

CHAPTER FOUR

IMPLEMENTATION OF THE ACT: WHAT WAS DONE

In the absence of any initiative from the City in starting to build their canal, a fresh initiative arose which concentrated solely on improving the navigable river between Hertford and the Thames.

John Norden was later to ascribe this initiative to 'the instant suite of the inhabitantes of Hartfordshire',¹ but no other comment can be made on the events which led to the issuing of a Commission of Sewers on 27 September 1575.² It was this body which was to substantially improve the river during the ensuing years of the decade.

Commissions of Sewers were traditionally forums where a compromise between the conflicting interests of the bargemen, fishermen, millers and riparian landowners could be effected and maintained, but this commission deliberately gave precedence to the interests of the navigation. Other interests were accommodated, but were subordinated to those of the bargemen.

This bias arose because the commission was not restoring and preserving the traditional flash lock navigation, they were instead introducing a novel and radical experiment in river improvement. This experiment is nowhere precisely described; it emerges from a careful consideration of the available documentation. Briefly stated it was that the commissioners either issued orders or reached agreement with millers and landowners along the valley whereby the amount of water flowing out of the river was restricted and controlled. Artificial embankments and other measures were introduced to train this increased amount of water into a defined narrower navigable channel, from which all obstructions such as shoals, osier beds and fishing weirs were removed. The only exceptions were that there were flash locks at Stanstead and Broxbourne and a pound lock at Waltham. A tidal lock at Bow was also left in situ.

This policy had two aims. Firstly the barges would be able to pass up and down the river without relying upon flashes every two or three miles, thus avoiding the delays that this involved. Secondly it was hoped that the removal of the weirs and the training of the flow of water into a narrower channel would increase the current's scouring action and so prevent the formation of shoals and preclude the need for constant dredging.

Without further evidence the conception of this policy cannot be determined. Had it first been proposed by Honrighe and Tymberman in 1560? Had the City considered such a policy when they obtained the act of 1571? Or had fresh advice been taken since then? What can be said is that this experiment was unique.

There is no evidence to suggest it was ever attempted elsewhere in England at this date or later.³

4.1 The creation of the navigable channel ⁴

Section based on two documents unless otherwise stated.

- 1) *BL, Landsdowne MS. 38 no.36, 'A note of all the defectes matereall in the Water of Lee from Waltom holy cross all a longe the iij milles benethe Stratford of the Bowe'. Catalogued as 1583, but should be c.1575-76. Defects are those which would be noted when work commenced, and note is made about which was the navigable channel near Temple Mills, a problem which was sorted out about the 17th year of the reign (PRO, S.P. 12/248 no.97) This document is referred to as the 'early survey'.*
- 2) *PRO, S.P. 12/109 no.19. A list of orders issued on 20 October 1576. Referred to as the 'commissioners orders'.*

A traditional task of any Commission of Sewers was to remove the shoals which built up on the bed of the river wherever the current slackened, at bends or above and below obstructions such as fishing weirs and milldams. Indeed many fishermen and millers assisted this process by dumping earth and rubbish into the river, thus ensuring that a flash was requested by the bargemen.

The newly appointed commissioners pursued this task with a thoroughness which may not have been displayed by earlier commissions, for the creation of a well dredged channel was an integral part of their policy. If any shoal could be attributed to a particular weir or piece of land, then the owner of that property was made responsible for scouring the shoal at his own expense. However many shoals could not be so attributed. These were removed by the officials of the commission and the cost was met out of a general rate levied on the local inhabitants.

A further development was that in October 1577, after two years work, a special survey was made of the river. A barge was loaded at Ware with two tons and sent down river. The draught of this barge was 18", and it managed to make the trip without running aground. Nevertheless it did touch the bottom on several occasions and note was taken of these spots so that further dredging could be undertaken. ⁵

Even fords at Sewardstone and Chingford were removed in pursuit of this policy. Contemporary records show that several people drowned at Chingford during the ensuing years whilst attempting to ford the river! ⁶

Other natural obstructions impeded navigation, so orders were issued to cut down willow trees which grew in or overhung the river, and to remove osiers or other reeds from the navigable channel. One effect of such measures was to allow water to flow down river more quickly, thus increasing the scouring effect of the current.

