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Scientific Dating

158 Watling Street East Towcester Northamptonshire

Tree-ring Dating of Oak Timbers

Martin Bridge and Cathy Tyers

Discovery, Innovation and Science in the Historic Environment

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SUMMARY
Eight timbers from the roofs and floors of the L-shaped building on the front (west) of this property were sampled. All were found to form a coherent group felled within the period of spring AD 1805 to winter AD1805/06, making construction most likely in AD 1806, or within a few years thereafter. This is later than the expected date, the building previously being thought to date to the early eighteenth century.

CONTRIBUTORS
Martin Bridge and Cathy Tyers

ACKNOWLEDGEMENTS
We are grateful to Brian Giggins, Chair of the Historic Towcester Survey, for coordinating this work and supplying drawings and background information, and to Rebecca Lane the local projects coordinator for Historic England (South West Region, Architectural Investigation). The owner kindly allowed the sampling to take place and thanks to. Shahina Farid (Historic England Scientific Dating Team) who commissioned the work.

ARCHIVE LOCATION
The Historic England Archive
The Engine House
Fire Fly Avenue
Swindon SN2 2EH

HISTORIC ENVIRONMENT RECORD
Northamptonshire Historic Environment Record
Northamptonshire Record Office
Wootton Hall Park
Mereway
Northampton NN4 8BQ

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2021

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INTRODUCTION

The Early Fabric in Historic Towns: Voluntary Group Projects, funded by Historic England, have been developed in the recognition and acknowledgement of the excellent work being undertaken by local vernacular groups in the study of local architectural trends and fabrics. The intention of these projects is to encourage this type of study through the provision of support and facilitate training of more people in building analysis and recording. The local projects are coordinated by Rebecca Lane (Historic England South West Region: Senior Architectural Investigator).

Early Fabric in Towcester Project

Whilst there have been many local investigations of historic buildings in the town over a number of years, no systematic research had been undertaken before this project, coordinated by Brian Giggins.

The project examines vernacular historic buildings in Towcester, aiming to improve understanding of the morphology and development of the historic town plan and to understand this within the framework of economic and social change. It aims to identify early plan forms and to understand the dates of the introduction of vernacular architectural details (eg in materials, carpentry, fenestration, and decorative features), thus mapping the survival of early (pre-AD 1750) fabric and revealing the architectural evolution of the town's buildings.

Initially, properties were identified that were thought to be key to understanding the town's architectural development for a programme of comprehensive investigation. These properties were assessed for their suitability for dendrochronology and those that contained oak timber considered suitable for analysis were sampled and analysed.

158 Watling Street East (The Old Wheatsheaf)

Situated on the main road through the town (Watling Street, Fig 1), this property represents the northern half of an old inn, from which the southern part has been demolished. It is listed at Grade II (Listed Entry Number 1190039 here). The site is known to have been split in the AD 1850s, the extant northern part retaining the entrance archway. Records of the Wheatsheaf go back to at least AD 1713 (Giggins pers comm). The current building has an L-shaped roof structure, with two trusses set at right angles to each other, each comprising a tiebeam, two principal rafters joining at the ridge, with a collar bracing the upper row of purlins. Both rows of purlins abut the principals and are pegged to slip-tenons, which pass through the principals.

METHODOLOGY

An initial assessment of the timbers for dendrochronological potential sought accessible oak timbers with more than 50 rings and where possible traces of sapwood, although slightly shorter sequences are sometimes sampled if little other material is available. Those timbers judged to be potentially useful were cored in

August 2021 using a 16mm auger attached to an electric drill. The cores were labelled, and stored for subsequent analysis.

