Overview of Data in the Compendium

The compendium presents information on bridges built before 1700 to carry roads, tracks and footpaths mainly across water flowing in rivers, streams, burns, becks and brooks, but also those crossing moats, whether wet or dry. The information sheets document my attempt to repeat the survey carried out by Jervoise, after an interval of c90 years. I originally confined myself to bridges surviving as masonry entities, but to take some account of the wholesale destruction of major medieval town bridges in the period from 1750 to 1850, I make mention of some of them in the preambles to the sets of information sheets, though they do not feature otherwise in the compendium. The sheets can stand alone, and I will say no more about them directly, save to point out that they are the sources of the data presented in the tabulations which are the subject of this discussion. I intend here to look at the national picture which can be built up by bringing together the data from the regions and nations of the British Isles. At the end of the overview, there is an Appendix dealing with Roman bridges which have left traces above ground.

Table 1. Numbers of Bridges built in each Century

COUNTRY/REGION	TOTALS PRE-1700	17th C*	16th C	15th C	14th C	PRE-1300	No. VISITED	DISCA-RDED**
Scotland	94	44	28	15	2	0	90	12
Northern England	221	101½	24	38	19	12	201	8
East Midlands & East England	135	31	32	30	26	10	117	9
West Midlands & English Marches	79	28½	17	17	9	2	72	11
Southern England	118	27	22	35	14	14	112	11
South-West England	173	73	30	42	11	5	161	10
Wales	86	47½	15	12	2	1	82	11
Totals	**906**	**352½**	**168**	**189**	**83**	**44**	**835**	**72**
Ireland	80	45	14	7	5	9	NA	NA

Notes:

* ≡ Bridges placed in the 17/18th C date-range are counted as ½ bridges in the 17th century columns

** ≡ Numbers of bridges considered in the desk-top assessment but discarded thereafter

In the above Table and those below, the numbers presented are the number of bridges in the particular category.

Some of the column headings in Tables 2 & 3 below may not be self-explanatory, i.e.

Ch. Arch Rings; each entry gives the number of bridges with chamfering of the outer voussoirs which form the arch shape, (illustrated in the nested documents containing the divisional tabulations)

Soffit Ribs/Ch.; each entry has 2 numbers, the first, the number of bridges with ribs on the underside of their arch(es), and the second, the number of bridges where these ribs are chamfered

Fabric; the numbers couples ashlar and coursed rubble masonry in the main body of the bridges excluding parapets and arch rings

Lintel; the number of bridges with rectangular apertures are, i.e. clapper bridges and developments of them

Table 2. Countrywide Variations in Bridge Features; 1500-1700 (Pre-Modern)

COUNTRY/REGION	Bridges Total	Span >7.5m	Width <2.2m	Gothic Arch	Ch. Arch Rings	Hood Moulds	Soffit Ribs/Ch.	Fabric A&CR	Lintel
Scotland	77	32	11	6	15	7	17/11	36	0
N. England	125½	61	61	9	10	18	6/2	79	10
E. Midlands & E. Eng.	63	4	15	6	11	3	11/4	35	2
W. Mids. & Eng. Marches	45½	2	14	3	2	1	4/1	29	4
S. Eng. & Thames Valley	49	0	9	10	8	0	5/0	26	1
S.W. England	103	6	34	17	2	14	0/0	29	8
Wales	62½	27	11	5	1	21	1/0	15	6
Totals	**525½**	**127**	**154**	**56**	**47**	**64**	**43/17**	**249**	**31**
Ireland	59	7	3	5	4	0	0/0	0	1

Table 3 Countrywide Variations in Bridge Features; Pre-1500 (Medieval)

COUNTRY/REGION	Bridges Total	Span >7.5m	Width <2.2m	Gothic Arch	Ch. Arch Rings	Hood Moulds	Soffit Ribs/Ch.	Fabric A&CR	Lintel
Scotland	17	10	6	7	7	3	2/1	7	1
N. England	69	34	8	34	35	2	46/33	56	1
E. Midlands & E. Eng.	66	9	16	40	39	6	28/22	42	0
W. Mids. & Eng. Marches	28	4	5	17	8	1	11/3	22	1
S. Eng. & Thames Valley	73	2	5	36	22	0	20/13	33	1
S.W. England	58	6	9	32	18	2	6/5	18	5
Wales	15	5	0	6	2	2	1/0	4	3
Totals	**326**	**66**	**50**	**171**	**129**	**16**	**113/76**	**182**	**12**
Ireland	21	0	1	11	2	0	0/0	0	1

