

Piped water supplies managed by civic bodies in medieval English towns

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ABSTRACT: When John Leland toured England in the 1540s, he observed water conduits in several towns, including a number of smaller urban centres. Subsequent historians and archaeologists, however, have seriously understated the number and importance of piped water systems in English towns. This article uses studies of individual towns, together with civic records and Leland's *Itinerary*, to examine the sources and technologies of urban water supplies, the origins of civic piped water systems, their relationships to other local systems, finance, management and oversight. It will argue that the growth in piped supplies by civic bodies in the later Middle Ages reflects the importance of charitable provision and the efforts of civic authorities to establish, maintain and regulate them. An appendix lists medieval English towns known to have provided public access to piped water supplies by c. 1550.

When John Leland toured England from around 1539 to 1545, compiling notes for a series of works which he unfortunately never produced, he observed piped water supplies in several towns.¹ While Leland's comments were usually brief, including remarks on the siting and appearance of water conduits, and occasionally how they had been funded, for several towns he provides the earliest known descriptions of these systems. Leland described conduits in Bath, Bristol, Coventry, Gloucester, Lincoln, Newcastle, Stamford and Southampton, but also in the smaller urban centres of Dartmouth, Frome, Lichfield, Liskeard, Ludlow, Petworth, Richmond, Totnes and Wells.² These small towns, with fewer than 2,000 inhabitants, are often considered by historians to have barely attained urban status, yet they possessed sophisticated piped water systems like the larger centres of London, Bristol, and Exeter.

¹ An earlier version of this article was presented at Sowing the Seeds and the Centre for Economic History, University of Reading: an early career workshop on medieval urban community and public space in March 2012. My thanks to James Davis, Catherine Casson and Christian Liddy and to the anonymous referees for their comments.

² L. Toulmin Smith (ed.), *The Itinerary of John Leland in or about the Years 1535–1543*, 5 vols. (London, 1964) (hereafter *Itinerary*). See the appendix to this article for these references.

The urban conduits which caught Leland's eye appear to have escaped the attention of many subsequent historians and archaeologists. According to one recent survey, 'very few medieval English towns could boast an engineered water supply', and the reason for this was not a lack of technical expertise or funding, but indifference: 'few town authorities saw any reason to invest in new public systems'.³ Nonetheless, a handful of recent academic studies have started to explore aspects of water management in medieval England, including the development of water supplies, particularly by monastic houses.⁴

Water management schemes reflect prevailing levels of technology, social and economic factors and institutional relationships: they 'supply excellent vantage points from which to observe and understand people as they interact with each other and their environments'.⁵ Medieval urban communities managed water as a source of power, notably for milling grain and fulling cloth, in manufacturing and food-processing industries, especially brewing, cloth and leather making, as a means of transport, as a source for fishing, as a means of waste disposal and for drainage and defensive purposes, in addition to requiring water for domestic consumption. These varying, and at times conflicting, purposes inevitably drew tensions which urban communities had to manage. These pressures are exemplified in the late fourteenth-century ordinances made at York to instruct butchers not to throw refuse or offal into the river where water was drawn for brewing or baking, and in the efforts of the city's corporation to keep major regional waterways clear from obstructions such as fishgarths.⁶ In the provision of piped water supplies, urban authorities had to consider the purity, reliability and volume of supply, as well as striking a balance between the needs of domestic and industrial consumers, the latter seeking larger quantities of water. This article assesses the significance of the piped supplies managed by civic bodies. Using

³ R. Holt, 'Medieval England's water-related technologies', in P. Squatriti (ed.), *Working with Water in Medieval Europe. Technology and Resource-use* (Leiden, 2000), 97–8.

⁴ D. Keene, 'Issues of water in medieval London to c. 1300', *Urban History*, 28 (2001), 161–79; R.J. Magnusson, *Water Technology in the Middle Ages: Cities, Monasteries and Waterworks after the Roman Empire* (Baltimore, 2001); C.J. Bond, 'Water management in the rural monastery', in R. Gilchrist and H. Mytum (eds.), *The Archaeology of Rural Monasteries* (British Archaeological Reports British Series, 203, Oxford, 1989), 83–111; C.J. Bond, 'Water management in the urban monastery', in R. Gilchrist and H. Mytum (eds.), *Advances in Monastic Archaeology* (British Archaeological Reports, British Series, 227, Oxford, 1993), 43–78; J. Bond, 'Monastic water management in Great Britain: a review', in G. Keevil, M. Aston and T. Hall (eds.), *Monastic Archaeology: Papers on the Study of Medieval Monasteries* (Oxford, 2001), 88–136. Studies of continental Europe include P. Squatriti, *Water and Society in Early Medieval Italy AD 400–1000* (Cambridge, 1998); M. Gläser (ed.), *Lübecker Kolloquium zur Stadtarchäologie im Hanseraum IV: Die Infrastruktur* (Lübeck, 2004); A. Guillerme, *The Age of Water: The Urban Environment in the North of France, AD 300–1800* (Texas, 1988); M. Kucher, 'The use of water and its regulation in medieval Siena', *Journal of Urban History*, 31 (2005), 504–36.

⁵ Squatriti, *Water*, 2.

⁶ J. Davis, *Medieval Market Morality: Life, Law and Ethics in the English Marketplace, 1200–1500* (Cambridge, 2012), 189; B.F. Duckham, *The Yorkshire Ouse* (Newton Abbot, 1967), 34–6.

historical, archaeological and topographical studies of individual towns, as well as evidence from Leland's *Itinerary* and civic records, the article examines the sources and technologies of urban water supplies, the origin of civic piped water systems, their relationships to other local systems, finance, management and oversight. It will argue that the growth in piped supplies by civic bodies in the later Middle Ages reflects the importance of charitable provision and the role of civic government. The appendix lists all towns known to have provided public access to piped water supplies to c. 1550, complementing previous lists of conduits constructed by cathedrals and monasteries.⁷

Sources and technologies of urban water supplies

Differing topographical and environmental factors required urban communities to find a variety of solutions to their needs for potable water. Favourable topography allowed spring water to be carried by gravity-fed channels into some towns, but elsewhere more complex and expensive engineering systems were needed, using airtight pipes or water-raising equipment. Coastal towns needed freshwater supplies to be protected from saltwater contamination.

Rivers, streams and wells provided the only supply of water for many townspeople. Rivers and streams, though, were also used for industrial processes and waste disposal, and often became polluted. Wells usually lay within private properties, which would only have been accessible to those who lived there, although urban authorities also maintained some common wells, such as those in the High Street, Saturday Market and Walkergate at Beverley.⁸ Wells often needed to be of significant depth to reach pure, filtered water, making them expensive to excavate. Growing populations and industrial activities placed pressure on these supplies and led to many sources becoming polluted.

Urban and monastic communities controlled and diverted watercourses but these works were usually undertaken for drainage, defence or transport purposes rather than to provide drinking water.⁹ Notable exceptions include the watercourses in the streets of Winchester, with channels leading off to houses and workshops, presumably laid out along with the grid of streets in the second half of the ninth century, and attested in the later tenth century.¹⁰ Two other early examples of watercourses being redirected to provide urban water supplies were the Great Cockey stream at Norwich, diverted perhaps in the tenth century, and the Delf, a canalized watercourse that provided Sandwich with freshwater. Christ Church Cathedral Priory, Canterbury, may have instigated the Delf, as the

⁷ Bond, 'Urban monastery'; Bond, 'Rural monastery'; Bond, 'Monastic water management'.

⁸ *Victoria County History* (hereafter VCH) *Yorkshire: East Riding*, vol. VI, 223.

⁹ J. Blair (ed.), *Waterways and Canal Building in Medieval England* (Oxford, 2007), 4–9, 155–206.

