DATING THE OAK TIMBERS

Details of orientation and number of rings of all samples are given in Table 2. The ring sequences of 112 oak samples were measured. Despite the poor correlation between the individual ring sequences, 61 were dated. All undated sequences, including those of less than 50 years, were compared with all individual dated ring sequences and phase masters. Seven phase masters (Appendix 2) were produced and finally a site master spanning the period AD 858-1310 (Tables 3 and 4). Full details of results are given in Appendix 3 and a summary is given in Figure 3.

Phase A

Only one phase A sample (752) was sent for analysis. As this was unsuitable for measurement, no dendrochronological date could be obtained for this phase.

Phase B

The ring patterns of <u>1586A</u> and <u>1586C</u> were almost identical (\pm =13.2) and the dimensions of the samples were also very similar, indicating that these two timbers were probably cut from the same tree. No consistent results were obtained when comparing the sequences to reference chronologies so the timber from this context remains undated.

Phase C

Five samples were dated, of which two had sapwood. Sample <u>1112</u>, associated with a deposit including wood fragments, gives a <u>terminus post quem</u> for felling of AD 1085. Sample <u>1583</u> gives a date of felling between AD 1100-1140.

Three dated timbers (1290, 1547, 1623) were from an earthfast post structure. They are probably contemporary and the presence of sapwood on 1623 indicates a felling date of AD 1102-1140.

Phase D

Of the six dated samples, three ($\underline{655}$, $\underline{655B}$, $\underline{1129}$) are associated with an earthfast post structure. If these are contemporary a felling date of between AD 1117-1155 is indicated. Samples $\underline{1110}$, a post, and $\underline{1300}$, associated with a pit, cannot have been felled before AD 1120 and AD 1121 respectively. Sample $\underline{1162}$, associated with a stake and wattle fence has retained its full complement of sapwood, indicated by the presence of the waney or bark edge. As the outer ring is complete it was felled in the winter or early spring of AD 1093/94.

Phase E/F

A total of 27 samples were dated from phase E/F. Samples from contexts 922, 959, 986 and 1020 are drain timbers and are part of the same feature, refered to in this report as drain 1. The seven dated samples from context 959 are all radially split planks of similar dimensions. Sample 959.3 was felled in the period AD 1148-1193. The felling dates of the other six timbers range from after AD 973 to after AD 1101. Archaeological evidence indicates that they are contemporary with 959.3. If they are primary, it is possible that <u>959.7</u> and <u>959.9</u> have been cut from the inner part of a tree trunk, whereas 959.2, 959.10, 959.4 and 959.1 have been cut from the outer heartwood rings of the trunk (Figure 2). However, they may be secondary timbers, having been robbed from previous construction periods for re-use.

Four timbers from context 986 were dated. Samples <u>986.2</u>, <u>986.3</u> and <u>986.4</u> were felled after AD 1132. The remaining dated sample, <u>986A</u>, has a heartwood-sapwood transition of AD 1073-1083. The date of the outermost sapwood ring is AD 1127 and this does not appear to be the bark edge. It is not unknown for oak trees to have 60-70 sapwood rings and in fact the sapwood statistics indicate that seven of the 143 Eastgate oak timbers are likely to have either more or less than the quoted sapwood range of 10-55 (see above). If <u>986A</u> is contemporary with <u>986.2</u>, <u>986.3</u> and <u>986.4</u> it would have to have at least 60 sapwood rings.

Seven samples from context 1020 were dated. Three of these samples (1020, 1020.8, 1020.9), all radially split timbers, crossmatched with <u>t</u>-values of over 9.0 and it is possible that they were cut from the same tree. Again the dates of the outermost heartwood rings are staggered in time. The estimated felling date is based on 1020.5 and 1020.8 which have sapwood transitions of 1134 and 1124 respectively. This gives a felling date in the range of AD 1143-1178.

The single sample from context 922 remains undated. Two samples (959.10 and 1020.10) crossmatch with a high <u>t</u>-value (8.6). The samples have very similar dimensions and the ring patterns are almost identical. Thus it appears likely that contexts 959 and 1020 are contemporary. If context 986 is also contemporary a felling range of AD 1148-1178 is obtained for the timbers used in the construction of drain 1. This would necessitate <u>986A</u> having 76-106 sapwood rings which, although unusual, is not impossible.

The samples from context 791 are part of a wooden bowl/vat feature which is related to drain 1. The Eastgate tub (sample <u>791TUB</u>) remains undated although two tentative dates were obtained. Its ring measurements were carried out manually using a Beck eyepiece. The curvature of the object may affect the ring width measurements as it meant that it was not possible to measure on the true radial. However, three timbers from this context were dated and produced a <u>terminus post quem</u> of AD 1137.

Samples from context 725 are also associated with a drain, referred to in this report as drain 2. Two of the timbers (725.1 and 725.4) were dated giving a terminus post quem for felling of AD 1168.

Four other timbers (468, 691, 1120 and 1283) from phase E/F were dated. The respective felling dates of 468 and 691 are after AD 1151 and AD 1151-1196. Samples 1120 and 1283 are associated with a stake and wattle alignment and in the absence of sapwood give a terminus post quem of AD 1107 and 1027 respectively.

Phase G

Six samples were successfully dated, of which four (711, 712, 713 and <u>796</u>) are from a rear extension of an earthfast post structure. Timbers 711, 712 and 796 had retained sapwood and the date of their heartwood-sapwood transitions range from AD 1136-1146. The outer ring of 713 is AD 1015, but the orientation of the inner rings suggest that they were very close to the pith. Although re-use should be considered it is possible, assuming that 713 is a primary timber, that a large number of heartwood rings are absent due to it having been split from the inner part of a trunk, unlike 712 and 796. The bark edge is present on 711 but the outer rings were counted rather than measured as they were very narrow. Therefore the felling date obtained for the timbers from the earthfast post structure extension is circa AD 1160. A felling range of AD 1152-1196 is obtained for sample 1166, also associated with the earthfast post structure.

The remaining dated sample $(\underline{883})$ from this phase had retained a full complement of sapwood rings. The outer rings were unclear and therefore the felling date is <u>circa</u> AD 1159.

Phase H

Three samples from this phase were dated of which one, $\underline{891B}$, had retained sapwood giving a felling range of AD 1131-1166. Samples $\underline{550}$ and $\underline{647A}$ are both associated with a chalk pathway. Neither have retained sapwood but, assuming that they are contemporary, cannot have been felled before AD 1152.

Phase I

Six samples from different structures and contexts were dated, none of which had retained sapwood. Further archaeological evidence may possibly indicate whether any of the samples are likely to be contemporary. If all six samples are contemporary a terminus post quem of AD 1185 is obtained for phase I.

Phase J

Sample <u>481</u> was measured but the ring pattern was distorted by the presence of knots. The sequence was not dated.

Phase K

The single oak sample (<u>666</u>) was unsuitable for measurement so no dendrochronological date could be obtained for this phase.

Phase L

Four oak timbers associated with a timber lined garderobe were dated. None had retained sapwood but if they are contemporary they could not have been felled before AD 1220. Two of the three dated samples from context 745 had retained sapwood and a felling date of AD 1310-1339 is indicated.

Sample <u>883/485</u> was successfully dated but had not retained any sapwood. The <u>terminus post quem</u> of AD 1131 cannot indicate conclusively which phase this sample belongs to.

INTERPRETATION

Tree-ring dates were obtained for timbers from seven phases. By examining these results it is possible to provide a basic dating framework for the site. Unfortunately interpretation of the felling dates was made difficult due to some dated timbers having been re-used and single timbers coming from apparently unrelated features and contexts. As will be seen below, further refinement of the dating framework given by the tree-ring results may be possible if other archaeological evidence is taken into account.

Phase C

Seasoning of the timbers associated with the earthfast post structure, other than through one or two years storage is unlikely and it is probable that they were used quite shortly after felling. The felling date of sample <u>1583</u>, associated with a fence, is almost identical to that of the earthfast post structure timbers. However, archaeological evidence indicates that the fence was constructed before the earthfast post structure. The felling dates for the timbers can neither confirm or refute this suggestion, but do at least show that it is possible. The original function of 1112 is unknown but it is

possible for it to be contemporary with timbers from the fence or the earthfast post structure.

Phase D

The results indicate that the earthfast post structure was probably constructed in the period AD 1117-1155. Timbers 1300 and 1110 may be contemporary with the earthfast post structure. However, the stake and wattle fence appears to have been built in AD 1093/94 or shortly afterwards. This suggests that it pre-dates the structures from phase C. As this construction date is based on only one timber it is possible that 1162 is a secondary timber which has been re-used from an earlier phase. Further archaeological evidence is needed to indicate which of these two suggested interpretations is the more likely.

Phase E/F

Archaeological evidence indicates that timbers from contexts 959, 986 and 1020 are contemporary and part of the same structure/feature. Dendrochronological analysis and the estimation of felling dates show that this is probable, though some timbers may have been re-used. Thus, the construction of drain 1 appears likely to have been during AD 1148-1178, shortly after felling. The felling dates of the timbers associated with the wooden bowl/vat feature (context 791) are also consistent with this feature being contemporary with drain 1, although this cannot be proved from tree-ring evidence.

The felling dates of the timbers from drain 2 indicate that it was built after AD 1168. These timbers, and also 468 (part of the shoring in a pit) and 691, may either be contemporary with or post-date drain 1. Neither of the timbers (1120 and 1283) from the stake and wattle alignment had sapwood, so the tree-ring dates do not help with the precise dating of the structure.

Phase G

The dated earthfast post extension timbers indicate that it was built <u>circa</u> AD 1160. It seems likely that post <u>883</u> is contemporary with these timbers. Archaeological evidence indicates that a further dated timber (<u>1166</u>) formed part of the original structure and it therefore seems probable that it was felled during AD 1152-1160. This suggests that the extension was built within approximately eight years of the construction of the original earthfast post structure.

Phase H

Neither of the two timbers associated with the chalk pathway were structural, so the tree-ring dates do not help with the precise dating of the pathway. Timber <u>891B</u>, a plank, formed part of the shoring in a pit. It may have been inserted in the mid 12th century, as suggested by the felling date, however it is possible that it is a re-used timber like the other undated plank (891A) from the same pit.

