Centre for Archaeology Report 72/2003

Tree-Ring Analysis of Further Timbers from Bromley Hall, Gillender Street, London Borough of Tower Hamlets

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ISSN 1473-9224

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Summary

The main part of Bromley Hall was thought to date to the early sixteenth century, though little was known of its history. A substantial first-floor construction, with moulded beams and hollow chamfered joists and a doorframe, and second-floor with dragon beams, remain from this primary phase. The roof structure was thought to date from the seventeenth century, but this was found to be made from softwood timbers and was not investigated further.

Samples were taken from various timbers associated with the primary phase. Seven timbers, all from the floors, crossmatched and were combined into a site chronology which dated against sites from a wide geographical area. Assuming the dated timbers have all come from a single batch of timbers, the most likely felling date range is AD 1482 - 95, suggesting that the primary phase was a little earlier than previously thought.

Keywords

Dendrochronology
Standing Building

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Introduction

Little is known of the early history of Bromley Hall (NGR TQ 381 819), which is an early Tudor brick structure with several later additions. The streets around the site have changed several times and a dual-carriageway, the main approach to the Blackwall Tunnel, now runs immediately to the west of the house. There are records of the property being transferred from the Priory of Christ Church to one Richard Morrison at the Dissolution in AD 1535. What stands today is thought to be the survivor of a once larger group of buildings. Its plan suggests that it may once have formed part of a gatehouse to an estate. The present building was much altered in the eighteenth century when the present roof arrangement was fabricated.

Dendrochronological study of the roof, floor, and other framing timbers was requested by the English Heritage inspector Ray Rogers as part of an archaeological evaluation and assessment of the building to inform a recent planning application. Previous work at this site was described in Bridge (2002). Subsequently, more timbers were exposed, and additional sampling was carried out. This report covers all the work undertaken, and therefore replaces Bridge (2002).

Methodology

Initially, the site was visited twice, once during August and once in September AD 2002, when different areas had been opened up for investigation. Subsequently, after the submission of the first report on the site (Bridge 2002) more timbers were exposed, and additional sampling was carried out in November AD 2002. The first and third visits were made in association with Andy Wittrick (English Heritage) who was also making an assessment of the historical features of the building and who gave an introduction to the site.

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. In addition, a slice was removed from one end of an *ex situ* floorboard which was the correct width to fit between the joists examined, and which had already been cut arbitrarily previously.

The cores and slice 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 (1999a).

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).

Results

The roof structure was found to be made of softwood and was not further investigated, except for one moulded oak timber which had been re-used as a prop, which was sampled. The stair to the attic was made from a mixture of oak and softwood, but the timbers were rejected as it was felt that sampling would be too intrusive. The stair newel posts were of softwood. The other structures investigated were of oak (*Quercus* sp.) and were sampled, the location of the samples being shown in Figures 1 and 2, and described along with other basic details of the samples in Table 1. Samples 19, 20, and 31 are not located on these figures.

The two door jambs (BHB 01 and 02) matched each other so well that they were considered to be from the same tree, and were combined into a single sequence, BHB0102m for subsequent analysis. The *t*-value was only 8.8, but graphically the match was very strong. Both showed a very abrupt decline in growth which persisted for several years, consistent with the tree having been managed in some way during its lifetime. Although the three samples BHB 09, 12, and 13 had higher *t*-values when matched against each other, and BHB22 matched well with several timbers, there was no additional suggestion that they were from the same tree, and each was treated separately (Table 2). Samples BHB29 and BHB30 matched each other ($t = 4.9$ with 61 years overlap). These were combined into a single 96-year series BHB2930m, but this showed several abrupt growth changes and did not date.

A total of seven timbers matched each other (Table 2) and were combined into a single site chronology, BROMLEY2 – to distinguish it from the chronology produced in Bridge (2002) - (Fig 3), which was dated against a range of reference chronologies (Table 3). The data for the site chronology are presented in Table 4. Some other timbers showed similar growth patterns and looked as if they should have matched the dated timbers, but their sequences could not be satisfactorily resolved, even after careful reassessment of the samples, and they remain undated.