¹⁰ D. Keene, *Survey of Medieval Winchester* (Oxford, 1985), 56.

watercourse served the priory's site in Sandwich, and the first reference is in a priory document from the time of Prior Wibert (1153–67), who was responsible for commissioning an elaborate system of water supply at Canterbury.¹¹

The construction of open channel conduits for water supply, though, was relatively unusual: English engineers seem to have preferred to lay closed airtight pipes. These allowed changes in topography to be accommodated without requiring extensive engineering works like aqueducts and tunnels. Airtight pipes when completely filled with water act as an inverted syphon and carry water up or down hill, providing that the outlet is on a lower level than the intake.¹² A conduit head was usually placed over springs with a cistern to collect water. The conduit was laid to carry the water – through pipes or an artificial channel – and a fountain-like structure erected (also known as a conduit) from where water was distributed to consumers.

Mechanical devices for raising water were occasionally used in medieval England, although there was nothing to compare in size with the bucket-chain systems used to lift water from wells to supply large numbers of users through pipes in Roman London.¹³ Master Edmund of St Andrew, an Augustinian canon of Newstead in Nottinghamshire, who had crafted stalls in the king's chapel at Westminster in 1355, installed a machine for raising water at Worksop Priory.¹⁴ The mayor of Lynn brought a workman from Boston to lead water to the town in March 1428, and in July he was to display his engine. By 1500, the town had a horse-driven 'kettlemill' which drew water from the River Gay using buckets attached to a wheel.¹⁵ In 1481, the bishop of Winchester granted Winchester College permission to lift spring water by means of a pair of waterwheels and to convey it to the college through pipes of lead or hollowed wood.¹⁶ Pumps appear to have come into use during the later fifteenth century.¹⁷ By the late sixteenth century, several public wells in London had been converted to pumps.¹⁸ From 1581, a water engine within the arch of London Bridge, consisting of a waterwheel working forced pumps, supplied Thames water directly to individual houses by lead and wood pipes. Such artificial lifting devices on urban rivers were increasingly constructed rather than conduits in the following two centuries, providing larger quantities of

¹¹ Helen Clarke *et al.*, *Sandwich: The 'Completest Medieval Town in England': A Study of the Town and Port from its Origins to 1600* (Oxford, 2010), 36–7.

¹² Magnusson, *Water Technology*, 63–4; Bond, 'Monastic water management', 93–4.

¹³ I. Blair *et al.*, 'Wells and bucket-chains: unforeseen elements of water supply in early Roman London', *Britannia*, 37 (2006), 1–52.

¹⁴ H.M. Colvin *et al.*, *The History of the King's Works*, 6 vols. (London, 1963–82), vol. I, 520.

¹⁵ D.M. Owen (ed.), *The Making of King's Lynn: A Documentary Survey* (Oxford, 1984), 196; V. Parker, *The Making of King's Lynn* (London, 1971), 162–3.

¹⁶ Keene, *Winchester*, 1084.

¹⁷ L.F. Salzman, *Building in England down to 1540: A Documentary History* (Oxford, 1952), 278.

¹⁸ John Stow, *A Survey of London*, ed. C.L. Kingsford, 2 vols. (Oxford, 1908) (hereafter *Survey*), vol. I, 138, 164, 192, 292.

lower-quality water.¹⁹ The chronological development of water-raising technology appears to mirror that of water power technology, as there are only limited examples of the wider application of water power beyond milling and fulling into areas such as iron production and tool sharpening until the sixteenth century.²⁰

Origins of civic piped water systems and their relationships to other local systems

Religious houses adopted some of the earliest piped water systems, conveying water from springs to their domestic buildings. The systems serving Winchester Cathedral precinct and bishop's palace probably existed by the early twelfth century, and may have originated in some form in the 970s.²¹ Some urban houses allowed public access to their piped water from an early date, including the twelfth-century systems serving Canterbury Cathedral Priory and Exeter's Cathedral canons.²² Some aristocratic residences also developed piped water supplies. Westminster possessed the earliest known conduit serving an English royal palace, recorded in 1169–70, and the installation of a new supply in 1234 may have prompted the construction of London's separate system just three years later.²³ These supplies, like those of religious houses, were sometimes shared with local residents. In 1447, the inhabitants of Westminster were permitted to convey the overflow from the king's conduit in the palace to a conduit of their own.²⁴

Increasingly, urban governments collaborated with religious institutions to extend supplies to townspeople. Friaries in Boston, Bristol, Exeter, Gloucester, Lynn, Sandwich, Scarborough and Southampton entered into agreements with town authorities to share their conduits.²⁵ Some of these relationships were more successful than others. The Franciscans at Scarborough seem to have found that sharing water with the burgesses gave them an inadequate supply, for they constructed another conduit from an alternative spring in 1339 for their exclusive use.²⁶ The Franciscans of Newcastle complained in 1341 that the townspeople had broken down the door of their shared conduit house and diverted the supply. An inquisition and letters patent from the king were required before the

¹⁹ Magnusson, *Water Technology*, 167–72.

²⁰ R. Holt, *The mills of medieval England* (Oxford, 1988), 130–58.

²¹ M. Biddle, *Winchester in the Early Middle Ages* (Oxford, 1976), 283–4; Keene, *Winchester*, 57.

²² See appendix.

²³ Magnusson, *Water Technology*, x, 6, 11; Keene, 'Issues', 174.

²⁴ See appendix.

²⁵ See appendix.

²⁶ L.S. Debenham, 'Scarborough's water supply: the influence of water on the expansion and prosperity of Victorian Scarborough and on later events', *Scarborough and District Archaeological Society Transactions*, 2 (1972), 4, 19–20.

Cambridge college of King's Hall was able to draw a 'qwil' (a quill or small pipe) of water from the Franciscans' conduit that crossed their site.²⁷

Competition for water sources could lead to disputes between urban institutions, as at Gloucester, where the prince of Wales had to mediate between the abbey and the Franciscan friary in 1357, resulting in the friars' pipe being restricted to one third the size of the abbey's pipe.²⁸ To avoid such quarrels, when the city of London sought in 1430 to join their conduit to the springs at Oxlease that already served Westminster Abbey, the abbey reserved the right to resume possession if the monastic supply was interfered with.²⁹ Similarly, watermill owners tried to protect their water rights at times of scarcity, or when new developments were being proposed. The watercourse to a fulling mill leased from the bishop of Winchester at Taunton was blocked for ten weeks in 1449–50 'in a time of dryness' so that water could be transferred to the lord's corn mills, and permission to build a fulling mill in Langford, Somerset, was permitted only on condition that the nearby demesne mill had precedence in times of water shortage.³⁰ Given the cost of infrastructure, it made sense for urban institutions to work together where possible, and the joint arrangements brokered between civic authorities and religious houses to share water supplies show that institutional co-operation, not conflict, predominated.

Increasingly, urban corporations took greater responsibility for water supplies of monastic origin. In 1391, Bristol corporation granted the Dominicans a pipe the size of a swan's quill from the civic pipe in exchange for the friars' conduit, spring and lead pipes, attaching a section of quill (0.3 inches in diameter) to the agreement (Figure 1).³¹ The town councils and friaries of Southampton in 1420 and Gloucester in 1438 decided to share the maintenance of conduits.³² When agreement was reached between the town and Carmelite friars of Sandwich in 1483 for the friary's conduit to be used more generally, the council paid for the construction of a brick cistern.³³ The citizens of Exeter extended their conduit to serve the Dominican friars in 1441, and during the 1490s constructed a

²⁷ Magnusson, *Water Technology*, 33; J.R.H. Moorman, *The Grey Friars in Cambridge 1225–1538* (Cambridge, 1952), 52–4; R. Willis and J.W. Clark, *The Architectural History of the University of Cambridge and of the Colleges of Cambridge and Eton*, 4 vols. (Cambridge, 1886, vols. I–III, reprinted 1988), vol. II, 427–9, 678–80.