The cores were polished on a belt sander using 80 to 400 grit abrasive paper to allow the ring boundaries to be clearly distinguished. The samples had their tree-ring sequences measured to an accuracy of 0.01mm, using a specially constructed system utilising a binocular microscope with the sample mounted on a travelling stage with a linear transducer linked to a PC, which recorded the ring widths into a dataset. The software used in measuring and subsequent analysis was written by Ian Tyers (2004). Cross-matching was attempted by a process of qualified statistical comparison by computer, supported by visual checks. The ring-width series were compared for statistical cross-matching, using a variant of the Belfast CROS program (Baillie and Pilcher 1973). Ring sequences were plotted on the computer monitor to allow visual comparisons to be made between sequences. This method provides a measure of quality control in identifying any potential errors in the measurements when the samples cross-match.

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

Ascribing felling dates and date ranges

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

A review of the geographical distribution of dated sapwood data from historic timbers has shown that a sapwood estimate relevant to the region of origin should be used in interpretation, which in this area is 12–45 rings (Miles 1997). It must be

emphasised that dendrochronology can only date when a tree has been felled, not when the timber was used to construct the structure or object under study.

RESULTS AND DISCUSSION

An outbuilding at the east end of the property was assessed, but it was found to contain elm timbers (*Ulmus* spp) with clear band-saw marks, making them likely to be much later than was of interest for this study, and no sampling was carried out in this building.

Details of the oak (*Quercus* spp) timbers sampled in the main L-shaped building at the west end of the property are given in Table 1 and illustrated in Figure 2. It was noted that the joists on the ceiling/floor beam in the eastern part of the building (Fig 3) and tiebeam and cellar beam (Fig 4) in the western part of the building were all housed in semi-dovetail housings, suggesting they were all of similar age.

One core (tows06) fractured, with the near complete sapwood (14 rings) being retained on the outer part (tows06ii), but although the inner rings (tows06i) were successfully cross-matched with other samples, these outer rings were not satisfactorily matched with the rest of the group. Nevertheless, few rings were lost between the two parts of the core, and the outside was thought to be very close to the bark edge. A narrow felling date range of five years has been applied to this sample. The inner rings of sample tows02 were distorted and were not therefore measured. The ring-width data of all measured samples is given in the Appendix. Ring series from all eight timbers sampled cross-matched (Fig 5; Table 2) and it can be seen that very strong matches were found between two pairs of series, tows04 and tows01, and tows05 and tows03, each pair being thought to represent a single parent tree. Two new series, tows41m and tows53m were made and used in subsequent analysis. The six tree ring series, representing all eight timbers, were combined into a 104-year long site sequence (TOWSt6) which was subsequently dated to the period AD 1702–1805 (Table 3).

Whereas samples tows01 (and by implication tows04) and tows02 were found to have come from trees felled very early in the spring of AD 1805, the tree represented by samples tows05 and tows03 was felled in the following winter, AD 1805/06. Construction of this building is therefore likely to have taken place in AD 1806, or within a few years of this date, using local timbers. This date was surprising, as there are documentary records referring to the Wheatsheaf existing at least as far back as AD 1713 (Giggins pers comm), so this may represent a previously unrecognised major rebuilding at the site.

The AD 1805–1806 period saw the tenancy of the Inn change from William Inns to William Amos. Between 1803 and 1806 the land tax for the inn appears to have doubled, which would fit in well with what must have been a substantial rebuilding (Giggins pers comm). The owner, the Earl of Pomfret, may have paid for the rebuilding as he considered that there would be an increase in trade using the Holyhead Road. It is also possible that the period saw an increase in the pig trade as it was one of two inns serving the Towcester Pig market, and the Ordnance Survey map of AD 1800 shows numerous pigsties in its large rear yard. Demand from

London, the fleet, and the army for pork, may have been considerations. On the other hand, it is difficult to say how much the inn was involved with the coach trade but it may have been this rather than pork which was the reason for the rebuilding. No documentation for a fire has been found at the inn. An advert from the Northampton Mercury dated to the 6th June AD 1807 advertises the sale of 60 oak timber trees at the Wheat Sheaf, that were still standing in Burcote Wood, also owned by the Earl of Pomfret, which is in the parish about two miles south of the Wheat Sheaf. Within two decades, the whole wood of several hundred acres had been felled and the land converted into a farm (Giggins pers comm). It is possible that this may well have been the source for the oaks used in the rebuild.