Notes and Discussion

1. I begin with comments on the limitations of the data. The total number of British bridges selected as fitting my criteria, on the basis of desk exercises was 978; of them 907 have been assessed on the ground, mainly by myself, but I am grateful to friends who have done the field work on a few of them. In general, those unseen are biased towards smaller and more remote bridges, and especially the 55 moat bridges which are often in private property. These grand totals include 72 bridges which I have removed from my list, almost always after visiting the location, on such grounds as collapse, replacement, or clear evidence that the bridge in question was built

after 1700. So there remain 906 qualifying bridges, (525 pre-modern, built 1500-1700, and 326 medieval, built pre-1500; note that the numbers do not add because of the decision to count 17/18th century bridges as half-bridges). All but 71 (8%) of them have been visited, while I have viewed all but 13 (4%) of the medieval bridges. Data for the bridges which have not been visited comes from the desk exercise only, and this is sometimes reflected in the tabulations by indications of greater uncertainty.

2. The sum of the information in the documents is certainly the most comprehensive available anywhere. Nonetheless, for many of the bridges, the information is incomplete and of variable quality. As regards the build-date estimates; the ideal scenario is to be able to point to documentation for the construction, and enough further documentation between then and now to give confidence that a bridge has been maintained and modified, rather than replaced in the intervening period. Needless to say, that is not the normal situation. More often some kind of consensus as to age can be reached on the basis of snippets of documentary information, circumstantial evidence, and surveys of a bridge in question by experts, who have looked for characteristics favoured during a particular period. Especially for smaller bridges, not least those named packhorse bridges, information is often more limited, either from documents or the structure itself, and this is why the catch-all '17/18th century' appears quite frequently in the Tables. The age data is most meaningful taken in large chunks as here, without too much focus on data for individual bridges, but taken this way should allow patterns and trends to be expressed as functions of time and place.

Unfortunately, the other data presented is not flawless either. The quantitative information for bridges like arch spans and widths is often imprecise because measurements, especially of the former, are not always easy to make, certainly without the skills and equipment of a professional surveyor. It has been the exception rather than the rule for most who have described bridges in the past, to go much further than to specify the number of arches, and even Jervoise seemed to regard total bridge length rather than arch span as the key dimension, though bridge builders usually had to take the former as fixed by the configuration of a river and its margins. As regards width, the main problem is that so many bridges have been widened, and it is one thing to be able to see the effects in the soffits, and quite another to obtain an accurate estimate of an original dimension, taking account of perspective. It is probably a good time to stress that the values appearing here, are my best estimate for the bridge as built, rather than those of the present day or at any time in between. One feature does not appear because I did not from the pin it down with enough rigor namely pier breadth. Criteria should have been 'broad', unexceptional, 'slender', and, ' part of a pierced causeway'. Latterly, I developed guidelines based on the ratio of pier breadth to adjacent arch spans, so that broad is equivalent to a ratio greater than 0.35, unexceptional to the range 0.1 to 0.35, and slender to less than 0.1, but these criteria have not been applied to sufficient bridges..

3. The data in Table 1 can be compared with the only other nation-wide accounting of bridges by age that I have seen, in 3 maps presented by Cook in his book on Medieval Bridges. As might be hoped, his numbers and mine for England only, as regards the 13th century or before and the 14th century are close, namely 36 and c80 bridges compared with my numbers of 43 and 79. For some reason the agreement breaks down completely in the 15th century for which he records less than 70 bridges, so an actual decline in survivals, whereas my number is 162. I can offer no explanation for the yawning gap, not least because stone bridge building seems to follow a generally increasing trend through the centuries, notwithstanding events like plagues and civil wars, and survival to the present day should be more likely, the shorter the time between construction and now. In addition Leland's

itineraries dating from not long afterwards, which have fed through into my numbers, often by way of Jervoise, must presumably have influenced Cook, and might have been expected to improve agreement rather than the opposite.

4. There is no doubt that bridge building in Scotland and Wales lagged behind that in England. The 43 bridges with significant pre-1300 masonry in England, noted above, compare with none surviving from then in Scotland and one in Wales. The data from both the latter countries suggest that most features appeared at least a century later than in England, until the industrial age. Bridge design in the far south-west of England also lagged, though this was not the case perhaps surprisingly, for the north, probably because many of the oldest surviving masonry bridges are grouped in clusters, near to major medieval religious establishments like Waverley Abbey in the south-east, and Durham Cathedral Priory and Fountains Abbey in the north, rather than radiating outwards from a single prototype, in the south-east. It is not obvious why a few out of hundreds of abbeys scattered round the country singled themselves out in this way; obviously they were rich, but not uniquely so, and there were rivers to cross almost everywhere. Clearly, some abbots were more far-sighted than the majority given that good transport links were surely a boon to most monasteries, with their large and often far-flung agricultural interests. Where there is commonality between the North of England and the other outer regions of Great Britain is in the surge of survival numbers which must reflect to some degree a corresponding surge in building, during the 17th century.