²⁸ L.E.W.O. Fullbrook-Leggatt, 'The water supplies of the abbey of St Peter and the priory of the Grey Friars, Gloucester, from Robinswood Hill', *Transactions of the Bristol and Gloucestershire Archaeological Society*, 87 (1968), 113–15.

²⁹ D. Lewis, "'For the poor to drink and the rich to dress their meat': the first London water conduit", *Transactions of the London and Middlesex Archaeological Society*, 55 (2004), 57.

³⁰ J. Langdon, *Mills in the Medieval Economy: England 1300–1540* (Oxford, 2004), 200.

³¹ Bristol Record Office, P/StjB/D/2/11; R. Hall Warden, 'Some additional ecclesiastical seals of Bristol', *Proceedings of the Clifton Antiquarian Club*, 3 (1893–6), 195–9; H.A. Croane (ed.), *Bristol Charters 1378–1499*, Bristol Record Society 11 (Bristol, 1946), 188–91.

³² W.H. Stevenson (ed.), *Calendar of the Records of the Corporation of Gloucester* (Gloucester, 1893), 391–2; C. Platt, *Medieval Southampton: The Port and Trading Community, AD 1000–1600* (London, 1973), 144.

³³ Clarke *et al.*, *Sandwich*, 134.



Figure 1: (Colour online) Agreement c. 1391 between the mayor and commonalty of Bristol and the Dominican Friars with sample swan's quill pipe attached. The friary exchanged their conduit for a supply pipe, the size of the assigned swan's quill, drawn from the town pipe (Bristol Record Office, P/StJB/D/2/11).

new shared conduit with this friary.³⁴ The dissolution of the religious houses provided some civic authorities with further opportunities to obtain monastic conduits, as at Lynn, Coventry and Lincoln.³⁵ When Lincoln council acquired the Franciscans' supply (and probably also the Dominicans' conduit), they extended the system to provide outlets on High Bridge and at St Mary-le-Wigford, where the conduit house included masonry fragments, probably from the Carmelite friary (Figure 2).³⁶

A number of towns also developed their own supplies independently from those primarily constructed to serve monastic and aristocratic houses. Some early water supplies appear to have been associated with parish churches, including the supply to St Mary Redcliffe Church Bristol (c. 1190) and in London, where a group of parish churches with the appellation 'upwell' or similar variants were located at or near springs. Spring water was probably collected in stone tanks, as Stow described as St Clement Dane in the sixteenth century.³⁷ These sites seem to have symbolized both spiritual and physical refreshment, as well as being intended to encourage remembrance of charitable provision. Similar concerns appear to have influenced one of the earliest and most ambitious civic schemes, the London conduit of 1237. This brought water from springs in Tyburn, around 3 miles to the west of the city, using gravity to ascend Ludgate Hill to Cheapside. The siting of the Great Conduit in Cheapside was arguably of greater symbolic than practical significance. Rather than being placed in the most central location, the conduit stood directly outside the birthplace of the city's patron saint, St Thomas the Martyr of Canterbury, where a

³⁴ Devon Historic Environment Record: J.Z. Juddery and M.J. Stoye, 'The aqueducts of medieval Exeter', *Exeter Archaeology Report*, 95.44 (1995).

³⁵ Parker, *Lynn*, 163; Magnusson, *Water Technology*, 165.

³⁶ D.A. Stocker, 'The archaeology of the Reformation in Lincoln. A case study in the redistribution of building materials in the mid-sixteenth century', *Lincolnshire History and Archaeology*, 25 (1990), 18–32.

³⁷ Bond, 'Urban monastery', 63; Keene, 'Issues', 171–4; *Survey*, vol. I, 15.



Figure 2: (Colour online) Conduit house at St Mary-le-Wigford, Lincoln, erected 1540 and re-using masonry fragments, probably from the Carmelite friary. Originally sited in the High Street, it was moved into a nearby churchyard in 1864.

church or chapel was being built around the same time as the conduit was constructed. The location of the conduit may therefore have formed part of the development of the saint's cult within the city, 'endowing the charitable provision of water by the community of citizens with a profound religious and symbolic purpose'.³⁸

Tracing the chronology of the development of engineered water supplies is an imprecise exercise, because our present knowledge is limited and largely reliant on published sources, and evidence from before 1100 is insufficient to make a comparison with the period afterwards. The appendix to this article lists piped water systems within towns which provided public access, together with the date of the first known documentary reference. References to monastic conduits predominantly appear in thirteenth- and early fourteenth-century documents, and tail off during the later Middle Ages.³⁹ The chronology of public conduits in towns though, as shown in the appendix, shows continued construction of new systems and the expansion of existing infrastructure through the fifteenth and early sixteenth centuries.

Finance

Aside from the cost of bringing water to particular places, which reflected site-specific topographical and hydrological factors that cannot be readily assessed, endowed wealth was the key factor which determined whether monastic houses adopted a complex water system, and size of community was less important.⁴⁰ In towns, however, both wealth and size appear to have been significant factors in the take-up of conduits. Those towns with references to a conduit accessible to the public included eight of the ten largest towns by taxpaying population (the largest, London, comprising about 40,000–50,000 inhabitants, the smallest, Colchester, around 4,500) and nine of the ten largest towns by taxable wealth in 1524–25.⁴¹ The only major cities which lacked provision were Norwich, where a stream was diverted to provide the city with water, and St Giles Hospital and the Franciscan friary enjoyed piped supplies, but there was no public provision available until the late sixteenth century, and York, where three attempts to establish a conduit during the sixteenth century were unsuccessful.⁴² Around half of the water systems in medieval English towns were shared with religious houses. A number of small towns

³⁸ Keene, 'Issues', 178; M. Burch, P. Treveil and D. Keene, *The Development of Early Medieval and Later Poultry and Cheapside. Excavations at 1 Poultry and Vicinity, City of London*, Museum of London Archaeology Monograph Series 38 (London, 2011), 179–82.

³⁹ Bond, 'Monastic water management', 113.

⁴⁰ Magnusson, *Water Technology*, 14.

⁴¹ See appendix; D.M. Palliser (ed.), *The Cambridge Urban History of Britain*, vol. I: 600–1540 (Cambridge, 2000) (hereafter CUHB), 396–7, 761–7.

⁴² C. Rawcliffe and R. Wilson, *Medieval Norwich* (London, 2004), 308–9, 411 n. 33; VCH *Yorkshire: City of York*, 117–20.

enjoyed public water supplies, including Newport in Shropshire, with fewer than 600 inhabitants in 1525.⁴³ These places, however, were the exceptions: with around 600 small towns in medieval England,⁴⁴ only 2–3 per cent of these minor urban centres are known to have possessed public conduits.