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TABLES

Table 1: Details of the tree-ring samples taken from 158 Watling Street East, Towcester, Northamptonshire

Sample No	Location	Number of rings	Date of sequence (AD)	Sapwood	Mean ring width (mm)	Mean sensitivity	Felling date range (AD)
tows01	Tie beam in rear (east) first-floor room	84	1721–1804	32¼C	1.48	0.20	spring 1805
tows02	Ceiling beam in rear (east) ground-floor room	11NM +103	1702–1804	16¼C	1.48	0.20	spring 1805
tows03	West lower purlin, south bay of west roof	93	1713–1805	38C	1.56	0.28	winter 1806/06
tows04	Tie beam in front (west) first-floor room	76	1715–90	13	1.87	0.20	1790–1822
tows05	West lower purlin, north bay of west roof	89	1717–1805	38C	1.64	0.30	winter 1806/06
tows06i	Ceiling beam in front (west) ground-floor room	68	1710–77	-	2.29	0.19	
tows06ii	As above, outer rings	24	-	14	1.87	0.17	1804–09
tows07	South principal rafter, rear (east) roof	78	1712–89	17	1.72	0.22	1789–1817
tows08	*Ex situ* cellar beam	73	1716–88	h/s	2.71	0.19	1800–33

Key: h/s = heartwood/sapwood boundary; NM = not measured; ¼C = complete sapwood, felled the following spring; C = complete sapwood, felled the following winter

Table 2: Cross-matching between the sample ring series (values over t *= 3.5 are statistically significant)*

t-value (number of years overlap)							
Sample No	tows02	tows03	tows04	tows05	tows06i	tows07	tows08
tows01	4.9 (84)	3.3 (84)	11.2 (70)	3.2 (84)	2.6 (57)	1.4 (69)	3.3 (68)
tows02		3.1 (92)	7.6 (76)	4.5 (88)	5.0 (68)	3.6 (78)	5.0 (73)
tows03			2.4 (76)	13.7 (89)	4.5 (65)	4.3 (77)	5.1 (73)
tows04				2.5 (74)	4.2 (63)	1.2 (75)	3.5 (73)
tows05					4.1 (61)	6.5 (73)	5.4 (72)
tows06i						4.6 (66)	6.3 (62)
tows07							5.9 (73)

Table 3: Cross-matching for the site chronology TOWSt6 AD 1702–1805

Source region	Chronology	Publication reference	Filename	Span of chronology (AD)	Overlap (years)	*t*-value
Oxfordshire	Oriel College Tennis Court	Miles and Haddon-Reece 1994	ORIEL1	1534–1776	75	10.0
Oxfordshire	Manor Farm, St Anton St John	Miles and Worthington 1998	ssj51	1710–1800	91	9.3
Leicestershire	Church Farm, Bringhurst	Groves *et al* 2004	BRNGHST1	1664–1781	80	9.1
Hampshire	H.M.S. Victory	Barefoot 1975	VICTORY	1640–1800	99	9.1
Buckinghamshire	Mill Pond planks, Stowe	Miles *et al* 2003	STOWE5	1712–1891	94	9.1
Buckinghamshire	The Hovel, Ludgershall	Miles and Worthington 1999	THEHOVEL	1671–1811	104	8.9
Buckinghamshire	Corinthian arch, Stowe	Miles *et al* 2004	STOWE8	1653–1765	64	8.7
Hampshire	Granary, Old Basing	Bridge 1996	BASING	1691–1790	89	8.7
Hertfordshire	Cromer Windmill	Tyers 1998	CROMER2	1692–1831	104	8.4
Leicestershire	Kibworth Harcourt mill	Arnold *et al* 2004	KIBASQ01	1582–1773	72	8.3
Cambridgeshire	Great Gransden Windmill	Bridge 2015	GRANSDEN	1706–1836	100	8.3