Phase I

None of the timbers had sapwood, so the felling dates are not precise and some timbers, for example <u>653</u>, show signs of re-use. The timbers were from unrelated contexts and had various functions. They did not appear to be associated with any major structure. If it is assumed that phase I timbers are broadly contemporary or at least re-used, then all that is indicated is that some form of construction was taking place after AD 1185.

Phase L

The timber-lined garderobe cannot have been constructed before AD 1220. There is no evidence for re-use of the timbers but the amount of heartwood missing is unknown so construction may have taken place much later. The sill timbers (context 745) associated with a barrel pit are probably primary timbers and therefore used in construction during the period AD 1310-1339.

THE TIMBERS

Of the 177 samples received from the Eastgate site, 34 were found to be species other than oak. Twenty three of these were alder (Alnus spp) including a root, 4 were ash (Fraxinus spp), 3 were willow (Salix spp) and 1 was Acer spp (Figure 4). The remaining 3 non-oak samples, one of which was coniferous, were too badly decayed for further identification. Two samples from phase C, <u>1605.2</u> and <u>1623</u>, were burnt on one side. They were not, however, associated with the same structure.

It is noticeable that phases K and L, the two latest phases, consist of mostly non-oak timbers. Assuming that this is not due to sampling methods, it may suggest a reduction in the amount of oak available. This could possibly be due to the decline of Beverley as a port resulting in less timber entering the area or due to locally depleted stocks.

Alder

Alder is the second most common species found on this site after oak. It was present in phases C, E/F, K and L. The samples were mainly from complete stems and in most cases the bark was preserved. Three samples (1605.1, 725.7, 1020.6) were from worked stems. Sample 1605.1 had been hewn to give a square post. Samples 725.7 and 1020.6, both associated with drains from phase E/F, appeared to have been split from larger stems. Where possible the season of felling has also been determined (Table 2b). In general it appears that the alder samples were from winter felled parent trees.

The average diameter of the stems, excluding the bark, varied from 50mm to 140mm, with the larger samples coming from phase L. The youngest stem was about 6 years old when felled, and the oldest about 28 years, but the majority were within the region of 14-24 years old. The average ring widths were not highly variable which would suggest that the alders grew under fairly similar conditions.

Ash

The four ash samples were associated with the two drains from phase E/F. Samples <u>725.8</u>, <u>725.10</u> and <u>959.5A</u> were from tangentially split planks whereas <u>959.5B</u> was from a quartered timber. The planks had between 20 and 30 rings and were all also narrow-ringed. However, <u>959.5B</u> had about 90 rings and the average ring width was wider suggesting that the trees grew under varying conditions.

Willow

Sample <u>1600</u> (phase C) and <u>82B</u> (phase L) were from complete stems including bark, but <u>1605.2</u> (phase C) appeared to have been split from a larger timber. The untrimmed sample from phase C had been felled in winter or early spring (pre-growing season). The sample from phase L (<u>82B</u>) contained about 28 rings and had been felled in winter.

Acer spp

Stake <u>1542</u> from phase C contained 28 rings and still had its bark attached. The outer ring appeared to be incomplete indicating that the stake was felled during the summer.

Conifer

The only coniferous sample was found in phase C. It was a radially split plank which was associated with a chalk-lined garderobe.

0ak

A small proportion of the oak timbers were untrimmed roundwood, usually less than 60 years old. The vast majority of timbers come from larger, older oak trees and have been trimmed or worked in some way. Some timbers, although shaped, were left virtually whole (eg 1522); others were trimmed to a greater extent on one or more sides (eg 662, 1129) so as to produce a square/rectangular shape. Many of the timbers appear to have been split from much larger trees. Samples 959.7, 1020 and 653 are radially split segments, whilst 108, for example, is a tangentially cut segment (Figure 2). The remaining timbers are

halved or quartered trunks (eg 420, 661, 986.10) which had been hewn into the required shape.

The age and size of trees used was variable throughout all phases. The youngest stem (802) was 12 years old when felled and the oldest (65.1) approaching 300 years. The timbers with bark edge present were mostly felled in winter and tended to be less than 60 years old; the notable exception being 972 which was over 150 years old. In general, during the medieval period trees seem to have been felled under 100 years old, and often at about 70 years (Rackham 1976). However, it is noticeable that at least half of the timbers from Eastgate, must have originated from parent trees aged over 100 years.

The size of trees is more difficult to assess as many of the samples are radially split segments with neither pith nor sapwood present. The diameter of the trunks however must range from approximately 0.1 to 1 metre plus. Sample <u>691</u>, for example, which has retained some sapwood, must have been from a trunk of approximately 1 metre diameter.

The average ring widths vary from 0.69mm to 5.43mm. This wide variation is apparent in all the phases and indicates that some of the trees must have grown under conditions that were limiting, possibly in dense woodland, whilst others had more favourable conditions and perhaps experienced less competition.

During the examination of the oak timbers in terms of the size and age of their parent tree, and the average width of their rings, it becomes obvious that there is a great variety of material, even within a single phase. Additionally the lack of significant similarity between the tree-ring curves of the timbers indicates that there were probably several diverse sources of timber. It is possible that this variety of material may result from the exploitation of a large area of woodland. However, Beverley was an important port before the growth of Hull and may well have served as a distribution centre for Thus timber from many sources may have been available timber. in Beverley. The Eastgate tub, as yet undated, is quite likely to have been imported from another region of Britain. It is interesting to note that many of the Eastgate samples crossmatched well with the Dyer Lane chronology but not Hall Garth bridge. This suggests that the Dyer Lane and Eastgate timbers are from similar sources, possibly local, where as the Hall Garth bridge timbers appear less likely to be of local origins.

CONCLUSION

The study of these samples has proved successful in that 61 of the 112 measured samples were dated and used to estimate construction dates for structures from several phases. From a dendrochronological point of view the success rate for the dating of the timbers is good, as although it is true that the majority of tree-ring chronologies for the historic period can be dated, it is not so for individual ring sequences (Hillam 1986). Due to the lack of similarity between single sequences it was necessary to treat all Eastgate timbers as individuals. In this instance it becomes apparent that it is necessary to include all available samples in the analysis so as to improve the dating success rate and therefore the precision of the felling dates.

The results indicate that there was an almost continuous period of construction throughout the 12th century and that the latest felling period occured in the early to mid 14th century. Tree-ring analysis also suggests that the timber was obtained from several diverse sources. It is likely that the probable importation of timber from other regions of Britain will continue to cause problems with tree-ring dating in the area. However further detailed work concerning the provenance of the timbers using dendrochronological, and also documentary evidence, where available, may resolve some of the porblems encountered.

The master chronology produced from the Eastgate timbers covered the period AD 858-1310 and has already proved useful for dating other timbers from Lurk Lane (Groves & Hillam in prep), a previously undated site from Beverley.

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Figure 1: Medieval Beverley and the excavation sites - 1 Wylies Road; 2 Dyer Lane/Walkergate; 3 Highgate; 4 Minster Moorgate; 5 Eastgate; 6 Dominican Priory; 7 Hall Garth; 8 Lurk Lane; 9 Constitutional Hall; 10 St Nicholas' Church; 11 Long Lane watching brief (reproduced from Armstrong 1985).



с. 8.

Figure 2: Diagram showing how some of the timbers may have been produced.

Figure 3: Bar diagram with ring sequences arranged according to their phase groupings. Sapwood is indicated by shading; H/S indicates sapwood transition; e - indicates presence of unmeasured rings; b/e indicates bark edge is present.



Figure 3 (cont)



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Figure 4: Summary of tree-ring samples.

context number	phase	structure/function
7	L	pile positions
10	\mathbf{L}	associated with chalk lined garderobe
22	\mathbf{L}	pile position
40	L	pile position
47	L	associated with chalk lined garderobe
65	I	pile positions
82	\mathbf{L}	pile positions
96	L	associated with timber lined garderobe
103	\mathbf{L}	beam - possible threshold
108	\mathbf{r}	associated with timber lined garderobe
109	\mathbf{L}	associated with timber lined garderobe
118	\mathbf{L}	associated with timber lined garderobe
178	К	pile positions
193	К	pile position
262	\mathbf{L}	pile position
419	I	pile position
420	I	post
426	K	pile position
431	I	layer
468	E/F	shoring in pit
478	G	layer
481	J	pile
485	D	deposit including wood fragments
550	H	associated with chalk pathway-not structural
556	I	pit
593	I	pit
640	I	part of gully
647	Н	associated with chalk pathway-not structural
653	I	post
655	D	earth fast post positions
656	e/f	post position
660	I	post
661	G	earth fast post position
662	G	earth fast post position
666	К	pile position

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Table 1: List of contexts in numerical order.

Table 1 (cont)

context number	phase	structure/function
668	I	post
691	E/F	pit
709	H	pit
711	G	earth fast post position - rear extension
712	G	earth fast post position - rear extension
713	G	earth fast post position - rear extension
714	G	earth fast post position
715	G	earth fast post position
725	E/F	drain 2
727	Н	post/stake
737	G	earth fast post position - rear extension
745	\mathbf{L}	sill timbers associated with barrel pit
751	?	?
752	A	scatter of wood chippings
791	E/F	wooden bowl/vat feature
796	G	earth fast post position - rear extension
802	G	earth fast post position - rear extension
812	e/f	earth fast post alignment
813	E/F	earth fast post alignment
879	E/F	post position
883	G	post
891	H	shoring in pit
898	E/F	pit
922	E/F	drain l
933	E/F	pit
959	E/F	drain l
972	E/F	layer including timber fragments
982	E/F	pit
983	I	stake
986	E/F	drain l
1020	E/F	drain l
1022	?	?
1103	E/F	post position
1110	D	post position
1112	C	deposit including wood fragments

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Table 1 (cont)

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context number	phase	structure/function
1120	E/F	stake and wattle alignment
1128	D	post position
1129	D	earth fast post position
1157	E/F	earth fast post alignment
1158	e/f	earth fast post alignment
1162	D	stake and wattle fence/gully line
1166	G	earth fast post position
1167	G	earth fast post position
1247	D	post position
1283	E/F	stake and wattle alignment
1290	C	earth fast post/plank
1300	D	pit
1304	D	earth fast post position
1314	e/f	pit
1324	E/F	post position
1372	D	pit fill
1408	D	stake and wattle fence/gully line
1507	С	post/stake
1522	C	earth fast post position
1542	С	post/stake
1543	C	post/stake
1547	C	earth fast post/plank
1569	С	post position
1571	C	post/stake
1573	С	post position
1576	C	tree root
1583	C	fence alignment
1586	В	scatter of wattle, stakes and timber
1598	C	earth fast post/plank
1600	C	earth fast post/plank
1601	С	earth fast post/plank
1605	C	fence alignment
1612	С	earth fast post position
1613	С	posts/stakes
1614	D	stake alignment

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TADIE I (CONF	Table	1 ((cont)
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Table 1 (cont)		
context number	phase	structure/function
1618	D	?
1622	С	earth fast post/plank
1623	С	earth fast post/plank
883/485	D or G	?