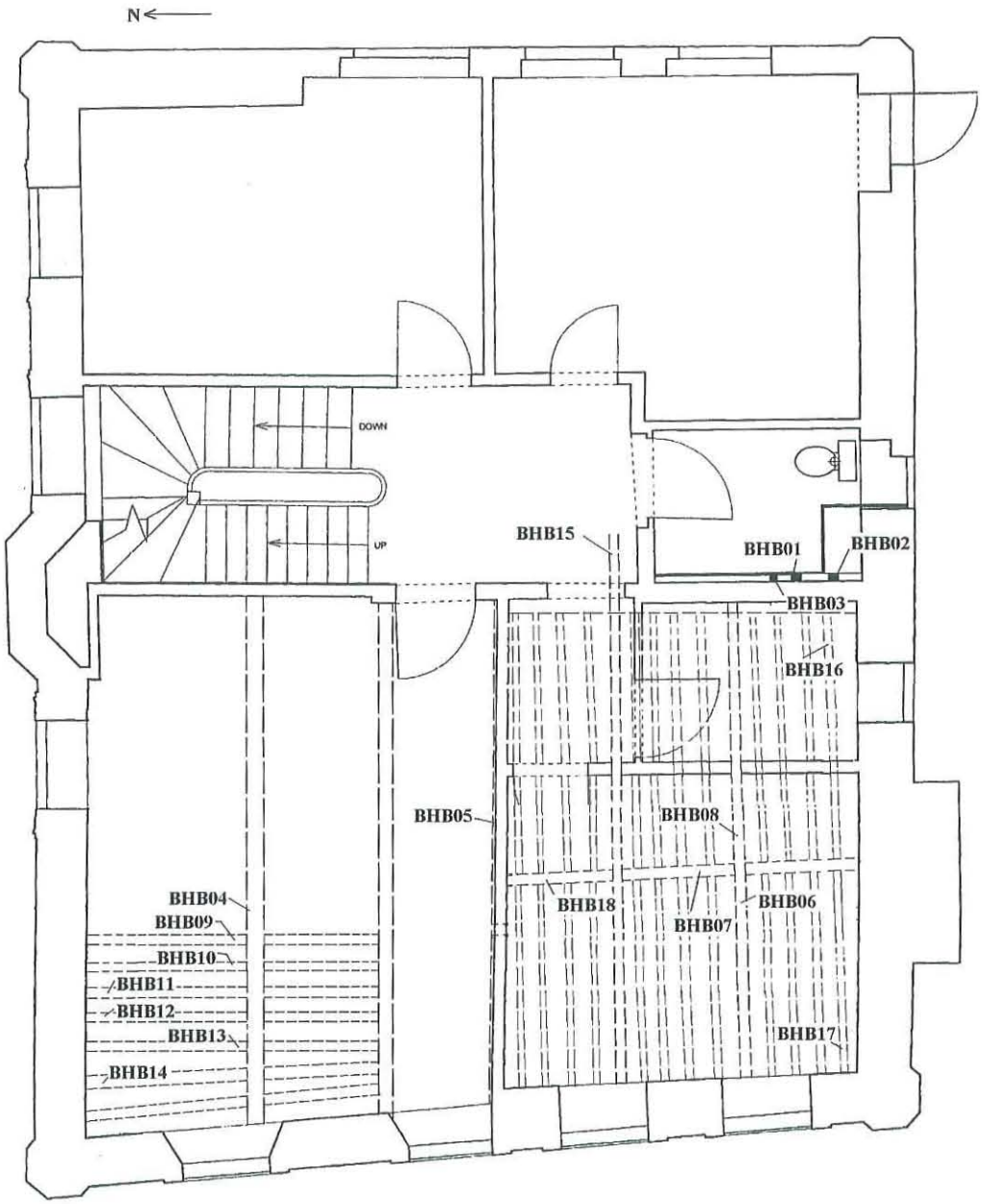

Figure 1: First-floor plan of Bromley Hall with underlying floor beams and joists added (not to scale and only approximate) showing the timbers sampled for dendrochronology