John Stow, the late sixteenth-century antiquarian, noted that the London conduits were ‘partly made by good and charitable citizens, and otherwise by charges of the communitie’.⁴⁵ Unfortunately, it is rarely possible to determine whether private donations or civic finances provided the majority of funding, and even overall construction costs are difficult to calculate. For example, the only known reference to the funding of London’s first conduit in 1237 is a contribution of £100 from the merchants of Picardy in return for trading privileges, which must have represented a small contribution, perhaps only 5 per cent, towards the total costs of the works.⁴⁶

The later Middle Ages generally saw civic authorities starting to exercise more control over certain construction and repair projects, including waterfront schemes.⁴⁷ Civic finances, though, appear to have been frequently strained, with towns claiming their inability to pay renders to the crown, and officials meeting expenses from their own pockets. Historians have debated the extent to which these pleas of civic poverty can be taken at face value.⁴⁸ Expenditure on major building works in late medieval English towns usually had to be met from sources other than regular civic income. Royal grants of pontage, murage, quayage and pavage allowed towns to levy tolls to invest in bridges, walls, port facilities and paving, but in practice the bulk of expenses were met through individual donations and investment, and local taxation.⁴⁹ Stow noted that part of the cost of building London’s Bishopsgate conduit in 1505 was met by the common charges of the city, and the city granted an assessment to construct conduits at Aldgate in 1535 and Lothbury in 1546.⁵⁰ The later Middle Ages saw many bequests which were private acts of charity, but provided works of public utility. These included bridges, hospitals, schools, road improvements, water supplies and even bequests

⁴³ E. Jones, ‘Historical records of Newport, co. Salop’, *Transactions of the Shropshire Archaeological and Natural History Society*, 8 (1885), 248. Population based on 88 taxpayers assessed in 1525: J. Sheail, *The Regional Distribution of Wealth in England as Indicated in the 1524/5 Lay Subsidy Returns*, ed. R.W. Hoyle, List and Index Society, special series, 28, 2 vols. (Kew, 1998), vol. II, 273.

⁴⁴ *CUHB*, 505–6.

⁴⁵ *Survey*, vol. I, 18.

⁴⁶ Based on known costs for the extension to the conduit in 1442, the cost of constructing the first conduit has been estimated at around £1,900: Lewis, ‘“For the poor”’, 56.

⁴⁷ *CUHB*, 280, 470.

⁴⁸ A. Dyer, *Decline and Growth in English Towns 1400–1640*, 2nd edn (Cambridge, 1995), 39–42.

⁴⁹ D. Harrison, *The Bridges of Medieval England: Transport and Society 400–1800* (Oxford, 2004), 208–13; *CUHB*, 470; E. Harvey, ‘Pavage grants and urban street paving in medieval England, 1249–1462’, *Journal of Transport History*, 3rd ser., 31 (2010), 151–63.

⁵⁰ *Survey*, vol. I, 128, 173, 283.

to construct public latrines, such as that by Richard Whittington, mayor of London (d. 1423).⁵¹ Stow lists 13 benefactors, including mayors and sheriffs, who gave between £10 and £900 to build or repair water conduits in London between 1439 and 1583.⁵²

Private donations also appear to have funded many water supply schemes in provincial towns. An early bequest was Lord Robert de Berkeley's gift of a well and conduit to St Mary Redcliffe Church, Bristol, with permission for St John's Hospital to draw a pipe from the same (c. 1190).⁵³ Exeter's civic water supply, constructed between 1420 and 1424, followed bequests from two citizens in 1411 and 1413, and bequests were made to start and complete the construction of Hull's covered conduit in 1438 and 1449.⁵⁴ Southampton's friary conduit was relaid and taken under the responsibility of the corporation following a bequest in 1420 from John Benet, three times mayor.⁵⁵ In small towns, where civic funds were much more restricted, if they existed at all, benefactors were even more important. Leland described how John Edmunds diverted a spring into Petworth to supply the manor house, parsonage and two or three places in the town street, which cost £100 to construct.⁵⁶ Recognizing the importance of donations to fund public supplies, urban corporations felt that it was worthwhile resorting to litigation if executors of wills failed to carry out bequests to improve urban water supplies. Two mayors took cases to the court of Chancery in the early sixteenth century against executors who refused to make a conduit in Cambridge marketplace and to perfect a cistern by the conduit of St Margaret in Lynn.⁵⁷

What motivated donors to make specific bequests to improve public water supplies? Donors may well have recalled Biblical references to water as a source of life, for cleansing, purifying and healing, and even perhaps the construction of the conduit in Jerusalem by King Hezekiah, son of David.⁵⁸ There appears to have been a collective memory of the charitable provision of water supplies, which were sometimes publicly commemorated. A bill from the commons of Cross Cheaping ward in Coventry in 1426 listed five benefactors, who were also recalled in a second petition presented in 1444.⁵⁹ The 'wels imbraced by angels' that decorated the Standard conduit in Cheapside were a rebus commemorating John

⁵¹ P.E. Jones, 'Whittington's longhouse', *London Topographical Record*, 23 (1972), 27–34.

⁵² *Survey*, vol. I, 18–19, 128, 173, 283.

⁵³ H.C.M. Hirst, 'Redcliffe conduit, Bristol, and Robert de Berkeley', *Transactions of the Bristol and Gloucestershire Archaeological Society*, 46 (1924), 353–62.

⁵⁴ Juddery and Stoye, 'Aqueducts', ix; *VCH East Riding*, vol. I, 371.

⁵⁵ Platt, *Southampton*, 144, 233.

⁵⁶ *Itinerary*, vol. IV, 92; J.S. Brewer, J. Gairdner and R.H. Brodie (eds.), *Letters and Papers, Foreign and Domestic, of the Reign of Henry VIII*, 2nd edn, 23 vols. (London, 1862–1932), vol. IV, part 2, no. 4591.

⁵⁷ The National Archives, C 1/299/52, C 1/331/88.

⁵⁸ 2 Kings 20: 20; 2 Chronicles 32: 30; Isaiah 12: 3, 44: 3; John 4: 6–15; Revelation 21:6.

⁵⁹ M.D. Harris (ed.), *The Coventry Leet Book*, Early English Text Society, Old Series, 134, 135, 138, 146 (London, 1907–13), vol. I, 105, 208.

Welles, mayor of London in 1431–32, who had left a bequest to rebuild the conduit in stone.⁶⁰ Leland noted that 80 years after Bishop Thomas Beckington permitted the burgesses of Wells to draw water from his conduit, the burgesses still ‘solemply visite his tumbe, and pray for hys sowle’ in commemoration of the grant.⁶¹ At Ashburton, the guild maintained lead pipes supplying the town.⁶² Water supplies provided a tangible and enduring display of charity.

Details of the sources of funding used to maintain civic water supplies are also very limited. Various schemes were tried to fund maintenance of the London conduit. While in 1310 the keeper of the conduit had to swear that he would not sell water to anyone, on pain of losing his freedom, just two years later moneys were collected with the mayor’s approval from brewers, cooks and fishmongers for use of the conduit.⁶³ By 1337, the conduit keepers were accounting for rents for ‘tynes’ or tankards. Each household seems to have been entitled to use one of these vessels to carry water from the conduit, which are depicted alongside the conduit houses on a map of the 1550s and Ralph Treswell’s plan of Cheapside in 1585.⁶⁴ In 1368, the city authorities leased the conduit for 10 years to two citizens, who were to maintain the conduit above ground, while the city retained responsibility for underground pipes. The lessees received the payments from those using the water.⁶⁵ When the lease expired, new attempts were made to spread the costs of maintaining the conduit, yet despite varied initiatives, the renewal of the piping and repair of many of the wellheads between 1439 and 1455, which may have cost around £5,000, was funded by special civic taxes and bequests.⁶⁶ Coventry corporation levied a quarterly charge on property towards the repair of its conduits in 1483 and 1497, and also allocated revenue from ameracements to this purpose.⁶⁷ Occasionally, endowments supported conduits, as at Newport and Dartmouth.⁶⁸ Hired labour and householders were often employed to repair and clean urban watercourses, as at Sandwich and King’s Lynn.⁶⁹ As with other aspects of urban infrastructure, civic bodies seem to have relied on a combination of local income, including user fees or tolls, taxation and charitable donations to fund their upkeep.

⁶⁰ *Survey*, vol. I, 26.

⁶¹ *Itinerary*, vol. I, 145.