5. Considering my data in the light of Harrison's work, I have nothing to contribute to his most daring thesis that there was an extensive national road network with many bridges as early as the Anglo-Saxon era. These bridges must have been mainly wooden so the fact that there are no traces above ground is not evidence for or against the conjecture. Another of his suggestions was that bridge building peaked in the 15th century, and that the rate of building slowed in the ensuing centuries before the Turnpike initiative and other major programmes in the 18th century. Although it needs always to be remembered that my data concerns survivals not builds, it still seems to conflict totally with that thesis, with numbers from the 16th century, more or less holding their own and then almost exploding upwards in the 17th century. However it can be seen from Table 1 that the numbers in the South of England follow something near to Harrison's pathway and those in Eastern England can be brought close to agreement by excluding the 22 moat bridges. The fact remains that the pattern is dramatically different in the remainder of the country.

6. Turning now to Tables 2 & 3, where caution must be applied to the accuracy of individual numbers, albeit that relationships and trends should be accurately reflected, the most remarkable feature is seen in the columns displaying the numbers of pre-modern bridges with arches spanning more than 7.5m. In Table 2, the data for all qualifying bridges shows that almost half the wide-span bridges are in the North of England, and that there are substantial numbers in Scotland and Wales, but comparatively few in the rest of England. This pattern has previously been the subject of general comments, though never, I think, made as explicit as here. Wholly satisfactory explanations are lacking, though it is fair to say that the large flow rates of the rivers of the north and west, and their propensities to flood almost compelled the development of designs with high and wide arches, which caused the least possible obstruction to flow. Obviously, the spans depend to an extent on the width of the river and any low- lying surrounds to be crossed, but otherwise it is a matter of choice for the bridge-builder. So it is surprising that wide-span designs were rarely adopted further south, given that they would have coped better with floods, even if of lesser magnitude, would have been cheaper to build, and would have eased water-

borne passage. Table 3 shows that the distribution of medieval bridges, i.e. those built before 1500, with large arch spans was not very different with more than half found in Northern England, with a healthy population in Scotland, and proportionately to the total number of bridges built then, in Wales also. The results in the two Tables also dispel any idea that spans increased systematically with the passage of time before 1700; location rather than age of a bridge is a far more relevant predictor of whether bridges are likely to have large spans.

7. I included the columns referring to narrow bridges to make two points. Firstly that the number of such bridges surviving from medieval times is relatively small and secondly that those remaining from the whole period up to 1700 are fairly uniformly spread across the country, apart from being noticeably scarce in the South of England. This may not conflict altogether with the common statements that packhorse bridges are found predominantly in the 'outer' more hilly regions of the country. My numbers include all footbridges, and it may be that the number built to serve local purposes, (access to churches and worksites) in more populous areas, balances the larger numbers built as part of long distance trading routes across northern and south-western hills.

8. The columns referring to the Gothic arch shape, chamfering of arch rings, and the insertion of ribs in the soffits (arch vaults) demonstrate that such features are indeed indicators of medieval origins, far more often than not. Looking at the figures for the whole country it is clear that the appearance of one of the three is suggestive rather than conclusive, while, the appearance of more than one of the features increases the likelihood of a pre-1500 build date. There are significant regional variations. In Scotland the features are found so frequently on 16th century bridges that they support the assertion that building of medieval-style bridges extended well into that period. In Wales, chamfered arch rings and soffit ribs are very rare, and Gothic arches seem as likely to be found on bridges built after 1500 as before. Of the three features, only Gothic arches are common in the two western regions of England.

9. The column for hood moulds shows firstly that they are mainly, though not exclusively, a post-medieval feature. Non-occurring in Southern England, as opposed to the South-West, they are especially linked to bridges in North Wales, but also are common in Northern England and Southern Scotland.

10. The columns in Tables 2 and 3, numbering the bridges with lintels, include both basic clapper bridges, and a few bridges in South West England and Wales which start from that form and build upon them, roads with parapets. They are absent from Southern England, and rare in Scotland.