To further ensure the free flow of an adequate supply of water measures were introduced to restrict and control the amount of water flowing out of the designated navigable channel. One such measure was that the alternative channels or 'by waters' which flowed down the opposite side of midstream islands were blocked off.

Another was the policy adopted towards the numerous ditches which flowed into and out of the river. Such ditches were important to the riparian landowners for they acted as drains, supplied water to surrounding meadows and fields, and functioned as cheap fences. Their frequency however did pose a problem for any policy designed to control the flow of water in the river.

An order issued in 1576 implies that the commissioners wished to see most of these ditches blocked off, but that sufficient opposition had been aroused to force a compromise:-

where any gutter water Course or Ditche yssuing from the said Ryver to the land shalbe stopped uppe if that the same maie be any hinderance to any pson...for the watering of there groundes it shall ... be lawfull for any suche...to lay in the Said gutte water Course or ditch at there owne Chardge one thorough or trough of tymber iij foot from the Channell of the Said Streame so the same ... be not above x ynches...at thende next the Said Ryver

Other sources show that earth dams or wooden piling were placed across the mouths of these ditches, and that either pipes or holes in these structures allowed water to flow into the channels behind. The picturesque term 'pysser' was used to describe these pipes, a usage not found in the O.E.D.⁷

Having ensured by these measures a greater supply of water for the navigation, the commissioners then erected artificial embankments to train this water into a designated navigable channel.

Unfortunately the few remaining records of this commission make no reference whatsoever to such embankments, they are only mentioned in reports about the 1581 riots. Reference is then made to 'A banke or Juttie (jetty) newly made at Susterneforde (Sewardstone) for the narrowing of the water for the better passage of boates', and a similar bank in Cheshunt.⁸

There is no indication as to how frequent such artificial embankments were. If only because of the cost it seems unlikely that they were built all along the river. It seems more probable that they were built only at strategic points where they could best narrow and train the navigable channel and increase the strength of the current's scouring action.

Besides this improved navigable channel, the commissioners introduced other measures to ease the passage of the barges. Several footbridges were either removed or raised by 2 feet, whilst road bridges at Ware, Stanstead, Waltham, Higham Hill and Hackney were also raised. Before this the bridge at Waltham stood only 2 feet 8 inches above the water

level, but the bridges seem only to have been raised to about 4 feet above.⁹ Bow Bridge at Stratford was also rebuilt, but this was to replace the derelict old bridge not to facilitate the passage of the barges.¹⁰

10 *Before the Dissolution, Bow Bridge had been maintained by Stratford Abbey, but the secular owners of the confiscated lands ignored this responsibility. By the end of the 1570s the bridge was in such decay that a temporary wooden frame had to be erected whilst repairs to the stone bridge were organised. In 1568 the City of London refused to accept responsibility for the bridge, and in the mid-1570s the secular owners of the confiscated lands followed suit (it was forced on them the following century). It was not until the mid-1580s that a new stone bridge was erected at an estimated cost of £600. The City voluntarily subscribed £50 towards this, the remainder was collected by rates upon local inhabitants as well as rates raised within the counties of Essex Suffolk. In addition a temporary two year toll was imposed on users:*

The banksides were also cleared of trees, bushes and other obstructions so that the bargemen could walk along without interruption when haling their barges. This was a traditional measure, but this commission also introduced 'low bridges for towyng' so that the bargemen did not have to wade across the millstreams. Many of these bridges were pulled down as soon as they were built.¹¹

4.2 Policy towards the fishing weirs

There had long been questions over the rights of fishing weirs, over whether they harmed the navigation, over whether they destroyed the fry and brood of fish, and over whether they caused floods by penning back too much water. In Henry VIII's reign there had been a nationwide campaign to remove them (see Chapter 1). In 1566 two bills were introduced to Parliament to remove them from the Thames and other rivers¹². Both failed, but they illustrate the continuing prejudice.