⁶² A. Kreider, *English Chantries: The Road to Dissolution* (Cambridge, MA, 1979), 69.

⁶³ H.T. Riley (ed.), *Memorials of London and London Life in the XIIIth, XIVth and XVth Centuries. AD 1276–1419* (London, 1868), 77, 107.

⁶⁴ *Ibid.*, 201–2, 264–5; Burch *et al.*, *Poultry and Cheapside*, 181.

⁶⁵ Burch *et al.*, *Poultry and Cheapside*, 182.

⁶⁶ R.R. Sharpe (ed.), *Calendar of Letter-Books of the City of London*, 12 vols. (London, 1899–1912), vol. H, 116, 127–8, vol. K, 234, 249, 318; C.M. Barron, *London in the Middle Ages: A Government and People, 1200–1500* (Oxford, 2004), 257.

⁶⁷ Harris (ed.), *Coventry Leet Book*, 516, 586–7.

⁶⁸ Jones, ‘Newport’, 251; F.W. Robins, *The story of water supply* (London, 1946), 134.

⁶⁹ Clarke *et al.*, *Sandwich*, 134; C. Rawcliffe, ‘Sources for the study of public health in the medieval city’, in J.T. Rosenthal (ed.) *Understanding Medieval Primary Sources* (Abingdon, 2012), 183.

Management and oversight

The construction and repair of piped water systems required skilled specialists. Some corporations made long-term contracts with plumbers for maintenance, such as Bristol in 1376 and Gloucester from 1494. The Bristol contract required plumber Hugh White to maintain a supply of water and provide 1,000 feet of new pipe each year. It contained a punitive penalty clause: if the supply failed for more than six days, White would be fined £10, the equivalent of his annual fee.⁷⁰ On occasions, specialist engineers were recruited to work on conduits. Sandwich employed a plumber from Canterbury to repair their conduit in 1491, Exeter took advice from a London plumber when extending their system in 1441, and a London master workman constructed a cistern for Rye's conduit in 1520.⁷¹

In regulating water supplies, civic authorities applied many of the same ideas and procedures as they used to regulate town markets. Conduits, like markets, generally had fixed hours of operation, and civic regulations organized and ordered space for traders and consumers in the marketplace and at the conduit.⁷² Access to conduits was regulated through the use of keys, such as those delivered to London's conduit wardens when they took up their office.⁷³ The conduits in Coventry were locked from nine at night until four in the morning in 1444, and another instruction to make grates and locks to secure all the conduits at night was issued in 1497.⁷⁴ This presumably discouraged people from walking the streets, and if the conduits had cisterns, would have allowed them to refill for the following morning. In Wells, a by-law of 1537 restricted the number of people who could collect water in tubs from the conduit in the heat of the year, a forerunner of the modern hosepipe ban.⁷⁵ Restrictions of space and time were also used to regulate access to urban watercourses for waste disposal purposes. Butchers at London, Winchester and York were to dispose of their waste at specific places where the current of water would ensure it was removed from the city, and in Winchester, by the 1370s dyers could dispose of woad waste in the brooks at night, but had to ensure that the water was kept clean during the day.⁷⁶

Domestic consumers were usually given priority over commercial traders at conduits, as they were in urban markets. No brewer was to take water from the conduits at Coventry in 1444 'for brewing, but only

⁷⁰ J. Lea-Jones, 'The history and development of a thirteenth-century lead water conduit: the Carmelites' Friary pipe, Bristol, England', in R. Bork (ed.), *De Re Metallica: The Uses of Metal in the Middle Ages* (Aldershot, 2005), 232; *VCH Gloucestershire*, vol. IV, 262.

⁷¹ Clarke *et al.*, *Sandwich*, 226; Juddery and Stoye, 'Aqueducts', xi; G. Mayhew, *Tudor Rye* (Brighton, 1987), 29.

⁷² Davis, *Medieval Market Morality*, 179–86.

⁷³ Riley (ed.), *Memorials*, 148.

⁷⁴ Harris (ed.), *Coventry Leet Book*, 208, 584.

⁷⁵ D.G. Shaw, *The Creation of a Community: The City of Wells in the Middle Ages* (Oxford, 1993), 132–3.

⁷⁶ Keene, *Winchester*, 64, 258; D.R. Carr, 'Controlling the butchers in late medieval English towns', *The Historian*, 70 (2008), 450–61.

to prepare food'. By 1483, though, industrial use was permitted, but at a charge of 6s 8d for brewing, dyeing or steeping barley. Yet, in 1548, water was to be drawn from the conduit 'onlie to dresse meit with', and brewers, maltmakers and fishmongers were expressly prohibited from using the conduit in 1553 and 1558.⁷⁷ Brewers were forbidden to take water from conduits or fountains in a fourteenth-century proclamation at Bristol.⁷⁸ Similar tensions between consumers and producers arose in London. The keeper of the conduit had to swear an oath that neither brewers nor fishmongers 'shall waste the water', and in 1312 charges were levied on brewers, cooks and fishmongers for using the water.⁷⁹ Residents living around the conduit complained in 1337 that they could not be served with water due to excessive use by local brewers. Similar complaints were voiced in 1345, when the city government heard that the water 'was now so wasted by brewers, and persons keeping brewhouses, and making malt ... it will no longer suffice for the rich and middling, or for the poor; to the common loss of the whole community'. Penalties included the confiscation of tankards, monetary fines and imprisonment if the offence was committed three times, with the same punishments applying to fishmongers who washed their fish there. By 1415, however, brewers were renting the upper pipe of the Cheapside conduit, while the smaller lower pipes were reserved for the ordinary householders, although the brewers were sometimes using them.⁸⁰ These repeated difficulties suggest that demand for water from the conduits outstripped the supply that they were able to provide. Similarly, the use of common watercourses in towns for industrial producers was often restricted. Winchester city court stated in 1299 that while a householder could use the common watercourse to wash and scour her clothes, thread and yarn, people should not put in woad waste, hides in the course of being tanned, sheepskins, entrails and human and animal blood.⁸¹ Possibly due to the restrictions placed on using communal supplies, urban craftsmen occasionally constructed their own piped systems. Two brewers built conduits at Sandwich in 1538. By the mid-sixteenth century, Colchester clothiers were piping water directly to their properties for dyeing or washing wool, and Miles Prance had set up a pump and pipes to convey water to his Cambridge brewhouse.⁸²

Civic authorities tried to prevent water supplies from being illicitly tapped, and those who unlawfully diverted public water supplies attracted opprobrium. The commons of Cross Cheaping ward in Coventry reported

⁷⁷ Harris (ed.), *Coventry Leet Book*, 208, 517, 788, 808–9, 812.

⁷⁸ F.B. Bickley (ed.), *The Little Red Book of Bristol*, 2 vols. (Bristol, 1900), vol. II, 229–30.

⁷⁹ Riley (ed.), *Memorials*, 77, 107.

⁸⁰ *Ibid.*, 200–1, 225, 617.

⁸¹ Keene, *Winchester*, 64.