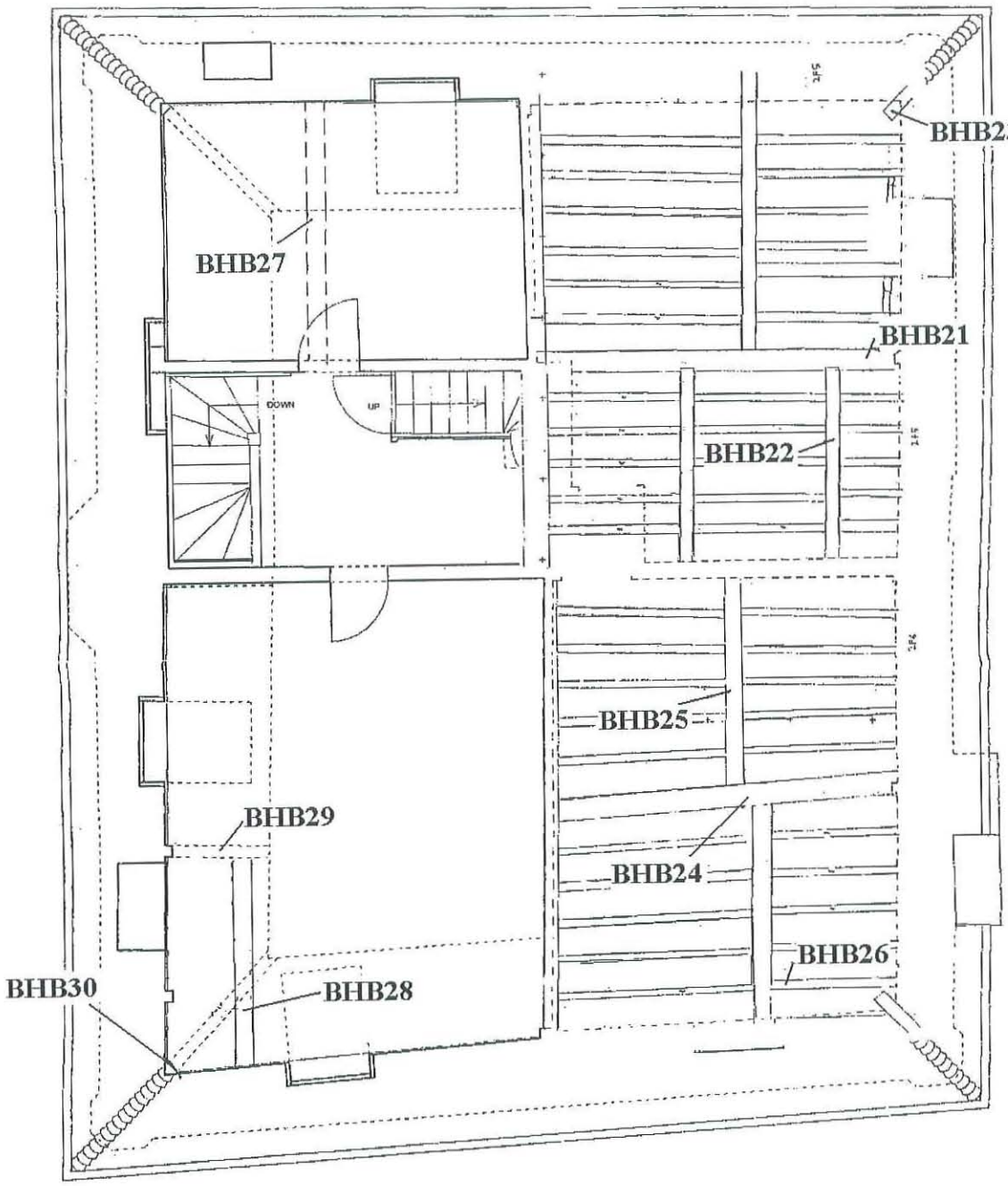

Figure 2: Second-floor plan of Bromley Hall with floor beams and joists, showing the timbers sampled for dendrochronology