12. *First bill passed the Commons, but did not get to the Lords. The second was defeated in the Commons by 65 votes to 62.*

The policy of the newly appointed commissioners was unequivocal. All fishing weirs were to be removed from the navigable channel whether they laid claim to ancient rights or not. Their removal was an essential part of a policy to introduce a navigation which did not rely on the provision of flashes.

Indeed in one sense the policy can be seen as a response to the prevailing prejudice against weirs. If weirs were removed, for whatever reason, then there must have been situations where this brought more harm than benefit to any navigation. Evidence to a Commission of Sewers in 1551 suggests that this may have been the case along the Lea.¹³

In the absence of weirs, positive steps were needed to protect the navigation. The experimental policy introduced along the Lea in the 1570s was one such response.

The removal of the weirs was amongst the first tasks undertaken by the commissioners. The early survey noted five weirs between Waltham and Stratford. One was found to be standing 5 feet into the river and it was removed and 'sett even with the river bancke', the others were just removed. Then in June 1576 a jury presented that within the parish of Tottenham there was a 'hobling(?) made with Stakes + bushes over the River saving the bredthe of vii or viii foote which was as we suppos done by the Earle of Rutlandes fyshermen' .¹⁴ This too was removed.

14. Is 'Hobling' (?) an ebbing weir? Such weirs stood in tidal stretches of rivers. A survey, catalogued as c.1560, suggests that the tide came up to Lock Bridge beneath Tottenham Mills.

Notwithstanding such determination the commissioners met with delays in complying with such orders. In October 1576 they complained that despite their former decrees piles, stakes and other parts of weirs were still standing in the navigable channel, and they ordered that such obstructions be removed within a month otherwise their owners would be fined 3s 4d for every stake, pile or piece of timber still standing. It seems reasonable to assume that these orders were complied with for the survey in October 1577 does not mention this problem.¹⁵

4:3 Policy towards the mills

For any improvement policy to succeed, agreement had to be reached with the millers along the valley, and any such agreement had to acknowledge the fact that the mills were expanding in size in order to exploit the growing London market as well as the needs of the local populace. Unfortunately the remaining records of the commission provide little information; the policy adopted towards the mills has to be pieced together from other sources.

In the 1590s the bargemen defended this policy against accusations that the mills had suffered: -¹⁶

it hath ben with Care and discreacon soe ordered ... that all the mills might stand and have sufficient water ... without greate difficultie, saving att Stanstide Broxborne and Waltham where the owners of the mylnes ...have ben pmitted to divert the Queenes streame by lockes to their mylnes soe longe as they Will maintaine passage for the Barges by Bye streames

The policy was thus that the commissioners agreed that three mills along the upper river were to keep locks, in the navigable channel, albeit with major changes to previous arrangements, whereas other mills were not, and other arrangements were introduced at these mills to control the water available for milling and for the navigation.

The fact that only three milldams were left in situ along the non-tidal river does not necessarily mean that several were removed by the commissioners. Some mills would not have had dams in the navigable river to remove. In fact far too little is known of the

previous arrangements to allow a proper evaluation of the changes introduced by the commissioners. All that can be done is note the measures introduced, where these are known, of the three locks that were authorised, the best documented is the famous pound lock at Waltham.

Briefly stated, I have presented the detailed evidence elsewhere,¹⁷ the commissioners opened up a new route (Route A on Figure 3) and closed off the traditional river route(Route B) by a lowshare*.

The new route took barges down the head stream of Waltham Abbey Corn Mills to a point just above them; they then turned into a new cut, dug on the commissioners' orders, which took them back into the traditional river channel just above Waltham High Bridge. At the entrance to the new cut from the mill stream the first pound lock in this country with mitre gates at both ends was built.