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context number	timber number	total no of rings	sapwood rings	mean ring width (mm)	sketch	maximum dimensions (mm)
Phase A	n ngapi gen an an an	میں پر ایک میں ہوتی ہے۔ اور میں پر این ہوتا ہے۔ والی میں پر این میں ایک میں ایک میں ایک میں ایک میں میں ایک می			<u></u>	
752	752	-	-	-	-	fragmented
Phase B						
1586	1586A	71+	-	2,90		275x90
1586	1586B	46	-	1.59		90x55
1586	1586C	54+	-	2.51		195x80
Phase C						
1112	1112	81	-	1.46		140x60
1290	1290	89	-	1.78		255x155
1507	1507	c.23	c.7	-		170x140
1522	1522	+47	14-16	4.26		340x310
*1543	1543	24	13	-		165x140
1547	1547	67	-	1.90		245x125
1569	1569	c.80	-			175x45
*1571	1571	31	31	1.71		145x65
1583	1583	+68+	У	1.26		160 x 60
1598	1598	26	10	-		190x45
1601	1601	34	11	5.43		205x85

Table 2a: Details of oak tree-ring samples. Sketches are not to scale; + - indicates unmeasured rings; sapwood is indicated on sketches by shading; * - indicates bark edge is present.

. ج Table 2a (cont)

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context number	timber number	total no of rings	sapwood rings	mean ring width (mm)	sketch	maximum dimensions (mm)
1612	1612	+47	10	3.82		310x260
*1613	1613.1	29	8 -	-		170x80
1613	1613.2	c.21	c.21	-		130x110
1622	1622	50 +	-	1.71		250x110
1623	1623	62+	У	0.87		180x100
Phase D						
485	485	89	-	1.09		105x15
655	655	157	-	1.45		260x250
655	655B	100	-	1.96		205 x 75
1110	1110	110	-	2.12		275x160
1128	1128	40+	-	5.19		340x300
1129	1129	89	12	2.44		360x235
*1162	1162	62	24	0.93		120x60
1247	1247	c•37	-	-		165x145
1300	1300	70+	-	2.99		500x450
1304	1304	37	28-32	1.51		140x95
1372	1372A	86+	-	1.17		125x30
1408	1408	c.65	У	-	Ê	125x55

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6	Table	2a	(cont)

context number	timber number	total no of rings	sapwood rings	mean ring width (mm)	sketch	maximum dimensions (mm)
*1614	1614	37	14-15	2.01		80 x 75
Phase E/	F					
468	468	94	-	1.30		150x10
656	656	186	-	1.29		295x90
691	691	+124	7	2.84		480x70
725	725A	27	7	-		145x45
725	725B	39	27-28	1.37		85 x 40
725	725.1	+118	-	0.97		185x30
725	725.2	54	-	2.14		135x65
725	725.3	56	8	1.78		210x80
725	725.4	+81	-	1.30		140x20
791	791.1	87	-	1.61		155x20
791	791.2	123	<u>-</u>	1.10		145x45
791	791.3	193	-	1.62		245x100
791	791.4	84+	-	1.08		160x15
791	791.5	90+	-	1.23		155 x 20
791	791.6	47	-	2.12		110x20
812	812 A	c.19	-	-	(A)	85 x 85

Table 2a (cont)

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context number	timber number	total no of rings	sapwood rings	mean ring width (mm)	sketch	maximum dimensions (mm)
813	813					broken
879	879	+97	-	1.38		190x150
898	898	78	-	1.07		95 x 15
922	922	49	-	1.05	(SA)	100x40
933	933	15	2	-		60x15
959	959.1	91+	-	0.76		110x10
959	959.2	82+	**	0.73		105x10
959	959.3	50	7	1.34		75 x 15
959	959.4	71	-	1.17		100x15
959	959.6	-	-	-	-	broken
959	959•7	79	-	1.42		120x10
959	959.8	46	-	1.72		90x20
959	959.9	98	_ ·	1.42		155x20
959	959.10	68	-	1.74		130x20
959	959.11	80	1.0	2.21		185x75
972	972	115+	у	0.78		150x50
982	982	107		2.30		270x75
986	986A	58+	У	2.06		190x80

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١.	Table	2a	(cont)

context number	timber number	total no of rings	sapwood rings	mean ring width (mm)	sketch	maximum dimensions (mm)
986	986.1	85	nan na kata kata kata kata kata kata kat	1.72		160x50
986	986.2	91+	-	1.66		180x15
986	986.3	98	-	1.39		145x15
986	986.4	59	-	2.37		155x45
986	986.5	158+	-	2.03		345x125
986	986.6	148	-	1.16		185x20
986	986.6(2)	81+	У	0.64		130x95
986	986.8	2 00	narrow ringed	d –		170x55
986	986.9	-	knotty	-		260x220
986	986.10	33	17	4.13		195x110
1020	1020	181	-	1.83		375x55
1020	1020.2	53	-	1.22		75x15
1020	1020.3	67	-	2.09		150x25
1020	1020.4	-	knotty			125x55
1020	1020.5	+91+	У	1.16	(THE DE D	135x10
1020	1020.8	187	4	1.52		335 x 75
1020	1020.9	174	-	1.93		380x80
1020	1020.10	67	-	1.63		125x20

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ĸ	Table	2a	(cont)

context number	timber number	total no of rings	sapwood rings	mean ring width (mm)	sketch	maximum dimensions (mm)
1103	1103	₽¥				broken
1120	1120	+130+	-	0.87		205 x 80
1157	1157	-	-	-	÷	broken
1158	1158	75+	-	1.00		175x130
1283	1283	133+	-	1.09	en an	180 x 35
1314	1314	84+	4-7+	1.92		180x50
1324	1324	17	-	-		65x60
Phase G						
478	478	87+	6 2	0.91		120x65
661	661	+56	7	2.80		135x130
662	662	70	25	1.49		235x175
+711	711	60+	У	1.37		225x130
712	712	71	16	2.72		225 x 75
713	713	116	-	1.85		235 x 75
714	714	172+	tan (1.65		315x125
715	715	8	5	and .		130x40
737	737	18	7	-		150x70
796	796	71	1	2.56		190x10

÷	Table	2a	(cont)	

context number	ontext timber total no umber number of rings		sapwood rings	mean ring width (mm)	sketch	maximum dimensions (mm)	
*802	802	12	12			110x110	
*883	883	82+	29-36	1.70		150x85	
1166	1166	96	11	1.64		170x30	
1167	1167	36+	-	2.75		135x20	
Phase H 550	550	107	-	0.94		135x120	
647	647 A	66+	-	0.82		115x20	
647	647B	+89	***	0.90		150x15	
709	709	87	***	1.34		130x25	
727	727	100+	-	1.11		180x75	
891	891A	+86		1.53		165x25	
891	891B	72+	у	1.16		185x20	
Phase I							
65	65	37	12	1.64		130x75	
65	65.1	+130+	-	0.65		175x80	
65	65.2	65	_	2.31		150x60	
419	419	27	-	-		55 x 45	
420	420	92	15	1.51		180x95	
431	431	27	9.	100		65x25	

Table 2a (cont)

context number	timber number	total no of rings	sapwood rings	mean ring width (mm)	sketch	maximum dimensions (mm)
556	556	41	11	2.69		115x35
593	593	129		1.80		255x45
640	640.1	80+	-	0.79		80x10
653	653	112	-	1.95		225 x 75
660	660	- 1	narrow rings	-		195x90
668	668	124+	_	1.41		275x170
983	983	+50	-	0.93		85x60
Phase J 481	481	95	21-25	1.17		95x95
Phase K 666	666	- 1	narrow rings	-		200x200
Phase L 82	82 A	- 1	narrow rings	-		145x130
96	96.1	56		1.67		105x90
96	96.2	+66+	-	1.69		160x50
96	96.3	121+	-	0.80		130x75
103	103	-	knotty	-	and the second s	130x70
108	108	89		1.18	(KC)	295 x 35
109	109	110+	-	0.99		125x110

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`	Table	2a	(cont)	

context number	timber number	total no of rings	sapwood rings	mean ring width (mm)	sketch	maximum dimensions (mm)
118	118	44		2.93	CTITIES	130x45
745	745A	106	-	1.76		240x75
745	745B	132	20	1.11		230x75
745	745C	44	-	2.17		170x95
745	745D	+126+	4+	1.43		305x50
Phase D (883/485	or G 883/485	92	-	1.42		140x70
Phase un	known					
751	751	-	-	-	-	fragmented
1022	1022	19	-	-		85x80
Fastrate	tub - nh	ase E/F				

nan verve	vuo – priabo					
791	791TUB	+80+	У	0.86	-	-

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Table 2b: Details of non-oak samples. The number of rings is an approximate value; sketches are not given for untrimmed roundwood samples.