11. In the column dealing with fabric, ashlar and coursed rubble are taken together because both require significant shaping of stone, and the distinction between them is sometimes a subjective judgement. In areas characterised by harder rocks, like Devon, Wales and Scotland, ashlar fabric was not an easy option, given the machining required. Nowadays, it is easy enough to bring in suitable stone from a distance, when local sources are lacking, but this only became feasible at the start of the canal age in the 18th century. Hence the well-documented building of wooden bridges in medieval times in South and East England, and early experimentation there with brick. It is also true that except in close proximity to thriving religious houses, small bridges were almost exclusively rubble-built, presumably because the creation of ashlar building blocks added significantly to the cost.

12. I have adopted a broad brush approach to considering the data I have collected. For reasons that will quickly become apparent it may be inadvisable to dig down to try to answer questions about the locations and characteristics of bridges, viewed individually or in smaller groups. It must always be remembered that we cannot look directly at the population of bridges which existed in any time period, but look always at a sample filtered by survival, in which many factors including chance have played a part.

13. Recent studies of old maps have suggested a way of estimating, albeit roughly, the likely survival rates of pre-1700 bridges. We know how many of the bridges marked on these maps are still coherent entities. I have now considered the whole of England, and Table 4 below, provides information on %age survival for each region of England.

Region/Country	No. of 16th C Bridges †	No. of Survivals	Survival Rate %age	Variation in County %ages	Survivals of non-Saxton Bridges
Northern England	245	55	22%	11% - 52%	35
Eastern England	244	44	17%	0% - 50%	40
West Midlands & Marches	135	21	16%	4% - 34%	16
South & South-East England	254	39	15%	0% - 36%	35
South-West England	194	35	18%	12% - 37%	70
England, Total	**1072**	**194**	**18%**		**196**
Wales	**107**	**11**	**10%**		**13**

† The numbers are of bridges shown on maps due to Christopher Saxton dated within the 1570s and 1580s, save in a few counties round London, where maps due to John Speed, and dated to 1610 provided additional information.

Notes:

a) The numbers in column 2, were obtained by studying maps on the British Library, Old Maps website. Although identification of bridges was sometimes made difficult by smudges and folds on the ancient maps, these numbers are thought to be fairly robust. The numbers are large, with 1072 pre-1600 bridges identified on Saxton (and Speed) maps in England, and 107 in Wales; more certainly than I had expected.

b) There is more uncertainty about the numbers in column 3 (and thus column 4), which were obtained by matching the 'Saxton bridges' against the locations of those already identified in the compendium, with the aid of documentation and appearance age markers, as pre-1600 bridges. Problems arose mainly because of name changes in the intervening period, and from imperfections in the scaling of the Saxton maps; the difficulties seem greatest in South-West England. However the numbers per region, and thus the survival rates per region, show consistency, so the key number of 18% survival for pre-1600 bridges in England

should be fairly robust. I make the point again, that what we can look at now as regards surviving bridges is a large sample of what was built, probably with systematic biases, and no more than that.

c) The numbers for each region were built up from numbers in the counties making up the regions, which are presented in the Tabulations. Column 5 shows the range of survival rate values for those counties, and the large differences make the point that county comparisons are unlikely to be helpful. That is not of course to deny that more detailed local analyses than could be attempted here, would almost certainly yield dividends as regards explanations.

d) Column 6 shows the number of bridges in each region, identified as pre-1600, and included as such in the compendium, but **not** marked by Saxton. His failure to note them could have many causes, smaller scale, situation on smaller streams, distance from important routes, or indeed because they did not actually exist when he did his surveys, albeit that they might have done before and after. The fact that the numbers in column 6, are quite close to the Saxton survivals in column 3, suggests the speculation, that if in general survival rates were much the same for both categories, there might have been close to 2000 pre-1600 bridges in England, and 200 in Wales. Of course many were no doubt of wood rather than of stone, and so almost guaranteed not to survive to the present day.

e) It may be that this kind of analysis, impossible for me without the freely available digitised maps on the British Library website, has been done before, but if so, I have seen no evidence. It has its faults and inaccuracies, but in my view gives a firmer basis for those who wish to consider this part of the built environment in the 16th century. Unfortunately a comparable analysis is not possible for Scotland, though some results are presented in the Scottish Tabulations

14. For comments about the population of Irish bridges, see the addendum out-with the compendium.

Appendix

Lastly, I will deal briefly with the topic of Roman bridges. Many old bridges throughout the country are given that name, but the only true Roman bridge remains which I have encountered are in Northern England, though such bridges would have been common, throughout the occupied regions. The standard model seems to have employed stone abutments and piers on which wooden platforms were laid, but as in the rest of their empire they built stone arched bridges as well. The hybrid stone/wood bridges were probably in use long after the Romans left Britain in the 5th century, being easy to repair and maintain, and the earliest bridges built by the Anglo-Saxons were almost certainly to this pattern. There is no reason to doubt that they continued to be built and used, especially in the South of England, throughout the medieval period. However the future lay with the arched bridges which fill this document, and it is the few Roman bridges which have left traces that I deal with here.