Such a policy was presumably adopted so that the improvements to the navigation also brought increased benefits to the mill by making more water available. Such a policy would have been necessary both to justify the fact that the owner of Waltham Abbey Corn Mills bore the cost of this work, and to alleviate the usual fears among millers that navigation improvements harmed their interests. Such principles presumably influenced the new routes opened at Stanstead and Broxbourne Mills, and the arrangements at other mills along the valley. The surprising absence of opposition, from millers, except at Enfield and later Waltham, seems to substantiate this.

No contemporary evidence remains about the arrangements introduced at Stanstead and Broxbourne other than that new routes were opened and that locks were erected. Since the observant swans in Vallan's poem¹⁸ made no comment about these locks it seems reasonable to assume that normal flash locks were built rather than the new type of pound lock that was built at Waltham, which the swans did note.

Some indication of the new arrangements at Broxbourne can be obtained from a comparison of the two maps reproduced opposite as Figure 4. The top map shows the situation shortly before 1576, the bottom map the altered channels as they existed during the first half of the eighteenth century. It can definitely be established that the alterations had been made before 1641.¹⁹

19. . In the 1740s Lea bargemen vaguely remembered that the mill river had once been the navigable channel

Since there is no evidence to suggest that such alterations could have been made to the channels at any other date in the intervening period, it seems sensible to assume that the alterations were part of the new arrangements introduced by the commissioners during the 1570s.

Based on this surmise the commissioners opened a new route, shown as Route A on the bottom map of Figure 4. This new route took barges down what had been lower parts the tail stream from Lynch Mill in Hoddesdon, then down a new cut into the head stream of

Broxborne Mills, then down part of this head stream before entering another new cut which took the barges back into the traditional river.

If the arrangements at Waltham can be used as a guide, it might be expected that the lock would have been erected along the cut between the head stream and the Lea in order to provide a flash, and that a lowshare would have been built across the traditional river channel just below what was the beginning of the new route. Such arrangements would have made more water available to the mill as well as improving the navigation.

About the arrangements introduced at Stanstead only even more tenuous surmise is possible. Arguments in the first half of the eighteenth century (see 11.5 & 16.4 and Figure 9) centred on the fact that the miller was forcing the bargemen to use his head stream and then pass down a cut back into the Lea with the assistance of a flash from a lock in this cut. It seems likely that the miller was taking advantage of an alternative route first opened by the commissioners during the 1570s, for it reflects the same principles which were introduced at Waltham and Broxbourne.

Another mill where the arrangements introduced by the commissioners can be pieced together is Enfield Mills, the property of the Wroth family. These mills were rebuilt and enlarged in 1572 so that the mill stream was made 'greater and larger than the high river'. In 1562 there was a lock near the mouth of the mill stream, and it is most probably this lock, or a rebuilt version, which in 1581 was described as 'Ladie Wrothes olde locke'.²⁰

The commissioners' new arrangements were that this lock was dismantled and the mouth of the head stream blocked up. A new entrance to the head stream was then dug, and across its mouth was erected the lock shown in Figure 5 below.

This lock was a frame into which boards could be inserted to make it a dam. These boards were usually left out so that water could flow into the head stream, but when barges approached the boards were inserted. This cut off the supply to the mills but increased the amount of water in the navigable channel whilst the barges passed. Afterwards the boards were removed and the supply to the mills resumed.²¹ It should be noted that Enfield Lock worked on the same principle in the eighteenth century.

The fact that there was a lock near the mouth of the head stream in 1562 suggests that the commissioners modified existing rather than introduced new arrangements. It seems likely that the Wroth family's opposition to the navigation improvements arose partly from their anger that the alterations they made to the millstream in 1572 were nullified by the commissioners' orders.

The precise arrangements introduced at other mills cannot be determined, but their owners, like those of mills already considered, would all have reached agreement or received orders concerning the width and depth of their head streams. Such measures

were traditional, but they were still an important part of any policy designed to restrict and control the amount of water available for the navigation.