context number	timber number	species	no of rings	sample trimmed	season felled	sketch/dimen excludin	sions (mm) g bark		
Phase C 1542	1542	Acer	28	no	summer?	<u>, , , , , , , , , , , , , , , , , , , </u>	85x60		
1573	1573	?	?	yes			120x75		
1576	1576	Alnus root	100	677	-		-		
1600	1600	Salix	12	no	summer		155x130		
1605	1605.1	Alnus	12	yes	-		60 x 50		
1605	1605.2	Salix	25	yes	-		140x75		
Phase D									
1618	1618	?	16	yes	-		130x85		
Phase E/	Phase E/F								
725	725.7	Alnus	18	yes	-		80 x 40		
725	725.8	Fraxinus	25	yes	-		80x20		
725	725.10	Fraxinus	30	yes	-		175x30		
791	791 A	Alnus	16	no	winter?		55 x 50		
791	791B	Alnus	22	no	winter		55 x 55		
791	791C	Alnus	25	no	winter		60 x 55		
791	791D	Alnus	15	no	winter		65x65		
959	959 . 5A	Fraxinus	20	yes	-		140x20		
959	959 . 5B	Fraxinus	90	yes	-		120x70		

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٩.	Table	2ъ	(cont)	

context number	timber number	species	no of rings	sample trimmed	season felled	sketch/dimensions (mm) excluding bark		
1020	1020.6	Alnus	28	yes	4225		80x40	
Phase K 178	178.1	Alnus	12	no	winter		75x75	
178	178.2	Alnus	15	no	winter?		75 x70	
178	178.3	Alnus	10	no	?		60x50	
193	193	Alnus	18	no	winter		85x75	
426	426	Alnus	6	no	?		50x50	
Phase L								
7	7.1	Alnus	25	no	?		140x135	
7	7.2	Alnus	23	no	?		125 x 125	
7	7.3	Alnus	18	no	?		100x90	
7	7.4	Alnus	16	no	?		85x80	
10	10.1	Alnus	18	no	winter		100x100	
10	10.2	Alnus	25	no	winter		85x80	
22	22	Alnus	-	-	-		broken	
40	40	Alnus	25	no	?		130x130	
47	47	conifer	-	yes	-	6THD	140x30	
82	82	Alnus	20	no	?		120x105	
82	82B	Salix	28	no	winter		125x120	
262	262	Alnus	16	no	summer?		80x70	

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Table 3: Ring width data of the Eastgate master.

AD 0 1 2 3 4 5 6 7 8 9 Bamples perdecade 858 3 7 68 57 67 53 79 51 86 73 1 870 68 62 93 81 61 69 82 48 55 76 2 860 70 52 61 60 62 58 62 40 41 2 900 83 66 52 51 61 81 85 62 85 76 44 910 80 104 105 84 90 58 77 90 73 78 66 920 77 89 80 75 98 75 72 99 106 136 66 930 135 109 14 85 76 71 85 67 51 14	years				ring	width	s (0.	02mm)				number of
858 .	AD	0	l	2	3	4	5	6	7	8	9	samples per decade
860 36 76 93 79 51 86 73 1 870 66 62 93 81 61 69 82 48 55 78 2 880 86 110 69 65 62 61 63 62 61 48 2 890 70 52 61 60 62 58 62 45 40 41 2 900 83 66 52 51 61 81 85 62 85 76 4 910 80 104 105 84 90 58 77 90 73 78 6 920 77 89 80 75 98 75 72 99 106 136 83 93 93 93 93 93 93 93 94 86 72 111 950 65 86	858									53	48	1
870 68 62 93 81 61 69 82 48 55 78 2 880 86 110 69 65 62 61 63 62 61 48 2 890 70 52 61 60 62 58 62 45 40 41 2 900 83 66 52 51 61 81 85 62 85 76 4 910 80 104 105 84 90 58 77 90 73 78 6 920 77 78 80 75 98 75 72 99 106 136 8 930 135 109 114 86 102 87 122 118 92 83 9 940 74 90 59 48 59 66 71 85 86 70 14 950 62 60 53 67 106 60 74 80 12 92 21 960 63 50 65 80 60 76 85 69 60	860	36	76	80	57	67	53	79	51	86	73	1
880 86 110 69 65 62 61 63 62 43 43 2 890 70 52 61 60 62 58 62 45 40 41 2 900 83 66 52 51 61 81 85 62 45 40 41 2 900 80 104 105 84 90 58 77 90 73 78 66 920 77 89 80 75 98 70 12 118 92 83 99 940 74 90 59 48 59 66 71 85 86 72 111 950 68 59 60 53 67 166 78 73 74 86 76 13 960 63 50 65 80 66 58 79 <td< td=""><td>870</td><td>68</td><td>62</td><td>93</td><td>81</td><td>61</td><td>69</td><td>82</td><td>48</td><td>55</td><td>78</td><td>2</td></td<>	870	68	62	93	81	61	69	82	48	55	78	2
890 70 52 61 60 62 58 62 40 41 2 900 83 66 52 51 61 81 85 62 85 76 4 910 80 104 105 84 90 58 77 90 73 78 66 920 77 89 80 75 98 71 29 91.06 136 88 930 135 109 114 86 102 87 122 118 92 83 99 940 74 90 59 48 59 66 71 85 70 14 960 65 58 54 85 91 64 68 78 85 70 14 970 62 60 67 53 65 61 55 57 52 56 13	880	86	110	69	65	62	61	63	62	61	48	2
900 83 66 52 51 61 81 85 62 85 76 4 910 80 104 105 84 90 58 77 90 73 78 6 920 77 89 80 75 98 72 72 99 106 136 8 930 135 109 114 86 102 87 122 118 92 83 9 940 74 90 59 48 59 66 71 85 86 72 11 950 63 50 65 51 61 68 78 85 70 14 960 63 50 65 80 60 76 85 69 60 59 15 970 65 70 81 73 78 78 80 112 92 21 <td>890</td> <td>70</td> <td>52</td> <td>61</td> <td>60</td> <td>62</td> <td>58</td> <td>62</td> <td>45</td> <td>40</td> <td>41</td> <td>2</td>	890	70	52	61	60	62	58	62	45	40	41	2
910 80 104 105 84 90 58 77 90 73 78 6 920 77 89 80 75 98 75 72 99 106 136 88 930 135 109 114 86 102 87 122 118 92 83 99 940 74 90 59 48 59 66 71 85 86 72 111 950 68 59 60 53 67 106 60 74 86 70 14 960 63 50 65 80 60 76 85 69 60 59 15 970 63 74 71 81 76 91 90 75 79 78 17 1000 90 93 90 102 82 73 74 80 112	900	83	66	52	51	61	81	85	62	85	76	4
920 77 89 75 98 75 72 99 106 136 8 930 135 109 114 86 102 87 122 118 92 83 9 940 74 90 59 48 59 66 71 85 86 72 111 950 68 59 60 53 67 106 60 74 86 76 14 960 65 58 54 85 91 64 68 78 85 70 14 970 62 60 67 53 65 66 55 57 52 56 13 980 63 50 65 80 60 75 79 78 17 1000 90 93 90 102 82 73 74 80 12 92 17	910	80	104	105	84	90	58	77	90	73	78	6
93013510911486102871221189283994074905948596671858672119506859605367106607486761496065585485916468788570149706260675365665557525613980635065806076856960591599069747181769190757978171000909390102827374801129221101093809110063847870676723102066787583737878859086271030948570897173709489773210407271825862726885878836105058625452467772697261331060727065606080927571331070777166	920	77	89	80	75	98	75	72	99	106	136	8
940 74 90 59 48 59 66 71 85 86 72 11 950 68 59 60 53 67 106 60 74 86 76 14 960 65 58 54 85 91 64 68 78 85 70 14 970 62 60 67 53 65 66 55 57 52 56 13 980 63 50 65 80 60 76 85 69 60 59 15 990 69 74 71 81 76 91 90 75 79 78 17 1000 93 80 91 100 63 84 78 70 67 67 63 67 33 1020 64 78 75 83 73 78 78 <t< td=""><td>930</td><td>135</td><td>109</td><td>114</td><td>86</td><td>102</td><td>87</td><td>122</td><td>118</td><td>92</td><td>83</td><td>9</td></t<>	930	135	109	114	86	102	87	122	118	92	83	9
95068596053671066074867614960655854859164687885701497062606753656655575256139806350658060768569605915990697471817691907579781710009093901028273748011292211010938091100638478706767231020667875837378788590862710309485708971737094897732104072718258627268858788361050586254524677726972613310607270656065608092757133107077716670807459688074291080956274856890836677813310907276 <td>940</td> <td>74</td> <td>90</td> <td>59</td> <td>48</td> <td>59</td> <td>66</td> <td>71</td> <td>85</td> <td>86</td> <td>72</td> <td>11</td>	940	74	90	59	48	59	66	71	85	86	72	11
960 65 58 54 85 91 64 68 78 85 70 14 970 62 60 67 53 65 66 55 57 52 56 13 980 63 50 65 80 60 76 85 69 60 59 15 990 69 74 71 81 76 91 90 75 79 78 17 1000 90 93 90 102 82 73 74 80 112 92 21 1010 93 80 91 100 63 84 78 70 67 67 23 1020 66 78 75 83 73 78 78 85 90 86 27 1030 94 85 67 71 83 36 57 71 33 <td>950</td> <td>68</td> <td>59</td> <td>60</td> <td>53</td> <td>67</td> <td>106</td> <td>60</td> <td>74</td> <td>86</td> <td>76</td> <td>14</td>	950	68	59	60	53	67	106	60	74	86	76	14
970 62 60 67 53 65 66 55 57 52 56 13 980 63 50 65 80 60 76 85 69 60 59 15 990 69 74 71 81 76 91 90 75 79 78 17 1000 90 93 90 102 82 73 74 80 112 92 21 1010 93 80 91 100 63 84 78 70 67 67 23 1020 66 78 75 83 73 78 78 85 90 86 27 1030 94 85 70 89 71 73 70 94 89 77 32 1040 72 71 82 58 62 54 52 46 77	960	65	58	54	85	91	64	68	78	85	70	14
980635065806076856960591599069747181769190757978171000909390102827374801129221101093809110063847870676723102066787583737878859086271030948570897173709489773210407271825862726885878836105058625452467772697261331060727065606560809275713310707771667080104105100104843210809562748568908366778133109072767669637471796025110052616365737680777853201120536687978486717179691811308289 <td< td=""><td>970</td><td>62</td><td>60</td><td>67</td><td>53</td><td>65</td><td>66</td><td>55</td><td>57</td><td>52</td><td>56</td><td>13</td></td<>	970	62	60	67	53	65	66	55	57	52	56	13
9906974718176919075797817100090939010282737480112922110109380911006384787067672310206678758373787885908627103094857089717370948977321040727182586272688587883610505862545246777269726135106072706560656080927571331070777166708010410510010484321080956274856890836677813310907276766963747179602511007253607960717179691811205261636573768077785320112053668797848671717969181130828982 <t< td=""><td>980</td><td>63</td><td>50</td><td>65</td><td>80</td><td>60</td><td>76</td><td>85</td><td>69</td><td>60</td><td>59</td><td>15</td></t<>	980	63	50	65	80	60	76	85	69	60	59	15
10009093901028273748011292211010938091100638478706767231020667875837378788590862710309485708971737094897732104072718258627268858788361050586254524677726972613510607270656065608092757133107077716670801041051001048432108095627485689083667781331090727676696374717960251100526163657376807778532011205366879784867171796918113082898278828970638767161140101111105979195948810512913115010999	990	69	74	71	81	76	91	90	75	79	78	17
1010938091100638478706767231020667875837378788590862710309485708971737094897732104072718258627268858788361050586254524677726972613510607270656065608092757133107077716670801041051001048432108095627485689083667781331090727676696374717960251100725360796074717960251100526163657376807778532011205366879784867171796918113082898278828970638767161140101111105979195948810512913150698576 <td>1000</td> <td>90</td> <td>93</td> <td>90</td> <td>102</td> <td>82</td> <td>73</td> <td>74</td> <td>80</td> <td>112</td> <td>92</td> <td>21</td>	1000	90	93	90	102	82	73	74	80	112	92	21
10206678758373787885908627103094857089717370948977321040727182586272688587883610505862545246777269726135106072706560656080927571331070777166708010410510010484321080956274856890836677813310907276766963747179602511105261636573768077785320112053668797848671717969181130828982788289706387671611401011111059791959488105129131150109997585836965755469611608985768258718910396103511608985 <td>1010</td> <td>93</td> <td>80</td> <td>91</td> <td>100</td> <td>63</td> <td>84</td> <td>78</td> <td>70</td> <td>67</td> <td>67</td> <td>23</td>	1010	93	80	91	100	63	84	78	70	67	67	23
103094857089717370948977321040727182586272688587883610505862545246777269726135106072706560656080927571331070777166708010410510010484321080956274856890836677813310907276766963745968807429110072536079607471796025111052616365737680777853201120536687978486717179691811308289827882897063876716114010111110597919594881051291311501099975858369657554696116089857682587189103961035116010296 </td <td>1020</td> <td>66</td> <td>78</td> <td>75</td> <td>83</td> <td>73</td> <td>78</td> <td>78</td> <td>85</td> <td>90</td> <td>86</td> <td>27</td>	1020	66	78	75	83	73	78	78	85	90	86	27
1040727182586272688587883610505862545246777269726135106072706560656080927571331070777166708010410510010484321080956274856890836677813310907276766963745968807429110072536079607474717960251110526163657376807778532011205366879784867171796918113082898278828970638767161140101111105979195948810512913115010999758583696575546961160898576825871891039610351170102968486841021119190816118055<	1030	94	85	70	89	71	73	70	94	89	77	32
10505862545246777269726135106072706560656080927571331070777166708010410510010484321080956274856890836677813310907276766963745968807429110072536079607471796025111052616365737680777853201120536687978486717179691811308289827882897063876716114010111110597919594881051291311501099975858369657554696116089857682587189103961035117010296848684102111919081611805562951317471757047534	1040	72	71	82	58	62	72	68	85	87	88	36
10607270656065608092757133107077716670801041051001048432108095627485689083667781331090727676696374596880742911007253607960747471796025111052616365737680777853201120536687978486717179691811308289827882897063876716114010111110597919594881051291311501099975858369657554696116089857682587189103961035117010296848684102111919081611805562951317471757047534	1050	58	62	54	52	46	77	72	69	72	61	35
107077716670801041051001048432108095627485689083667781331090727676696374596880742911007253607960747471796025111052616365737680777853201120536687978486717179691811308289827882897063876716114010111110597919594881051291311501099975858369657554696116089857682587189103961035117010296848684102111919081611805562951317471757047534	1060	72	70	65	60	65	60	80	92	75	71	33
108095627485689083667781331090727676696374596880742911007253607960747471796025111052616365737680777853201120536687978486717179691811308289827882897063876716114010111110597919594881051291311501099975858369657554696116089857682587189103961035117010296848684102111919081611805562951317471757047534	1070	77	71	66	70	80	104	105	100	104	84	32
1090727676696374596880742911007253607960747471796025111052616365737680777853201120536687978486717179691811308289827882897063876716114010111110597919594881051291311501099975858369657554696116089857682587189103961035117010296848684102111919081611805562951317471757047534	1080	95	62	74	85	68	90	83	66	77	81	33
11007253607960747471796025111052616365737680777853201120536687978486717179691811308289827882897063876716114010111110597919594881051291311501099975858369657554696116089857682587189103961035117010296848684102111919081611805562951317471757047534	1090	72	76	76	69	63	74	59	68	80	74	29
111052616365737680777853201120536687978486717179691811308289827882897063876716114010111110597919594881051291311501099975858369657554696116089857682587189103961035117010296848684102111919081611805562951317471757047534	1100	72	53	60	79	60	74	74	71	79	60	25
1120536687978486717179691811308289827882897063876716114010111110597919594881051291311501099975858369657554696116089857682587189103961035117010296848684102111919081611805562951317471757047534	1110	52	61	63	65	73	76	80	77	78	53	20
11308289827882897063876716114010111110597919594881051291311501099975858369657554696116089857682587189103961035117010296848684102111919081611805562951317471757047534	1120	53	66	87	97	84	86	71	71	79	69	18
114010111110597919594881051291311501099975858369657554696116089857682587189103961035117010296848684102111919081611805562951317471757047534	1130	82	89	82	78	82	89	70	63	87	67	16
11501099975858369657554696116089857682587189103961035117010296848684102111919081611805562951317471757047534	1140	101	111	105	97	91	95	94	88	105	129	13
116089857682587189103961035117010296848684102111919081611805562951317471757047534	1150	109	99	75	85	83	69	65	75	54	69	6
117010296848684102111919081611805562951317471757047534	1160	89	85	76	82	58	71	89	103	96	103	5
1180 55 62 95 131 74 71 75 70 47 53 4	1170	102	96	84	86	84	102	111	91	90	81	6
	1180	55	62	95	131	74	71	75	70	47	53	4