(i) Chesters Roman Bridge in two manifestations spanned the River North Tyne just downstream of Chollerford and where Hadrian's Wall reached Chesters Fort on the right bank of the river. In its earliest form, the bridge was probably built in 122 AD and comprised a set of

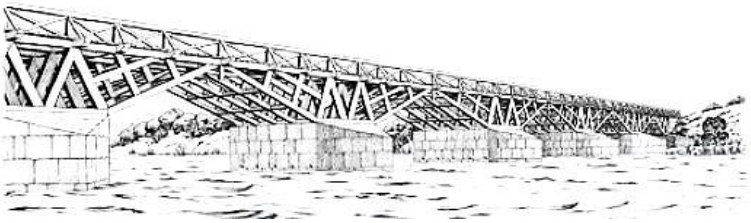
arches thought to span 4m each, 9 in all, which carried Hadrian's Wall over the river. When the Romans pulled back from Scotland, the second bridge, a much more substantial affair was built in 160 AD. It had 4 semi-circular arches, which must have spanned nearly 10m each, and carried a roadway 6m wide with stone parapets. The bridge is thought to have survived the Roman departure around 400 AD, eventually being dismantled in the 7th century when much of the stone found its way into the buildings of Hexham Priory. The visible remains shown below are somewhat disordered but comprise the foundations of the guard house and abutments on the east bank of the river, which can be accessed from a path leading from Chollerford. Excavations on the other bank have apparently shown the presence of corresponding structures there, and remains of the piers of the second bridge survive on the river-bed.

(ii) **Corbridge Roman Bridge** was located a few hundred metres upstream from the standing 17th century bridge, and carried Dere Street into the Roman fort at

Corbridge, and northwards. It may have been the largest Roman Bridge built in Britain. It was 138½m long and had as many as 11 stone arches supporting a road 9m above the river. The road was 6m wide and the piers were 4½m in breadth, the channels between them were 6½m wide. Dere St approached the bridge by way of a long gradual ramp. It should be emphasised that it was a large bridge even by today's standards, wider and comparable in height to its 17th century successor. It

was built in 160AD, and almost certainly had a wooden predecessor. There are apparently many blocks on the river bed which survive from the stone bridge, and in 2004, blocks, which had formed part of the wall of the aforementioned ramp, were dug out from the south bank and piled up as a wall, though the result is not meaningful.

(iii) **Piercebridge Roman Bridge** remains are in a field, two hundred metres east of the present bridge over the River Tees in Piercebridge, about 6 miles west of Darlington. They lie east of the line of Dere Street, and archaeologists think that they were part of the second Roman Bridge, to cross the river here. The site is quite confusing, because the river has shifted north, so that the view looking south below is of the remains of a ramp leading onto the bridge, and of piles of large blocks which are remnants of southern piers. The north abutments are not visible. The excavated remains now sit below the surrounding land because of the build-up in levels over nearly 2000 years. An unusual feature, is the paving of the river bed around the piers, presumably to smooth the flow and reduce erosion. It is thought that the upper structure was made of wood, as in the reconstruction. It has been suggested that the bridge survived in use until the 16th century, after the present bridge was built, but that seems incompatible with the depth to which the remains were buried



(iv) **Willowford Bridge** carried Hadrian's Wall with its walkway, and later a broader roadway across the River Irthing, a major tributary of the River Eden. It is just to the west of the village of Gilling, and accessed by way of a sign-posted farm road. The first bridge was built shortly after 120 AD, and it was variously altered until the early 3rd century, when most of it seems to have been washed away by a flood, to be replaced by a wooden structure of which there is no trace. Stone was then scavenged for the fort at Birdoswald, and it has suffered other depredations in the centuries since. In the aerial photograph, the wall runs from the bottom left hand corner of the frame to a

square turret right in the centre. Further along the wall, are the remains of an abutment, and after a short gap, the first pier; the river has long since shifted to the west, out of shot to the right. In the photograph, alongside, the remains of the pier are in the foreground, then the abutment, with the wall and two turrets behind.