⁸² Clarke *et al.*, *Sandwich*, 141; *VCH Essex*, vol. IX, 104, 290; W.M. Palmer (ed.), *Cambridge Borough Documents* (Cambridge, 1931), 84, 95, 135.

in 1426 that the common conduit was being 'letted'⁸³ 'to gret hyndryng of the comen people', and the leet court responded by ordering one of the perpetrators to undertake repairs within eight days, and amercing him 40*d*.⁸⁴ Orders were given to destroy openings in the conduit, described as 'suspirales', in 1421, and anyone creating one was to pay 40*s* in 1434.⁸⁵ Officials were ordered in 1497 to search for openings in the conduit and anyone reporting an offender to the court was to receive 8*d* reward.⁸⁶ In Coventry, there was clearly a perception among the community that tapping into public conduits was illegal and that it was the corporation's role to punish offenders. Nonetheless, some authorities permitted private pipes to be connected to public conduits, providing that they could regulate them and use them as a source of revenue. The corporations at Coventry from 1493, and Gloucester from 1509, charged licences for private pipes and 'suspirals' connected to conduits.⁸⁷

Punishments for infringing civic regulations governing water resembled those applied for breaching market rules. Amercements were generally used, with corporal punishment reserved for flagrant or repeat offenders. Corporal punishment could include public humiliation, like the use of the pillory and the tumbrel for bakers and brewers – dramatic elements which publicized the misdemeanour and consolidated communal memory of the offence.⁸⁸ William Campion was punished in this way in 1478 for illegally tapping into a public pipe and bringing water to his Fleet Street house. He was paraded through the streets of London on a horse 'with a vessell like unto a conduyt full of water uppon his hede, and that when the water is wasted newe water to be put in the saide vessell ayein'.⁸⁹

Claims that public health was being endangered in the marketplace or through water supplies were investigated by civic governments.⁹⁰ The second largest expense claimed by the keepers of the London conduit in 1350, at the time of the Black Death, was for 'examining the conduit when it was slandered for poison, by command of the Mayor'.⁹¹ There seems to have been awareness that drinking polluted water could result in illness, even if there was a lack of clear medical understanding why. In 1305, the University of Oxford complained that brewers were endangering men's health by taking water near drains and sewers. A leprous woman was rumoured to have contaminated the Stanwell at Colchester in 1406 by washing there.⁹² Town governments became increasingly involved in

⁸³ 'Let' in the sense of 'to allow the escape of (confined fluid)': *Oxford English Dictionary*, 2nd edn 1989, online version www.oed.com/Entry/107496, accessed 9 Jun. 2012.

⁸⁴ Harris (ed.), *Coventry Leet Book*, 104–5.

⁸⁵ *Ibid.*, 21, 157.

⁸⁶ *Ibid.*, 189–90, 585.

⁸⁷ *VCH Gloucestershire*, vol. IV, 262; Harris (ed.), *Coventry Leet Book*, 549.

⁸⁸ Davis, *Medieval Market Morality*, 263–70.

⁸⁹ Sharpe (ed.), *Letter-Books*, vol. L, 160.

⁹⁰ Davis, *Medieval Market Morality*, 221–2.

⁹¹ Riley (ed.), *Memorials*, 205.

⁹² *VCH Oxfordshire*, vol. IV, 354; *VCH Essex*, vol. IX, 290.

controlling and responding to a range of environmental and public health issues during the later Middle Ages, through regulations and enforcement, such as ordinances to restrict river pollution and scouring and dredging activities to remove materials.⁹³

Regulations for the use of water, like those for the market, made particular references to protection for the poor.⁹⁴ Generally, water was considered a drink suitable only for this class. A community of nuns was reported to be reduced to drinking water because their house could not afford ale, while in describing the relative poverty of the French population in the 1470s, Sir John Fortescue noted that they drank water.⁹⁵ The mayor of Lynn ensured in 1390 that if anyone broke the fragile water containers of poor people, he would compensate the injured party.⁹⁶ All classes, of course, required water for other domestic uses, and even the brewing of ale, which the majority of the population drank, required good quality water, if the taste was not to be compromised.⁹⁷

Piped water supplies also enhanced the dignity of public spaces and emphasized civic pride, as did other infrastructure such as guild halls, market crosses and street paving.⁹⁸ A similar purpose was expressed when a committee was established in Salisbury in 1452 to supervise street paving and the common privies, ditches, sewers and gutters, in order that the common ditches 'may be kept in their state of well-being to the adornment of the city'.⁹⁹ Conduits formed town landmarks, such as those at Gloucester depicted on a rental of 1450.¹⁰⁰ The conduit at the Standard in Fleet Street, rebuilt in 1478, included a carillon, providing an audible as well as visual attraction.¹⁰¹ The architectural embellishments invested on many conduit houses and fountains highlighted their symbolic importance within the town.

Conduits formed the backdrop for celebratory and commemorative events. Pageants were staged at London's Great Conduit, particularly for royal entries and other processions. At Edward I's coronation in 1274, this conduit flowed with wine for all to drink, a feature which

⁹³ Rawcliffe, 'Public health'; D. Jørgensen, 'Local government responses to urban river pollution in late medieval England', *Water History*, 2 (2010), 35–52.

⁹⁴ Davis, *Medieval Market Morality*, 234, 236, 260, 271; J.S. Lee, 'Grain shortages in medieval towns', in B. Dodds and C.D. Liddy (eds.), *Commercial Activity, Markets and Entrepreneurs in the Middle Ages: Essays in Honour of Richard Britnell* (Woodbridge, 2011), 70–2.

⁹⁵ C. Dyer, *Standards of Living in the Later Middle Ages: Social Change in England c. 1200–1520* (Cambridge, 1989), 93, 159, 251, 272.

⁹⁶ S. Alsford (ed.), Medieval English Towns website <http://users.trytel.com/tristan/towns/ly1390b.html> accessed 9 Jun. 2012

⁹⁷ Lewis, "'For the poor'", 57.

⁹⁸ J.S. Lee, 'The functions and fortunes of English small towns at the close of the Middle Ages: evidence from John Leland's *Itinerary*', *Urban History*, 37 (2010), 19–20.

⁹⁹ D.R. Carr (ed.), *The First General Entry Book of the City of Salisbury 1387–1452*, Wiltshire Record Society 45 (1998), 242.

¹⁰⁰ W.H. Stevenson (ed.), *Rental of all the Houses of Gloucester by Robert Cole* (Gloucester, 1890), facing 1.

¹⁰¹ *Survey*, vol. II, 41.

subsequently became a customary element in staged royal entries into the city. The architecture of the conduits with their polygonal sides, niches and parapets, readily accommodated pageants and made them easily visible from the surrounding streets. For Richard II's coronation in 1377, the Cheapside conduit was transformed into a heavenly city with angels and virgins scattering golden leaves and coins and offering the king a golden crown and cup of wine from the conduit.¹⁰² Similarly Exeter's Great Conduit was hung with expensive cloth and primed to flow with wine for Henry VI's visit in 1451.¹⁰³ Conduits could, however, also become places of opposition and resistance, for, like market crosses, they were public spaces in which bills were cast.¹⁰⁴

Conclusion

Most of the largest English towns, and a handful of small towns, provided some access to an engineered public water supply by the later Middle Ages. This fact has not hitherto been appreciated, and indeed the extent of provision has been significantly downplayed. A recent English Heritage publication states that there are only between 20 and 30 recorded examples of medieval conduits from monasteries, noble residences and towns, yet the appendix to this article lists examples from over 40 towns.¹⁰⁵ The systems installed in several towns during this period had a remarkable longevity. London's Great Conduit was not demolished until 1669, after sustaining serious damage in the Great Fire of 1666, and in other towns, including Lincoln and Scarborough, medieval conduits remained in use until the nineteenth century.¹⁰⁶ Public conduit systems continued to be installed in towns in the sixteenth and early seventeenth centuries,¹⁰⁷ but with the development of private water companies such as London's New River waterworks, which provided individual supplies to wealthy households, maintaining public systems became a lower priority for urban governments.¹⁰⁸

The provision of piped water supplies raises queries about precise dating, finance and the motives behind their provision. Dobson voiced

¹⁰² G. Wickham, *Early English Stages 1300 to 1660*, 3 vols., 2nd edn (London, 1980), vol. I, 54–8; L. Manley, *Literature and Culture in Early Modern London* (Cambridge, 1995), 223–33; Barron, *London*, 19–20.