Table 3 (cont)

years				ring	widths	(0.	02mm)				number of
AD	0	1	2	3	4	5	6	7	8	9	samples per decade
1190	51	39	64	87	73	69	94	76	51	61	4
1200	61	86	69	114	69	64	51	45	47	45	4
1210	48	52	32	39	36	37	30	30	31	42	3
1220	56	52	53	72	78	64	87	56	67	76	3
1230	64	60	45	34	64	77	58	105	77	100	3
1240	48	34	27	38	54	54	61	77	57	68	3
1250	49	62	55	82	72	87	55	91	50	47	3
1260	71	76	101	117	81	68	79	83	105	71	3
1270	57	87	88	77	70	67	42	44	40	76	2
1280	71	68	66	74	88	91	58	36	33	68	2
1290	88	110	96	101	55	46	51	57	38	44	1
1300	43	53	50	43	41	51	42	54	46	58	l
1310	58										1

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Table 4: Results of comparisons between the Eastgate master (AD 858-1310) and dated reference chronologies.

chronology	t-value
Bilby	7.9
Bristol	6.8
Carlisle medieval	5.9
City Med	5.6
Coppergate medieval	7.3
Coppergate Viking	5.9
Dublin	6.2
Dundas Wharf	7.2
Dunstable	6.3
Dyer Lane	9.2
East Midlands	13.9
England	10.0
Exeter	6.4
Germany Munich area	3.9
Germany Trier area	6.3
Hall Garth	4.0
Hartlepool	3.2
Hen Domen	5.7
Hull	4.8
Nantwich	4.5
Ref6	5.8

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Table 5: Summary of tree-ring dates.

timber number	date span of rings	sapwood transition	felling date		
۲۰۰۰ میروند کرد. در 	AD	AD	<i>AD</i>		
Phase C					
1112	1006-1086	-	after 1096		
1290	978-1066	-	after 1076		
1547	990-1056	4 44	after 1066		
1583	989-1100	1086	1100-1140		
1623	988-1102	1086	1102-1140		
Phase D					
655	951-1107		after 1117		
655B	992-1091		after 1101		
1110	1001-1110	-	after 1120		
1129	1024-1112	1101	1112-1145		
1162	1032-1093	1070	1093/94		
1300	1021-1111	-	after 1121		
Phase E/F					
468	1048-1141	-	after 1151		
691	1005-1148	1142	1151-1196		
725.1	981-1158	-	after 1168		
725.4	1047-1147	-	after 1157		
791.1	1033-1119	-	after 1129		
791.2	1005-1127	-	after 1137		
791.6	1046-1092	-	after 1102		
959.1	961-1101	-	after 1111		
959.2	988-1072	F	after 1082		
959.3	1096-1145	1139	1148-1193		
959.4	989-1059	**	after 1069		
959.7	909-987	-	after 997		
959.9	866-963	F	after 973		
959.10	1003-1070	-	after 1080		
986A	1000-1127	1073-1083	circa 1127		
986.2	1018-1122	<u>k</u> ati	after 1132		
986.3	1010-1107	-	after 1117		
986.4	1047-1105	er	after 1115		
1020	924-1104	<u>_</u>	after 1114		