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

Sample number	Origin of core/slice	Total no of years	Average growth rate (mm yr^{-1})	Sapwood details	Date of sequence AD	Felling date of timber AD
First Floor						
BHB01	North door jamb, room 3	69	2.89	-	undated	unknown
BHB02	South door jamb, room 3	57	2.87	-	undated	unknown
BHB03	Stud in west wall, room 3	<30	not measured	-	undated	unknown
BHB04	Main floor beam, room 1	108	1.64	-	undated	unknown
BHB05	Floor joist	61	1.30	-	undated	unknown
BHB06	South beam, room 2	108	1.38	-	undated	unknown
BHB07	West-east beam, room 2	73	1.95	-	undated	unknown
BHB08	North beam, room 2	<30	not measured	-	undated	unknown
BHB09	Joist 1, room 1	95	1.81	h/s	1360 - 1454	1463 - 95
BHB10	Joist 2, room 1	67	1.32	h/s?	undated	unknown
BHB11	Joist 3, room 1	31	not measured	-	undated	unknown
BHB12	Joist 4, room 1	87	1.78	1	1388 - 1474	1482 – 1514
BHB13	Joist 5, room 1	103	1.63	-	1368 - 1470	after 1479
BHB14	Joist 6, room 1	14	not measured	-	undated	unknown
BHB15	East beam, hallway	113	1.19	h/s	1344 - 1456	1465 - 97
BHB16	Joist 2, room 2	34	not measured	h/s	undated	unknown
BHB17	Joist 1, room 2	21	not measured	1	undated	unknown
BHB18	North beam, room 2	80	1.33	-	1370 - 1449	after 1458
BHB19	*ex situ* floorboard	62	2.90	-	undated	unknown

Table 1: continued

Sample number	Origin of core/slice	Total no of years	Average growth rate (mm yr^{-1})	Sapwood details	Date of sequence AD	Felling date of timber AD
First Floor						
BHB20	Re-used moulded timber in roof	90	1.03	-	undated	unknown
Second Floor						
BHB21	Beam in south east room	49	1.22	?h/s	undated	unknown
BHB22	Moulded secondary beam	94	1.50	h/s	1377 - 1470	1479 - 1511
BHB23	South east dragon beam	52	2.04	-	undated	unknown
BHB24	Beam in south west room	<40	not measured	-	undated	unknown
BHB25	Beam in south west room	83	2.74	h/s	1382 - 1464	1473 - 1505
BHB26	Moulded joist	48	2.32	-	undated	unknown
BHB27	Beam in north east room	<40	not measured	-	undated	unknown
BHB28	Beam in north west room	<40	not measured	-	undated	unknown
BHB29	Beam in north west room	83	0.90	h/s	undated	unknown
BHB30	North west dragon beam	74	1.50	4	undated	unknown
First Floor						
BHB31	Partition wall support beam	<40	not measured	-	undated	unknown

Table 2: Crossdating between the dated timbers from Bromley Hall

	t-value					
Sample no	**BHB12**	**BHB13**	**BHB15**	**BHB18**	**BHB22**	**BHB25**
BHB09	9.3	16.1	4.9	6.3	10.4	4.6
BHB12		11.6	4.8	5.6	11.4	4.6
BHB13			4.8	6.8	16.6	4.8
BHB15				4.5	5.0	-
BHB18					7.0	3.4
BHB22						4.8

Table 3: Dating of the oak site chronology BROMLEY2

	BROMLEY2 AD 1344 - 1474	
Dated reference or site master chronology	*t*-value	Overlap (yrs)
Hants02 (Miles pers comm)	6.1	131
Kent (Laxton and Litton 1989)	6.0	131
London1175 (Tyers pers comm)	4.8	131
North Waltham, Hampshire (Miles pers comm)	6.1	86
Overton3, Hampshire (Miles and Worthington 1997)	5.3	78
Baylins, Buckinghamshire (Miles pers comm)	4.9	123
Widdington, Essex (Tyers 2001)	4.9	104
Catesby, Northants (Bridge 2000a)	4.9	123
Thaxted2, Essex (Tyers 1990)	4.7	130
Chicksands, Bedfordshire (Howard *et al* 1998)	4.7	131
Barton Stacey, Hampshire (Miles pers comm)	4.7	94
Stanford, Northamptonshire (Howard *et al* 1996)	4.6	126
Ford, West Sussex (Bridge 2000b)	4.5	131