¹⁰³ City of Exeter Museums and Art Gallery, *Exeter's Underground Passages* (Exeter, 1994), 17.

¹⁰⁴ C.D. Liddy, 'Bill casting and political communication: a public sphere in late medieval English towns?', in J.A.S. Telechea and B.A. Bolumburu (eds.), *La Gobernanza de la Ciudad Europea en la Edad Media* (Logroño, 2011), 447–61.

¹⁰⁵ English Heritage, *Designation Scheduling Selection Guide: Utilities* (2012), 8.

¹⁰⁶ Birch *et al.*, *Poultry and Cheapside*, 152; M.S.R. Jenner, 'From conduit community to commercial network? Water in London, 1500–1725', in P. Griffiths and M.S.R. Jenner (eds.), *Londonopolis: Essays in the Cultural and Social History of Early Modern London* (Manchester, 2000), 260–2; Debenham, 'Scarborough's water supply'; Magnusson, *Water Technology*, 165–6.

¹⁰⁷ J.H. Thomas, *Town Government in the Sixteenth Century* (London, 1933), 61–2.

¹⁰⁸ Jenner, 'Conduit community'.

similar concerns over the building and rebuilding of town halls and parish churches in the late medieval town.¹⁰⁹ The limited evidence for dating conduits makes the identification of general trends over time problematic, but the majority of references date to the later Middle Ages, when earlier systems were extended and new supplies installed. As most English towns were smaller in 1500 than in 1300, investment in water supplies was rarely in direct response to population growth.

The growth in civic piped water supplies in the later Middle Ages reflects the increasing role of urban governments in their provision and upkeep, and this growing involvement can be found in other areas of town life, notably public health and marketing. Even before the dissolution of the monasteries, civic authorities were taking greater responsibilities for urban water systems that had been established by religious houses. Rexroth argued that concerns about dirty streets and polluted waterways in London arose from the 1360s onwards in response to ideals of purity and transparency, with environmental and moral dimensions, and were used by the city's ruling elite to legitimize its own authority in competition with the crown, but similar orders are found in many provincial towns for cleaning streets and watercourses, improving hygiene and enforcing pollution controls, 'suggesting coherent strategies for environmental improvement, based upon current medical opinion'.¹¹⁰ Such trends may, however, be exaggerated by the paucity of documentary evidence for public health initiatives in towns, including piped water supplies, street cleansing and paving, prior to the late Middle Ages, which 'may reflect records rather than reality'.¹¹¹

There were important parallels between regulations directing the use of conduits specifically and those controlling urban water resources more generally, and also with those governing urban markets. Civic authorities sought to regulate hours of access, give consumers priority over producers, prevent networks from being illegally intercepted, punish those who infringed, restrict supplies in times of scarcity, investigate claims that public health was being endangered, and make particular reference to protection for the poor. Both marketplaces and conduits provided focal points for civic pride expressed through architectural embellishments and ceremonial pageantry.¹¹² The parallels between water and foodstuffs is not exact, however, as conduit water usually benefited only a minority, whereas foodstuffs affected most of the townspeople. In both cases, though, they illustrate the capacity of civic authorities to intervene more

¹⁰⁹ R.B. Dobson, 'Urban decline in late medieval England', in R. Holt and G. Rosser (eds.), *The Medieval Town. A Reader in English Urban History 1200–1540* (Harlow, 1990), 272–5.

¹¹⁰ F. Rexroth, *Deviance and Power in Late Medieval London* (Cambridge, 2007), 73, 102–4, 108; Rawcliffe, 'Public health', 192; Jørgensen, 'Local government responses'; C. Rawcliffe, 'Health and safety at work in late medieval East Anglia', in C. Harper-Bill (ed.), *Medieval East Anglia* (Woodbridge, 2005), 130–51.

¹¹¹ *CUHB*, 178.

¹¹² Jenner, 'Conduit community'.

actively in regulation and enforcement during the later Middle Ages than before.¹¹³

Motives for establishing piped water supplies seem to have been charitable provision and civic pride. Piped supplies were driven by an emphasis on the quality of supply rather than the volume. Safer than wells, they reduced the risk of contamination and could supply several people simultaneously. Conduits enhanced civic pride and identity. They caught the eye of John Leland, along with market crosses and paved streets, reflecting his own preoccupations, notably his approval of order, cleanliness and modernity.¹¹⁴ The extent of their provision, though, was probably very restricted. In 1350, only about 45 householders paid rent to draw water from the Great Conduit in London. Magnusson felt that conduits never provided sufficient water to eliminate or probably even seriously reduce citizens' reliance on rivers and wells.¹¹⁵ Supplies often seem to have been limited by the capacity of the springs, leading to attempts to tap new sources, as at London in 1430 and 1543–44, Exeter in 1493–94 and at Gloucester in 1541–42.¹¹⁶ This was in distinct contrast to the introduction of river water systems in the later sixteenth century, when volume became a more important consideration and purity less so, as provision was now driven by industrial and wealthier users rather than motives of charitable provision for the poor and civic pride. That said, even in early modern towns, water supplies were often intermittent, of uncertain quality and rarely extended beyond the main streets.¹¹⁷ As with many other aspects of urban infrastructure in the later Middle Ages, including bridges and hospitals, charitable donations appear to have been significant in establishing civic conduits, and arrangements for their upkeep were often *ad hoc*. Rosser's comment regarding the establishment of small urban almshouses and infirmaries in the later Middle Ages could apply equally to civic piped water supplies – 'the fragmentary character and humble scale of these and similar charitable ventures in the late medieval town were never commensurate to the actual need'.¹¹⁸ The piped water systems managed by civic bodies in medieval English towns reflected the fervent belief in the spiritual value of charitable works by wealthy individuals and the efforts of civic authorities to establish, maintain and regulate them.

¹¹³ CUHB, 331.

¹¹⁴ Lee, 'Small towns', 23.

¹¹⁵ R. Magnusson, 'Public and private urban hydrology: water management in medieval London', in S.A. Walton (ed.), *Wind and Water in the Middle Ages. Fluid Technologies from Antiquity to the Renaissance* (Tempe, 2006), 184.

¹¹⁶ Lewis, "'For the poor'", 57; Juddery and Stoye, 'Aqueducts', xvi; *Statutes of the Realm (1101–1713)*, Record Commission, 11 vols. (London, 1808–28), vol. III, 873–4, 967–9.

¹¹⁷ Peter Clark (ed.), *Cambridge Urban History of Britain*, vol. II: 1540–1840 (Cambridge, 2000), 311.

¹¹⁸ CUHB, 367.

Appendix: piped water supplies with public access in medieval English towns to c. 1550

Ashburton

Fraternity supports town's lead pipe conduit (Kreider, *English Chantries*, 69).

Bath

1263 and 1280 supplies constructed serving the town and Benedictine priory (Bond, 'Monastic water management', 123–4). Spring water brought to houses by lead pipes (*Itinerary*, vol. I, 140).

Boston

1327 licence for Dominican friary to construct conduit from Bolingbroke (12.5 miles away) for own use and for others in the town. Not known if this was completed (Bond, 'Urban monastery', 57).

Bridgwater

1427–28 conduit in the High Market (*Third Report of the Royal Commission on Historical Manuscripts* (London, 1872), 315).

Bristol

c. 1190 St Mary Redcliffe Church granted pipe of water by Robert Berkeley. 1381 St Thomas' church conduit first recorded. Shared systems with Augustinian, Franciscan, Carmelite and Dominican friaries (Bond, 'Urban monastery', 57–8, 63). By 1539–45 there were eight conduits (*Itinerary*, vol. V, 92).

Burton-on-Trent

Mid-thirteenth century: possible reference to a maker or supervisor of conduit. By 1431 probably a conduit in the marketplace (*VCH Staffordshire*, vol. IX, 97).