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Table 5 (cont)

timber number	date span of rings AD	sapwood transition AD	felling date		
1020.2	942-994		after 1004		
1020.3	946-1012	-	after 1022		
1020.5	1041-1142	1134	1143-1188		
1020.8	941-1127	1124	1133-1178		
1020.9	925-1098	-	after 1108		
1020.10	1001-1067	-	after 1077		
1120	893-1097	-	after 1107		
1283	858-1017	_ ·	after 1027		
Phase G					
711	1036-1160	circa 1136	circa 1160		
712	1082-1151	1136	1151-1190		
713	900-1015	-	after 1025		
796	1076-1146	1146	1155-1200		
883	1075-1159	1121-1128	1159		
1166	1057-1152	1142	1152 - 1196		
Phase H					
550	1036-1142		after 1152		
647A	987-1132	-	after 1142		
891B	900-1131	circa 1112	1131-1166		
Phase I					
65.1	873-1157	-	after 1167		
593	1047-1175	-	after 1185		
640.1	1022-1108	-	after 1118		
653	1026-1137	-	after 1147		
668	907-1040	-	after 1050		
983	1029-1123	-	after 1133		
Phase L					
96.1	1127-1182		after 1192		
108	1122-1210	-	after 1220		
109	1068-1182	40	after 1192		

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Table 5 (cont)

timber number	date span of rings AD	sapwood transition AD	felling date
118	1108-1151	-	after 1161
745A	1166-1271	-	after 1281
745B	1179-1310	1291	1310-1345
745D	1153-1291	1285	1294-1339
Phase D or G			
883/485	1030-1121	-	after 1131

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APPENDIX 1

Details of reference chronologies used in the dating of the Eastgate tree-ring sequences

chronology

date span

Bilby, Nottinghamshire (Morgan unpublished)	1084-1311
Bristol (Hillam 1984)	1032-1239
Carlisle medieval (Baillie & Pilcher pers comm)	893-1600
City Med, London (SDL unpublished)	682-1159
Coppergate medieval, York (SDL unpublished)	1031-1248
Coppergate Viking, York (SDL unpublished)	715-1011
Dublin (Baillie 1977)	855-1306
Dundas Wharf, Bristol (Nicholson 1985)	770-1202
Dunstable, Bedfordshire (Bridge 1983)	1172-1302
Dyer Lane (Groves & Hillam 1985)	903-1183
East Midlands (Nottingham Group unpublished)	882-1976
England (Baillie & Pilcher pers comm)	404-1981
Exeter Trichay Street (Hillam 1980)	799-1216
Germany Munich area (Becker 1981)	370BC-AD1969
Germany Trier area (Hollstein 1980)	400BC-AD1965
Hall Garth, Beverley (Hillam 1981)	1002-1324
Hartlepool (Hillam 1983)	951-1212
Hen Domen, Montgomeryshire (Morgan 1984)	931-1049
Hull (Hillam 1979)	1126-1297
Nantwich, Cheshire (Leggett 1980)	930-1330
Ref6 (Fletcher 1977)	780-1193

(SDL - Sheffield Dendrochronology Laboratory)

APPENDIX 2

Details of phase master chronologies, including ring widths in units of 0.02mm

EASTPC AD978-1 EASTPD AD951-1 EASTPEF AD858-1 EASTPG AD1036-	ca ca 1
EASTPEF AD858-1 EASTPG AD1036-	112
	158 1156
EASTPH AD987-1 EASTPI AD907-1	142 175 1710
EADIFL HDIVOO	

EASTGATE BEVERLEY EASTPC

TREE EG1290 STARTS AT YEAR 1 ENDS AT YEAR 89 N= 89 TREE EG1623 STARTS AT YEAR 11 ENDS AT YEAR 72 N= 62 TREE EG1547 STARTS AT YEAR 13 ENDS AT YEAR 79 N= 67 TREE EG1112 STARTS AT YEAR 29 ENDS AT YEAR 109 N= 81 TREE EG1583 STARTS AT YEAR 41 ENDS AT YEAR 108 N= 68 MASTER STORED IN FILE CALLED EASTPC

EASTGATE BEVERLEY AD 978-1086 EASTPC '

119 86 178 232 189 234 209 192 60 59 1 1 1 1 1 1 1 1 1 1 1 116 103 169 118 105 101 102 136 138 99 110 102 108 127 134 104 74 81 123 96 102 88 112 119 82 62 4 4 4 4 4 4 4 4 4 4 4 άS 59 51 4O 29 38 33 43

TREES INCLUDED ARE - EG1290 EG1623 EG1547 EG1112 EG1583

EASTGATE BEVERLEY EASTPD

TREE EG655 STARTS AT YEAR 1 ENDS AT YEAR 157 N= 157 TREE EG655/B STARTS AT YEAR 42 ENDS AT YEAR 141 N= 100 TREE EG1110 STARTS AT YEAR 51 ENDS AT YEAR 160 N= 110 TREE EG1300 STARTS AT YEAR 71 ENDS AT YEAR 140 N= 70 TREE EG1129 STARTS AT YEAR 74 ENDS AT YEAR 162 N= 87 TREE EG1162 STARTS AT YEAR 82 ENDS AT YEAR 143 N= 62

EASTGATE BEVERLEY AD 951-1112 EASTPD

133 102 64 143 184 132 141 154 124 104 1 1 1 1 1 1 1 1 1 1 140 95 127 132 104 61 77 93 1 1 1 1 1 1 1 1 1 1 6.5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 103 116 92 1 2 2 2 2 2 2 2 2 2 2 117 116 138 120 109 116 103 157 110 149 3 3 3 3 3 3 3 3 3 3 119 110 108 87 118 120 102 76 79 136 124 140 151 160 123 135 169 179 175 4 4 4 5 5 5 5 5 5 5 5 131 98 115 114 91 149 138 124 112 112 135 132 89 7Ö 85 90 81 55 111 124 100 81 103 112 113 99 91 67 71 69 68 89 113 102 92 119 130 124 81 1 1

TREES INCLUDED ARE - EG655 EG655/B EG1110 EG1300 EG1129 EG1162

EASTGATE BEVERLEY EASTFEF

TREE EG95973 STARTS AT YEAR 239 ENDS AT YEAR 288 N= 50

EAS1 EAS1 301	IGATE IPEF	E BEV	VERLE	ΞΥ	AL	858.	-1158			
53	48	36	76	80	57	67	53	79	51	1 1 1 1 1 1 1 2 2
86	73	68	62	93	81	61	69	82	48	2 2 2 2 2 2 2 2 2 2 2
55	78	86	110	69	65	62	61	63	62	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
61	48	70	52	61	60	62	58	62	45	2 2 2 2 2 2 2 2 2 2 2 2
40	41	56	59	44	45	53	69	64	.4.4	2 2 2 2 2 2 2 2 2 2 2 2
4/	61	55	68	12	104 ∕	58	4.5	55	57	233333333
34	457	6 J. 1 777	00 110	33 140	61 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	87	82	80	115	333334555
고사고 이트	137	170	140	140	117	11/	107	133	120	
7.J 1.0.1	70	20	110	14	30 10:77	70	115	84 70	104	0 0 0 0 0 / / / / 8 8
70	77/1	70 41	с. 571	01 53	70	00 07	1. I.J 4. A	С. 74	/ 01	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
102	7~7	61 40	L.7	7L	17 47	75	77	40	73. ECO	, , , , , , , , , , , , , , , , , , ,
56	61	57 57	с/ Бр	70 40	70	7.J 54	/ <u>*</u> .	74	57 50	, , , , , , , , , , , , , , , , , , ,
n in in	E.S.	51	67	60	79	20 20	81	77	47	
73	77	101	93	84	104	85	70	68	76	
112	102	92	79	94	105	59	86	85	78	
77	75	76	77	77	84	68	69	78	77	
78	75	90	80	73	91	72	78	73	89	14 14 14 14 14 15 15 15 15 15
87	76	70	73	83	67	66	74	76	95	15 15 15 16 16 17 17 17 18 19
87	86	55	59	49	52	50	79	70	62	20 20 20 20 19 19 19 19 19 19
69	67	77	71	62	61	66	58	73	86	18 18 17 17 17 17 17 17 17 18
69	71	78	68	65	64	75	86	91	85	17 17 16 15 15 15 15 15 15 15
93	71	88	62	65	76	$^{\circ 1}$	84	76	63	14 14 14 14 14 14 14 14 14 14 14
75	82	73	79	85	79	62	75	63	67	14 14 14 14 14 13 13 13 14 14
78	73	71	54	59	75	61	75	71	67	$-14 \ 13 \ 13 \ 13 \ 13 \ 13 \ 13 \ 12 \ 11 \ 11$
80	62	56	62	66	70	65	74	7.5	7Ö	10 9 7 7 9 9 9 9 9 9 9
69	49	50	58	71	71	68	70	66	64	9 7 8 8 8 8 8 8 8 8
81	66	76	80	84	68	74	84	70	57	6666665555
65	56	81	103	89	65	62	00	85	88	5555444433
77	61	. 95	66	49	44	51	44	54	79	2 1 1 1 1 1 1 1 1 1
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TREES INCLUDED ARE - EASTODDS EAST759M EAST1020M EAST786M EAST771N EAST72 59/3

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EASTGATE BEVERLEY EASTPO

TREE EG711 STARTS AT YEAR 1 ENDS AT YEAR 60 N= 60 TREE EG1166 STARTS AT YEAR 22 ENDS AT YEAR 117 N= 96 TREE EG883 STARTS AT YEAR 40 ENDS AT YEAR 121 N= 82 TREE EG796 STARTS AT YEAR 41 ENDS AT YEAR 111 N= 71 TREE EG712 STARTS AT YEAR 47 ENDS AT YEAR 116 N= 70 MASTER STORED IN FILE CALLED EASTPG

EASTGATE BEVERLEY AD 1036-1156 EASTPG 121

30 57 21 32 39 84 157 68 14287 1 1 1 1 1 1 1 1 1 1 1 47 15 23 39 100 17 1530 52 1 1 1 1 1 1 1 1 1 1 19 1222222222 55 91 71 55 57 5143 49 58 50 122 139 287 95 116 73 72 72 2222222223 55 87 223 212 207 156 152 102 121 140 100 147 4 4 4 4 4 4 5 5 5 5 112 118 108 92 94 55555555555 126 95 76 83 72 70 93 100 100 91 62 69 108 60 86 4 4 4 4 4 4 4 4 4 4 4 4 69 59 57 42 37 51 6169 104 91 4 4 4 4 4 4 4 4 4 4 4 4 69 65 88 138 172 129 147 4 4 4 4 4 4 4 4 4 4 105 104 92 113 102 110 84 103 108 85 92 92 1004 4 4 4 4 4 4 4 4 4 4 4 4 85 77 92 73 127 135 129 118 102 124 4 4 4 4 4 4 4 4 4 4 4 4 115 105 117 147 110 89 103 67 66 45 4333332111 36 1