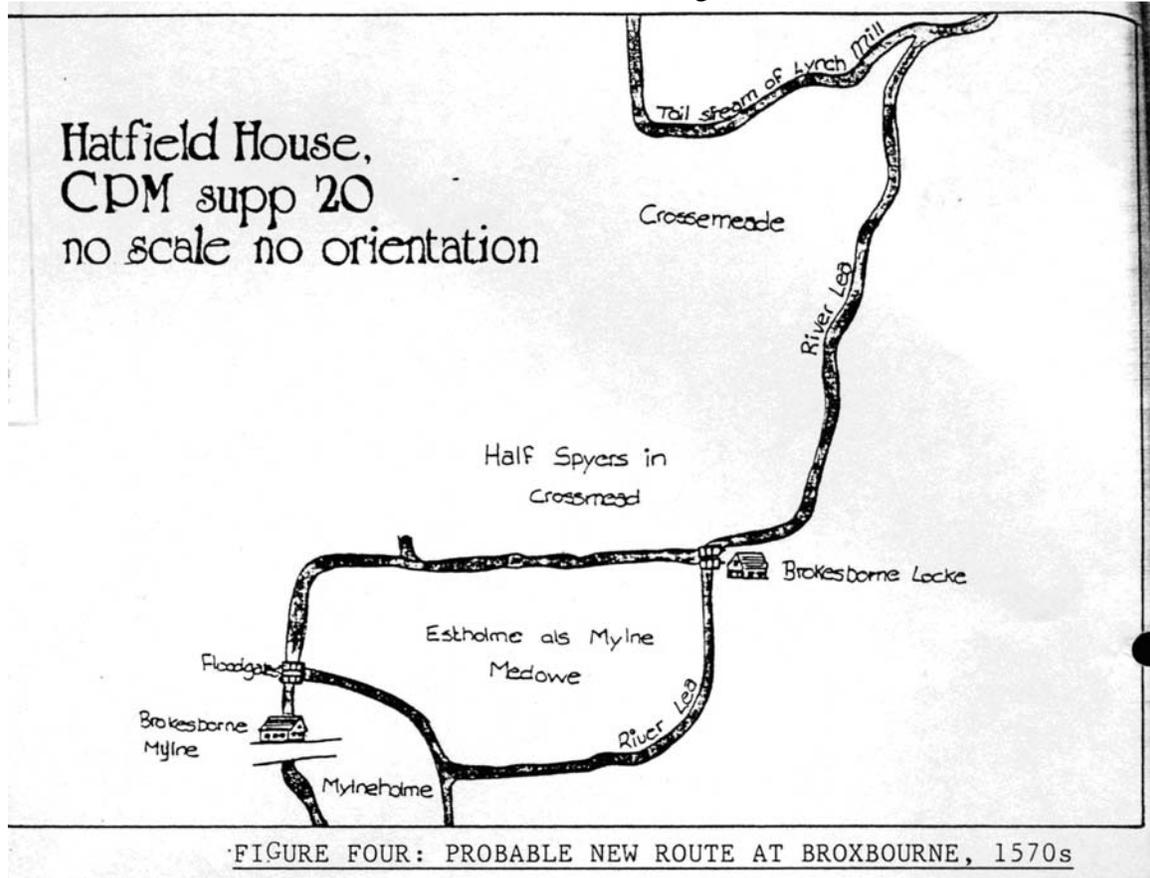


FIGURE FOUR: PROBABLE NEW ROUTE AT BROXBOURNE, 1570s



Hertford Record Office
Ref B 479

Map showing Broxbourne Gull and Millstream and the location of Cartagena Turnpike. Probably soon after 1741

Similarly arrangements would have been made for the shutting down of the mills, for the opening and closing of their gates, and any other measures which would have made the greatest amount of water available to the navigation whenever it was desired. No details of such arrangements remain.

Under usual circumstances the millers would have been entitled to a toll for such co-operation, but there is a possibility that tolls were not allowed, for no reference to their existence at this period is known.

If such was the case there were other means of obtaining the miller's co-operation. Careful control of the river regime could allow more water for the mills as well as the navigation, as at Waltham. The improved navigation offered benefits to millers who wished to deal in meal themselves.