Canterbury

c. 1160 plan of Christ Church Cathedral Priory system shows cistern outside main precinct, which would have been accessible to public (R.A. Skelton and P.D.A. Harvey, *Local Maps and Plans from Medieval England* (Oxford, 1986), 54–7).

Chelmsford

By mid-fourteenth century, water carried in underground elm pipes to marketplace. Probably built by the Dominican friary, which carried water from the same source to their house in 1341 (H. Grieve, *The Sleepers and the Shadows*).

Chelmsford: A Town, its People and its Past, vol. II: *From Market Town to Chartered Borough 1608–1838* (Chelmsford, 1994), 5).

Chester

1537 Franciscan friars began to construct a conduit, which came to be used as a public supply (*VCH Cheshire*, vol. V, part 2, 36).

Colchester

By 1539 conduit at the Hythe (*VCH Essex*, vol. IX, 290).

Coventry

1332 Edward III gave permission for a conduit. By 1483 there were four conduits (*VCH Warwickshire*, vol. VIII, 293; Harris (ed.), *Coventry Leet Book*, 517; *Itinerary*, vol. II, 107).

Dartmouth

1339–40 conduit referred to in property grant (*Fifth Report of the Royal Commission on Historical Manuscripts* (London, 1876), 602; *Itinerary*, vol. I, 220).

Dunster

1390s conduit in New or Middle Street (*VCH Somerset: work in progress*, Dunster www.victoriacountyhistory.ac.uk/sites/default/work-in-progress/dunster_local_government_1st_edited_draft.pdf accessed 19 Dec. 2012)

Durham

1450 construction of watercourse and pipe from spring to marketplace (M. Bonney, *Lordship and the Urban Community: Durham and its Overlords 1250–1450* (Cambridge, 1990), 51).

Exeter

Cathedral system of twelfth century, with public cistern, rerouted 1346–49. 1420–24 city constructed own system, extended in 1429/30, and in 1441 to serve Dominican friary. City also built in 1490s a new shared conduit with the Dominican friary from new springs and extensive underground passageways for its existing conduit, which were extended in the early sixteenth century (Juddery and Stoyale, 'Aqueducts'; *Exeter's Underground Passages*, 16).

Frome

By 1539–45 spring in churchyard conveyed into town by pipes and trenches (*Itinerary*, vol. V, 97).

Gloucester

1438 Franciscan friary shared their supply with town. By 1446 public conduit (*VCH Gloucestershire*, vol. IV, 262; *Itinerary*, vol. II, 57).

Ipswich

By 1395 common conduit (D. Allen, 'The public water supply of Ipswich before the Municipal Corporations Act of 1835', *Proceedings of the Suffolk Institute of Archaeology and History*, 40 (2001), 36).

Kingston-upon-Hull

1293 fresh-water dike, 1402 new dike constructed. Covered conduit installed 1449, removed 1461 (*VCH Yorkshire: East Riding*, vol. I, 371).

Lichfield

By 1270s town aqueduct possibly connected to cathedral close's system; Franciscan friary system with public conduit (*VCH Staffordshire*, vol. XIV, 96; *Itinerary*, vol. II, 100).

Lincoln

1539 Mayor and aldermen acquire former Dominican and Franciscan friars' conduits. 1540–44 extended in Wigford suburb (Stocker, 'Archaeology'; *Itinerary*, vol. I, 31).

Liskeard

By 1539–45 (*Itinerary*, vol. I, 209).

London

1237 citizens acquire springs at Tyburn and build Great Conduit, Cheapside, during 1230s or 1240s; 'Standard' conduit in Cheapside by 1395; new springs added, piping renewed 1439–55; Great Conduit rebuilt 1479; Gracechurch Street conduit 1491 (Barron, *London*, 256–7; see also Burch *et al.*, *Poultry and Cheapside*, 179–82, and Lewis, "'For the poor'", where the chronology differs slightly). See also below, Westminster.

Ludlow

By 1539–45 two castellets for conduit water (*Itinerary*, vol. II, 77).

Lynn

Before mid-fourteenth century, conduit in market. 1386 agreement between Augustinian friars and townspeople that friars would construct conduit with access for the community (Alsford (ed.), Medieval English Towns website). ‘Kettlemill’ by 1500 supplying water from river (Owen (ed.), *Making*, 16).

Newcastle-upon-Tyne

By 1341 shared with Franciscan friary (A.G. Little, *Studies in English Franciscan History* (Manchester, 1917), 15–16). By 1539–45 there were five heads of conduits for the town (*Itinerary*, vol. V, 126).

Newport (Shropshire)

1309 burgesses granted licence to dig and place lead pipes from spring (Jones, ‘Newport’, 248).

Northampton

Fourteenth-century conduit; replaced 1483 and improved 1543 (Thomas, *Town Government*, 60).

Petworth

By 1539–45 Parson Edmunds brings lead pipe from spring to town (*Itinerary*, vol. IV, 92).

Plymouth

Wooden conduits from late fifteenth century (C. Gill, *Plymouth, a New History: Ice Age to the Elizabethans* (Newton Abbot, 1966), 204).

Poole

By 1497 supply of water to town from outside borough in existence. 1542 grant authorized mayor and inhabitants to erect conduit head (Robins, *Story of Water Supply*, 138).

Richmond (Yorkshire)

By 1539–45 conduit at Grey Friars (*Itinerary*, vol. IV, 25) (Unclear whether there was public access.)

Rye

By 1520 conduit (Mayhew, *Tudor Rye*, 29).

Salisbury

Early thirteenth century: water supplied through shallow channels running down the centre of most streets for household and industrial use (Royal Commission on the Historical Monuments of England, *Salisbury. The Houses of the Close* (London, 1993), 2–4; *Itinerary*, vol. I, 259).

Sandwich

By 1153–67 the Delf, freshwater stream in existence. 1483 conduit shared with Carmelite friary, second conduit for town's own use by 1485 (Clarke *et al.*, *Sandwich*, 36–7, 134).

Scarborough

1283 agreement for conduit to supply Franciscan friars and burgesses, constructed 1319 (Debenham, 'Scarborough's water supply', 4).

Shrewsbury

'By close of Middle Ages' abbey had conduit for inhabitants of its manor (R. Cromarty, 'The water supply in Shrewsbury 1500–1835', *Transactions of the Shropshire Archaeological and Historical Society*, 75 (2000), 15).

Southampton

1310 Franciscan friary allowed burgesses pipe from their cistern. Conduit purchased by town 1421 (Bond, 'Urban monastery', 62; *Itinerary*, vol. I, 278).

Stamford

By 1539–45 serving friars houses and town (*Itinerary*, vol. IV, 90).

Taunton

By 1414 conduit in existence (Somerset Historic Environment Record).

Tiverton

Mid-thirteenth century: Isabella, countess of Devon gave the right to springs which were brought by open leat to the borough (Robins, *Story of Water Supply*, 110).

Totnes

By 1539–45 conduit with three castellettes in town (*Itinerary*, vol. I, 219).

Waltham

1220s abbey provided supply from its conduit to townspeople (Bond, 'Monastic water management', 99).

Wells

Early thirteenth century open conduit built to carry water through cloistral area to market place. 1451 Bishop Beckington granted burgesses portion of water (Bond, 'Urban monastery', 52; *Itinerary*, vol. I, 145).

Westminster

1447 townspeople granted overflow from palace conduit (*Calendar of Patent Rolls 1446–52*, 45; G. Rosser, *Medieval Westminster 1200–1540* (Oxford, 1989), 239–40).

Winchester

Probably from late ninth century: open water channels along streets (Keene, *Winchester*, 56).