FIGURES

Figure 1: Maps to show the location of 158 Watling Street East in Towcester, Northamptonshire, marked in red. Scale: top right 1:25000; bottom 1:1300. © Crown Copyright and database right 2022. All rights reserved. Ordnance Survey Licence number 100024900

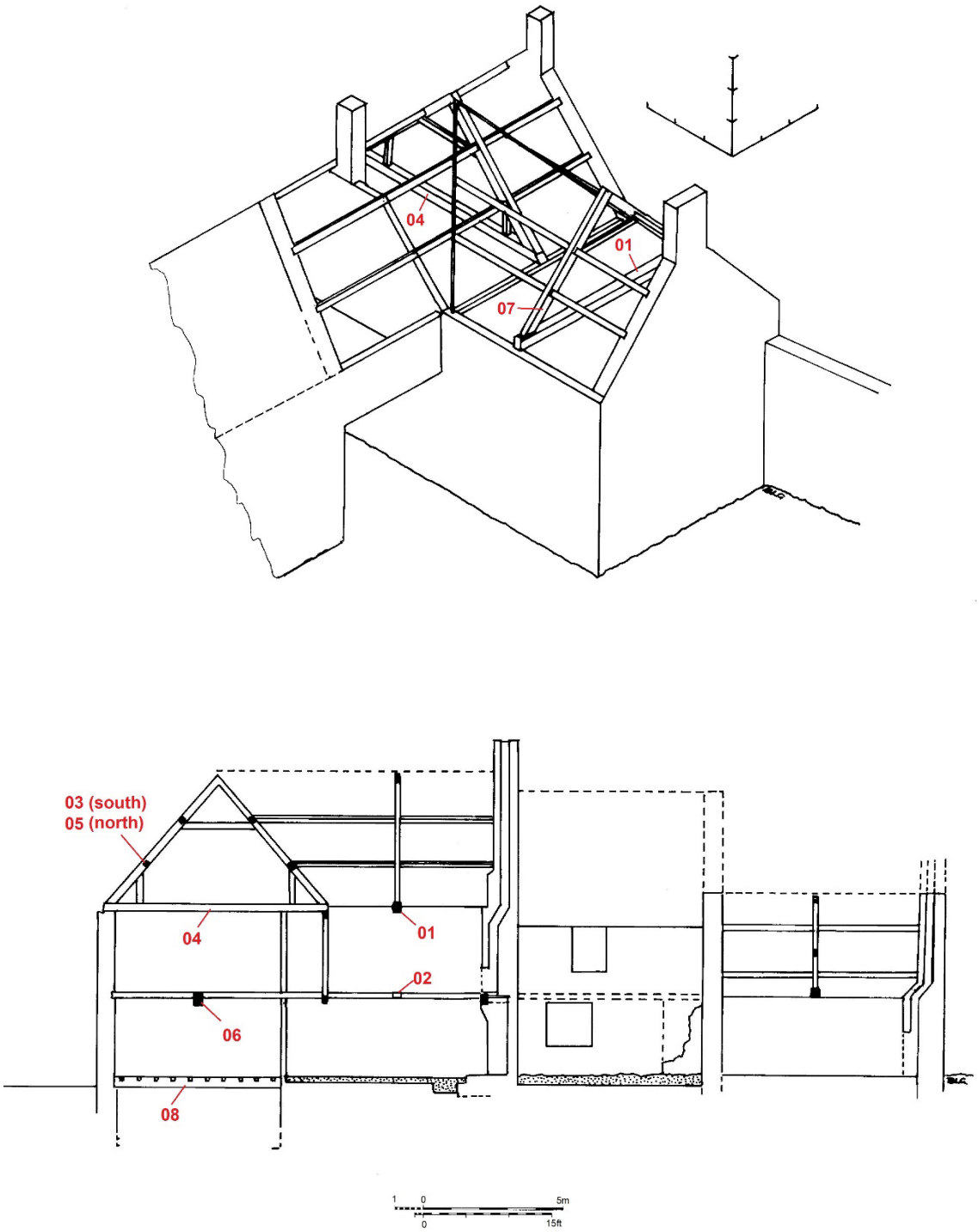

Figure 2: Isometric drawing (upper) and long section (lower) showing the positions of timbers sampled for dendrochronology, adapted from original drawings by Brian Giggins

Figure 3: View from above of the floor beam (tows02) showing the sample hole in the complete sapwood, and the half dovetail joint between