TREES INCLUDED ARE - EG711 EG1166 EG883 EG796 EG712

EASTGATE BEVERLEY EASTEH

TREE EG647/A STARTS AT YEAR 1 ENDS AT YEAR 66 N= 66

TREE EG550 STARTS AT YEAR 50 ENDS AT YEAR 156 N= 107

MASTER STORED IN FILE CALLED EASTFH

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42	33	38	58	51	64	77	67	61		1	1	1	1	1	1	1	1	1	1
47	60	65	49	48	45	38	40	56		1.	1	1	1	1	1	1	1	1	1
57	40	31	29	47	46	35	41	45		1	1	1	1	1	1	1	1	1	1
21	28	21	36	37	43	26	26	27		1	1	1	1	1	1	1	1	1	1
23	25	45	37	46	43	26	21	53		1	1	1	1	1	j.	1	1	1	\mathbb{Z}
45	53	54	48	56	40	32	47	53		2	2	2	\mathbb{Z}	2	2	2	\mathbb{R}	\mathbb{Z}	\mathcal{Z}
62	68	41	49	4 <u>(</u>)	37	42	63	52		2	\mathbb{Z}	2	2	2	2	1	1	1	1
51	50	57	54	47	42	40	36	43		1	1	1.	1	1	1	1	1	1	1
59	51	57	43	33	40	36	47	45		1	1	1.	1	1	1.	1	1	1	1
39	52	52	43	60	59	44	50	55		1	1	1	1	1	1	1	1	1.	1
58	57	55	51	33	36	47	47	44		1	1	1	1	1	1.	1	1	1	Ĵ.
45	52	49	43	35	49	53	45	44		1	1	1	1	1	1	1	1	1	1
44	35	29	41	33	33	42	38	47		1	1	1	1	1	1	1	1	1	1
48	35	29	35	40	42	48	51	42		1	1	1	1	1	1	ţ	1	1	1
42	37	38	49	42	38	44	36	33		1	j.	1	1	1	1	1	1	1	1
36	30	56	38	47		11	1 1	11											
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<td>42$33$$39$$58$$51$$64$$77$$67$$61$$47$$60$$65$$49$$48$$45$$38$$40$$56$$57$$40$$31$$29$$47$$46$$35$$41$$45$$21$$28$$21$$36$$37$$43$$26$$26$$27$$23$$25$$45$$37$$46$$43$$26$$21$$33$$45$$53$$54$$48$$56$$40$$32$$47$$53$$62$$68$$41$$49$$40$$37$$42$$63$$52$$51$$57$$54$$47$$42$$40$$36$$43$$59$$51$$57$$43$$33$$40$$36$$47$$45$$39$$52$$52$$43$$60$$59$$44$$50$$55$$58$$57$$55$$51$$33$$36$$47$$47$$44$$45$$52$$49$$43$$35$$49$$53$$45$$44$$44$$35$$29$$41$$33$$33$$42$$38$$47$$48$$35$$29$$35$$40$$42$$48$$51$$42$$42$$37$$38$$47$$1$$1$$1$$1$$1$$1$</td> <td>42 33 38 58 51 64 77 67 61 1 47 60 65 49 48 45 38 40 56 1 57 40 31 29 47 46 35 41 45 1 21 28 21 36 37 43 26 26 27 1 23 25 45 37 46 43 26 21 33 1 45 53 54 48 56 40 32 47 53 2 62 68 41 49 40 37 42 63 52 2 51 50 57 54 47 42 40 36 43 1 59 51 57 54 47 42 40 36 43 1 59 51 57 51 33 36 47 45 1 58 57 55 <td< 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49 48 45 38 40 56 1</td><td>42 33 38 58 51 64 77 67 61 1</td><td>42 33 38 58 51 64 77 67 61 1</td><td>42 33 38 58 51 64 77 67 61 1</td><td>42 33 38 58 51 64 77 67 61 1</td></td<>	42 33 38 58 51 64 77 67 61 1 1 47 60 65 49 48 45 38 40 56 1 1 57 40 31 29 47 46 35 41 45 1 1 21 28 21 36 37 43 26 26 27 1 1 23 25 45 37 46 43 26 21 33 1 1 45 53 54 48 56 40 32 47 53 2 2 62 68 41 49 40 37 42 63 52 2 2 51 50 57 54 47 42 40 36 43 1 1 59 51 57 43 33 40 36 47 45 1 1 59 51 57 43 33 40 36 47 45 1 1 59 51 57 51 33 36 47 47 44 1 1 44 35 29 41 33 33 42 38 47 1 1 44 35 29 41 33 33 42 38 47 1 1 44 35 29 35 40 42	42 33 38 58 51 64 77 67 61 1 1 1 47 60 65 49 48 45 38 40 56 1 1 1 57 40 31 29 47 46 35 41 45 1 1 1 21 28 21 36 37 43 26 26 27 1 1 1 23 25 45 37 46 43 26 21 33 1 1 1 45 53 54 48 56 40 32 47 53 2 2 2 2 62 68 41 49 40 37 42 63 52 2 2 2 2 51 50 57 54 47 42 40 36 43 1 1 1 1 1 1 1 1 1 1 1 1	42 33 38 58 51 64 77 67 61 1 1 1 1 47 60 65 49 48 45 38 40 56 1	42 33 39 58 51 64 77 67 61 1 1 1 1 1 47 60 65 49 48 45 38 40 56 1	42 33 38 58 51 64 77 67 61 1	42 33 38 58 51 64 77 67 61 1	42 33 38 58 51 64 77 67 61 1	42 33 38 58 51 64 77 67 61 1

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TREES INCLUDED ARE - EG6477A EG550

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EASTGATE BEVERLEY EASTFI

TREE EG668 STARTS AT YEAR 1 ENDS AT YEAR 124 N= 124 TREE EG65/1 STARTS AT YEAR 12 ENDS AT YEAR 141 N= 130 TREE EG640/1 STARTS AT YEAR 116 ENDS AT YEAR 195 N= 80 TREE EG653 STARTS AT YEAR 120 ENDS AT YEAR 231 N= 112 TREE EG593 STARTS AT YEAR 141 ENDS AT YEAR 269 N= 129 TREE EG983 STARTS AT YEAR 168 ENDS AT YEAR 217 N= 50

EASTGATE BEVERLEY AD 907-1175 EASTFI

89 186 116 172 237 195 180 243 139 158 1 1 1 1 1 1 1 1 1 1 1 185 88 98 82 116 109 84 106 79 110 72 123 90 32 27 105 64 4Ö 60 -29 28 33 42 \mathbf{Z} 0.1 33 31 40 41 39 42 36 34 26 31 32 32 36 38 30 37 31 44 70 53 33 43 47 83 \mathbb{Z} 104 92 103 73 56 69 58 52 54 37 52 71 102 105 97 76 90 81 65 83 49 96 109 81 93 81 59 62 46 72 65 65 61 72 75 4 4 4 4 4 3 3 3 3 З 55 61 48 54 54 43 41 56 70 84 79 70 6Ŏ 77 96 104 94 90 104 73 149 118 170 154 92 103 118 171 136 115 148 169 150 139 91 145 108 103 87 1 1 1 1 1 1 1 1 1 1 129 95 111 147 137 100 104 100 107 102 1 1 1 1 1 1 1 1 1 1 122 106 111 92 146 151 171 170 181 - 1 1 1 1 1 1 1 1 1

TREES INCLUDED ARE - E6668 E66571 E664071 E6653 E6593 E6983

EASTGATE BEVERLEY EASTPL ست محمد بسین اینام محمد بعد بلین بالی این این این این محمد میزا بندو بعد محمد بالا وزور وزور وی این محمد محمد مروز و این ا

TREE EG109 STARTS AT YEAR 1 ENDS AT YEAR 110 N= 110 TREE EG118 STARTS AT YEAR 41 ENDS AT YEAR 84 N= 44 TREE EG108 STARTS AT YEAR 55 ENDS AT YEAR 143 N= 89 TREE EG96/1 STARTS AT YEAR 60 ENDS AT YEAR 115 N= 56 TREE EG745/D STARTS AT YEAR 96 ENDS AT YEAR 221 N= 126 TREE EG745/A STARTS AT YEAR 99 ENDS AT YEAR 204 N= 106 TREE EG745/B STARTS AT YEAR 112 ENDS AT YEAR 243 N= 132 MASTER STORED IN FILE CALLED EASTPL *****

EASTGATE BEVERLEY AD 1068-1310 EASTPL . ÷ 5

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107 78 44 57 112 127 140 85 1 1 1 1 1 1 1 1 1 1 56 49 48 45 58 - 37 24 15 -29 37 41 100 103 117 105 130 61 112 83 90-4 4 4 4 4 4 4 4 4 4 106 116 107 103 77 4 4 4 4 4 4 4 4 4 4 4 4 4 109 73 6^{9} 100 124 102 106 61 7Ö 3 3 3 3 4 4 4 5 5 68 68 77 87 100 111 91 102 104 86 - 70 9Ö 95 131 74 94 76 64 87 114 69 51 45 4 4 4 3 3 3 3 3 $\mathbb{S}1$ 58 105 3 3 3 3 3 3 3 3 3 3 64 60 3 3 3 3 3 3 3 3 3 3 100 48 34 3 3 3 3 3 3 3 3 3 3 3 62 55 82 55 91 3 3 3 3 3 3 3 3 3 3 3 76 101 117 81 79 83 42 44 105 71 57 87 101 55 110 96 53 50 43 41 51 42 54 1 1 1 1 1 1 1 1 1 1 1 1 1 1

TREES INCLUDED ARE - EG109 EG118 EG108 EG96/1 EG745/D EG745/A EG745/8

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APPENDIX 3

Details of tree-ring results

Context - context number Sample - sample number Result2 - date of ring sequence excluding additional rings.