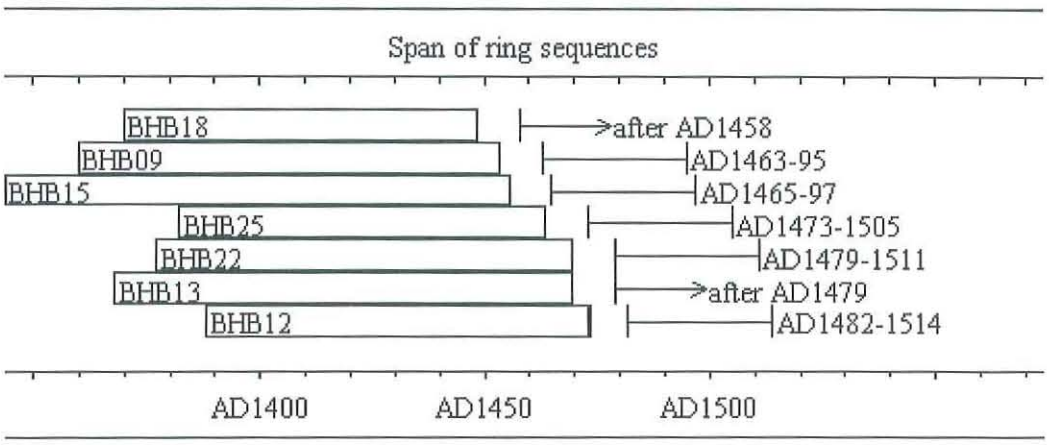

Figure 3: Bar diagram showing the relative positions of overlap of the dated samples from Bromley Hall, with their interpreted felling date ranges

Interpretation

The seven dated timbers appear to come from a single batch, and give a likely felling period of AD 1482–95. This makes the floors, and therefore the primary phase of construction of what remains today, more likely to be late-fifteenth century, than early sixteenth. The addition of two samples to the chronology BROMLEY (Bridge 2002) strengthens the matches found against the database. The BROMLEY2 chronology gives good matches with sites over a wide geographical area, and it is not possible to suggest the likely origin of the timbers beyond saying that they are likely to have come from southern England.

Sample BHB22, a moulded beam thought to be in a secondary position within the floor, was found to be from the primary phase timbers.

The roof construction, known to be of later date, could not be dated on this occasion as it was constructed from softwood. It remains as a part of the building that may be dated at some later stage in the development of dating softwood structures in this country. The stairs to the attic were a mixture of oak boards and softwood, and should these ever be removed in the future, the oak boards look suitable for further investigation.

Acknowledgements

I would like to thank Andy Wittrick (English Heritage) for his help and useful on-site discussion. This work was commissioned by English Heritage, and I would like to thank Alex Bayliss and Peter Marshall for their work in support of my activities. On-site assistance was given by Andrew Westman and Nick Holder, who kindly made their survey drawings available for this report. I would also like to thank Cathy Groves (University of Sheffield) for her valuable comments on the data during the initial draft of this report.

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Table 4: Ring width data for the site chronology BROMLEY2 AD 1344 - 1474

ring widths (0.01mm)										no. of trees									
170	194	193	202	209	186	163	155	152	190	1	1	1	1	1	1	1	1	1	1
179	200	145	134	133	238	233	152	200	176	1	1	1	1	1	1	2	2	2	2
197	176	131	121	149	142	140	148	129	111	2	2	2	2	3	3	4	4	4	4
82	103	130	146	149	139	147	161	203	186	4	4	4	5	5	5	5	5	6	6
193	195	263	254	240	173	140	163	137	103	6	6	6	6	7	7	7	7	7	7
105	93	153	164	189	169	177	114	68	114	7	7	7	7	7	7	7	7	7	7
192	226	230	197	176	181	171	187	180	129	7	7	7	7	7	7	7	7	7	7
112	80	96	141	186	151	173	177	148	174	7	7	7	7	7	7	7	7	7	7
174	131	102	130	158	222	227	194	212	157	7	7	7	7	7	7	7	7	7	7
136	145	136	135	142	146	214	188	208	205	7	7	7	7	7	7	7	7	7	7
211	172	165	177	148	168	160	177	159	166	7	7	7	7	7	7	6	6	6	6
205	189	198	218	209	191	186	224	200	234	6	5	5	4	4	4	4	4	4	4
158	174	275	207	222	195	216	299	277	324	4	3	3	3	3	3	3	1	1	1
254										1									

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Author(s)	**DR MARTIN BRIDGE**
Keyword(s)	**DENDROCHRONOLOGY** **STANDING BUILDING**
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No of figures	**3**
No of tables	**3**
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Date received by IMC	6/8/03
Report no issued	72/2003
Information entered on database	Yes/No*
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