the joist and the beam, found also in the tiebeams and the cellar beam (photograph Martin Bridge)

Figure 4: The ex situ *cellar beam, showing the half dovetail joist housings and sapwood on the top right corner of the beam (photograph Martin Bridge)*

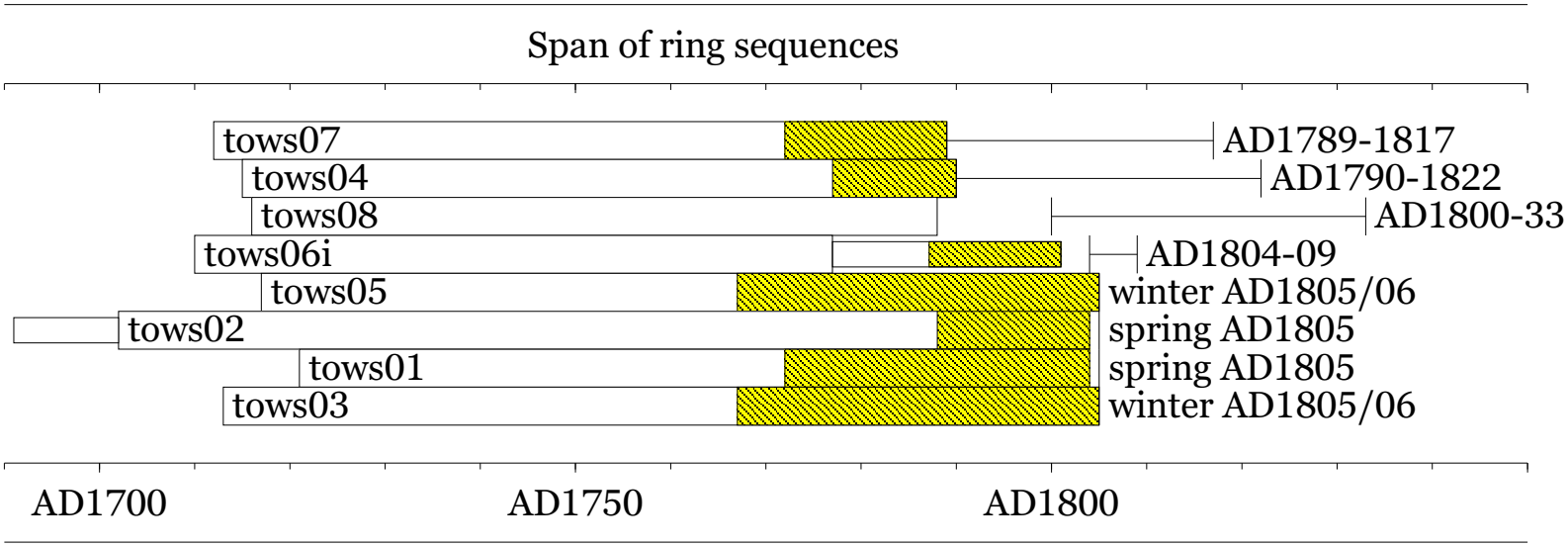

Figure 5: Bar diagram showing the relative positions of overlap of the dated samples, along with their individual interpreted felling date or felling date range. White bars represent heartwood rings; yellow hatched bars represent sapwood rings; narrow sections of bars represent additional unmeasured or undated rings