Samples are arranged in order of phase.



Page 1

CONTEXT	SAMPLE	PHASE	SPECIES	RESULT1	RESULT2	COMMENT
7	7.1	L.	alder	rejected		
7	7.2	L	alder	rejected		
7	7.3	L	alder	rejected		-
7	7.4	i_	alder	rejected	<u></u>	[end]
10	10.1	l	alder	rejected	199-149	-
10	10.2	L	alder	rejected	time ve	
22	22	L_	alder	rejected		
40	40	L.,	alder	rejected		
47	47	L,	conifer	rejected		
65	65	I	oak	undated	-	
65	65.1	I	oak	dated	918-1047	+110 outer & +45 inner rin
65	65.2	I	oak	undated		georg
82	82	L	alder	rejected		and a start of the
82	82A	<u> </u>	oak	rejected		narrow rings
82	82B	1	willow	rejected		-
96	96.1	L	oak	dated	1127-1182	447.97
96	96.2	L_	oak	undated		_
96	96.3	L.	oak	undated	_	4774.
103	103	L.	oak	rejected		very knotty
108	108	L_	oak	dated	1127-1182	pang di s
109	109	L.	oak	dated	1068-1177	+5 outer rings; knotty
118	118	L	oak	dated	1108-1151	
178	178.1	К	alder	rejected		
178	178.2	К	alder	rejected	-	544F
178	178.3	ĸ	alder	rejected	n	and a
193	193	К	alder	rejected		8
262	262	1	alder	rejected		-
419	419	I	oak	rejected		
420	42Ø	I	oak	undated	-	near pith
426	426	K	alder	rejected	-	
431	431	I	oak	rejected		a#/
468	468	E/F	oak	dated	1048-1141	
478	478	G	oak	undated	_	-
481	481	J	oak	undated	_	knotty
485	485	D	oak	undated	-	
550	550	Н	oak	dated	1036-1142	****
556	556	I	oak	undated		
593	593	1	oak	dated	1047-1175	Mine
640	640.1	I	oak	dated	1022-1101	+7 outer rings
647	647A	Н	oak	dated	987-1052	+80 outer rings
647	647B	ł-ł	oak	undated	upone a	
653	653	I	oak	dated	1026-1137	
655	655	D	oak	dated	951-1107	_
655	655B	D	oak	dated	992-1091	
656	656	E/F	oak	undated		<u> </u>
660	660	I	oak	rejected	_	narrow rings
661	661	G	oak	undated	9	
662	662	G	oak	undated		
666	666	К	oak	rejected		narrow rings

Page 2

CONTEXT	CONTEXT SAMPLE PHASE SPECIES RE		RESULT1	RESULT2	COMMENT			
 668	 AA8		nak	dated	9/17-1/03/0	+10 outer ringe		
691	691	F/F	oak	dated	1025-1148	and the second second and the second se		
709	709	ы, т. Н	nak	undated	and the second second second second	<u> </u>		
711	711	G	nak	dated	10136-10195	+60 rings to bark edge		
712	712	(G	oak	dated	1082-1151	knottu		
713	71.3	- (5	nak	dated	900-1015	knottu		
714	714	G	oak	undated	t water. In the sheet			
715	715	G	oak	rejected				
725	725A	F/F	oak	rejected		_		
725	725B	E/F	oak	undated				
725	725.1	E/F	oak	dated	1041-1158			
725	725.2	E/F	oak	undated	*+	rings distorted		
725	725.3	E/F	oak	undated	*****	_		
725	725.4	E/F	oak	dated	1067-1147			
725	725.7	E/F	alder	rejected		-		
725	725.8	E/F	ash	rejected	and the second	Inter		
725	725.10	E/F	ash	rejected		<u> </u>		
727	727	Н	oak	undated				
737	737	G	oak	rejected	Januar	_		
745	745A	L	oak	dated	1166-1271			
745	745B	L_	oak	dated	1179-1310	_		
745	745C	L	oak	undated	_	par		
745	745D	L	oak	dated	1163-1288	+3 outer rings		
751	751	?	oak	rejected	~	fragmented		
752	752	À	oak	rejected	_	small fragments		
791	791A	E/F	alder	rejected		-		
791.	791B	E/F	alder	rejected		-		
791	791C	E/F	alder	rejected		P44		
791	791D	E/F	alder	rejected		<u> </u>		
791	791.1	E/F	oak	dated	1033-1119	Anna		
791	791.2	E/F	oak	dated	1005-1127			
791	791.3	E/F	oak	undated		****		
791	791.4	E/F	oak.	undated	<u> </u>	-		
791	791.5	E/F	oak	undated	-			
791	791.6	E/F	oak	dated	1046-1092	um;		
796	796	(Fi	oak	dated	1076-1146	····		
802	802	G	oak	rejected		-		
812	812A	E/F	oak	rejected		decayed		
813	813	E/F	oak	rejected		decayed		
879	879	E/F	oak	undated	·			
883/485	883/485	D/G	oak	dated	1030-1121	_		
883	883	G	oak	dated	1075-1156	+3 outer rings		
891	891A	Н	oak	undated				
891	891B	Н	oak	dated .	900-971	+160 outer rings		
898	898	E/F	oak	undated		-		
922	922	E/F	oak	undated				
933	933	E/F	oak	rejected				
959	959.1	E/F	oak	dated	961-1051	+50 outer rings		
959	959.2	E/F	oak	dated	988-1069	+3 outer rings		

APPENDIX 3 - RESULTS

CONTEXT	SAMPLE	PHASE	SPECIES	RESULT1	RESULT2	COMMENT
959 959	959.3	E/F	oak	dated	1096-1145	
959	959.4	E/F	oak	dated	989-1059	****
959	959.5A	E/F	ash	rejected		
959	959.5B	E/F	ash	rejected		
959	959.6	E/F	oak	rejected		broken
959	959.7	E/F	oak	dated	909-987	
959	959.8	E/F	oak	undated		-
959	959.9	E/F	oak	dated	866-963	
959	959.1Ø	E/F	oak	dated	1003-1070	haired
959	959.11	E/F	oak	undated		5 4 5 4 T
972	972	E/F	oak	undated		c.35 to bark edge
982	782	E/F	oak	undated		
983	983	I	oak	dated	1074-1123	~~~
986	986A	E/F	oak	dated	1000-1057	+70 rings
986	986.1	E/F	oak	undated		
986	986.2	E/F	oak	dated	1018-1108	+14 outer rings
986	986.3	E/F	oak	dated	1010-1107	
986	986.4	E/F	oak	dated	1047-1105	
986	986.5	E/F	oak	undated		-
986	986.6	E/F	oak	undated	_	No.
986	986.6(2)	E/F	oak	undated		
986	986.8	E/F	oak	rejected		narrow rings
986	986.9	E/F	oak	rejected		veru knottu
986	986.10	E/F	oak	undated		
1020	1020	E/F	oak	dated	924-1104	
1020	1020.2	E/F	oak	dated	942-994	
1020	1020.3	E/F	oak	dated	946-1012	
1020	1020.4	E/F	oak	rejected	*****	very knotty
1020	1020.5	E/F	oak	dated	1043-1133	+9 outer rings
1020	1020.6	E/F	alder	rejected		
1020	1020.8	E/F	oak	dated	941-1127	-
1020	1020.9	E/F	oak	dated	925-1098	
1020	1020.10	E/F	oak	dated	1001-1067	_
1022	1022	7	oak	rejected	_	
1103	1103	E/F	oak	rejected	****	broken
1110	1110	D	oak	dated	1001-1110	knotty
1112	1112	С	oak	dated	1005-1086	
1120	1120	E/F	oak	dated	948-1077	+20 outer & +55 inner ring
1128	1128	D	oak	undated	_	rings distorted
1129	1129	D	oak	dated	1024-1112	_
1157	1157	E/F	oak	B-4448		decayed
1158	1158	E/F	oak	undated		
1162	1162	D	oak	dated	1032-1093	pith & bark edge
1166	1166	G	oak	dated	1057-1152	1 60°
1167	1167	G	oak	undated		
1247	1247	D	oak	rejected	_	rings distorted
1283	1283	E/F	oak	dated	858-990	+27 outer rings
1290	1290	С	oak	dated	978-1066	near pith
1300	1300	D	oak	dated	1021-1090	+21 outer rings

APPENDIX 3 - RESULTS

CONTEXT	SAMPLE	PHASE	SPECIES	RESULT1	RESULT2	COMMENT
1304	1304	 D	oak	undated		knotty
1314	1314	E/F	oak	undated	P-04	
1324	1324	E/F	oak	rejected		-
1372	1372A	D	oak	undated		
1408	1408	D	oak	rejected		narrow rings
1507	1507	С	oak	rejected	-	
1522	1522	С	oak	undated	-	-
1542	1542	С	Acer	rejected	-	P104
1543	1543	С	oak	rejected	<u> </u>	bark edge
1547	1547	С	oak	dated	990-1056	
1569	1569	С	oak	rejected	-	narrow rings
1571	1571	С	oak	undated	-	bark edge
1573	1573	С	?	rejected		-
1576	1576	С	alder	rejected		root
1583	1583	С	oak	dated	1018-1085	+15 outer & +29 inner rin
1586	1586A	В	oak	undated		-
1586	1586B	В	oak	undated		knotty
1586	1586C	в	oak	undated	-	Print Control of Contr
1598	1598	С	oak	rejected		
1600	1600	С	willow	rejected	-	
1601	1601	С	oak	undated		-
1605	1605.1	С	alder	rejected		M-41
1605	1605.2	С	willow	rejected		-
1612	1612	С	oak	undated	-	W) Jak
1613	1613.1	С	oak	rejected		bark edge
1613	1613.2	С	oak	rejected	-	
1614	1614	D	oak	undated		pith & bark edge
1618	1618	D	?	rejected		
1622	1622	С	oak	undated		
1623	1623	С	oak	dated	988-1049	+53 outer rings

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