APPENDIX

Ring width values (0.01mm) for the sequences measured

tows01

264	241	223	297	196	163	212	183	183	207
170	203	280	219	172	173	170	185	192	143
131	99	197	173	130	102	137	145	105	125
141	191	161	175	151	209	195	219	258	213
173	133	201	205	145	124	100	144	167	99
113	119	161	156	163	160	162	122	104	101
85	114	167	131	77	70	71	94	152	111
93	97	56	48	80	122	113	111	93	88
68	62	55	68						

tows02

110	191	176	142	241	189	212	113	91	108
209	283	153	279	246	234	127	179	209	201
194	159	183	164	179	229	165	153	153	169
229	181	155	208	140	151	183	201	146	178
151	217	194	156	144	165	119	86	109	125
122	78	102	93	108	84	79	136	123	126
122	170	165	82	99	81	85	110	128	134
130	141	136	146	135	150	128	116	107	120
200	196	118	86	84	94	127	142	141	168
110	99	100	167	163	158	154	133	148	104
82	127	135							

tows03

242	131	99	107	181	199	147	239	216	178
121	242	149	231	166	162	151	146	67	157
146	184	155	118	108	144	181	103	77	89
126	174	445	430	393	274	188	243	326	309
280	338	244	254	292	227	322	183	152	111
162	189	106	126	160	206	123	83	75	94
134	191	162	189	101	95	74	97	92	191
175	125	87	81	118	87	112	88	89	67
52	46	74	43	90	73	80	75	69	52
64	56	71							

tows04

143	158	251	130	215	257	252	239	251	304
199	190	232	231	188	182	176	218	256	230
204	177	174	197	238	164	161	133	218	166
126	118	125	139	83	117	141	218	177	236
193	255	218	205	340	278	234	202	257	250
170	168	125	134	215	167	156	160	167	174
194	182	186	182	125	152	129	162	216	160
123	96	95	124	261	170				

tows05

282	247	175	263	268	273	147	305	205	316
289	249	171	168	85	239	174	303	397	268

216 325 311 138 110 101 182 173 428 391
337 260 214 243 277 231 166 243 152 145
132 144 244 122 83 93 138 200 125 120
166 222 122 90 111 82 121 193 187 171
88 96 75 75 63 95 128 96 59 64
122 95 140 91 83 68 44 37 70 37
58 82 91 86 69 55 49 48 59

tows06i
114 156 212 274 122 112 103 122 103 116
202 221 201 162 252 346 259 356 295 283
252 237 317 356 407 342 200 147 175 193
135 172 224 274 212 282 288 313 239 181
158 276 263 244 298 254 276 242 337 282
228 227 179 222 237 163 204 161 204 244
244 214 228 229 232 253 255 249

tows06ii
129 137 134 161 161 215 146 113 118 153
218 171 185 200 202 204 270 194 280 311
208 220 208 160

tows07
315 408 186 378 322 303 256 268 316 249
266 149 244 227 274 203 142 144 211 146
229 247 263 283 184 169 256 292 157 140
153 305 247 253 347 290 205 181 189 199
172 142 183 116 130 109 170 147 100 98
94 96 109 101 118 121 112 69 98 87
103 100 118 119 89 58 68 92 77 57
80 80 84 59 82 88 73 66

tows08
165 167 168 257 354 254 227 138 229 270
215 342 289 231 300 246 302 279 341 373
308 272 339 278 182 175 179 252 222 297
271 288 208 190 227 269 301 277 331 249
368 309 360 398 306 385 247 330 347 221
295 370 385 310 301 269 301 307 300 319
323 285 260 275 306 157 261 212 201 179
187 219 217

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