Finally there is a possibility (see 4.4) that the passage of barges was restricted to certain days of the week. Thus any interruptions to the mills would have been concentrated, and a determined pattern of working could be assayed.

4.4 The overall experiment

The measures so far described were part of a determined policy. The interests of the weir-owners and the riparian land-owners were definitely subordinated to those of the navigation, and novel departures were considered to reach accommodation with the millers.

The commissioners were attempting to control the river regime so that more water was available for the navigation. They were training this water into a defined narrower navigable channel, using artificial embankments where necessary, from which all but a few obstructions were removed.

An important and novel feature of this policy was the attempt to prevent the formation of shoals, relying on the scouring effect of the stronger uninterrupted current to achieve this end:²²

The lenger it is traveled, the more Navigable it is: as hetherto experience doste shew. The often passage of boates keepeth open the Chanell, and by the helpe of the Streame by often workinge, Dryveth the Shelves Downe into the depthes: And would doe more to the perfection of the same, yf malicious persons would suffer the river, to retayne the full water, that of right appertayneth

Preventing the formation of shoals was important for the continuous passage of barges, especially since they no longer had flashes of water to carry them over such shoals. It would also mean less frequent scouring of the river.

Whether the commissioners were successful in achieving these ends cannot be determined for lack of evidence. It can be noted that later writers made similar proposals for the problems of shoals.²³

23. *'We shall begin by shewing how the Stream is to be contracted, to carry off Shoals or sand Banks, without the Assistance of human force': C. Vallancey, A Treatise on Inland Navigation, or, the Art of making Rivers navigable, of making Canals in all Sorts of Soils, and of Constructing Locks and Sluices (Dublin, 1763), 29. 'The only permanent method of lowing soft shoals ... is by reducing the width of the channel along the site of the shoal, thus producing its removal by increased scour, which also prevents it forming again' 'The regulation of a channel is more effectually accomplished by longitudinal embankments'*

Another aim was to obtain a more regular and speedier navigation than that associated with the reliance on frequent flashes of water. A description of the navigation by Burghley in 1588 suggests that the commissioners were successful:²⁴

24. *Hertford market was on a Saturday, Ware market on a Tuesday:*

They lade on Saturday, on Monday go down to Boo bridge to tarry the tide. From ye Boo with the tyde they will pass in 4 houres, if they roo away. They com on to London with fludd, and return at an ebb to the creke mouth, and then with a flood ... They come from the Boo to Waltham in 6 houres, and from Waltham to Ware in another 6 houres

This description may imply a fixed pattern of travelling on certain days of the week. Complaints in 1587 and descriptions of the riots in 1592 both seem to confirm that barges travelled together on one or two days of the week only.²⁵ Further evidence is necessary to be certain about such a pattern, but it would be a sensible compromise with the millers whose co-operation was necessary for the experiment to be successful.

It is unfortunate that more information is not available about this policy, for it was an unusual approach to the problem of improving a river navigation. The normal method of improvement was the introduction of pound locks and the construction of navigation cuts. The policy introduced along the Lea was a unique attempt at a different approach.

4.5 The river above Ware

Contemporaries always cited Ware as the main beneficiary of the improved navigation, but there is evidence that the river between Hertford and Ware was also improved at this time, and there was even a proposal to improve the river a further five miles above Hertford.²⁶

There is no contemporary evidence about the improvements above Ware, but in 1647 elderly inhabitants of Hertford recalled that 'within 60 yeres there was a turne Pyke at the Hedye of blacke ditch'.(see Figure 8) and that barges carried wheat and malt from Hertford to London.²⁷

Inhabitants of Hertford were named as barge owners in 1581 and 1588, but on the second occasion it has to be noted that the size of their barges was only 26 quarters carrying capacity compared to the 36-40 quarters of barges owned by inhabitants of Ware. This suggests that the improvements above Ware were somewhat limited compared to those below.²⁸

During the winter of 1594-5 major flooding along the river destroyed Ware Bridge and the turnpike at the head of the Black Ditch. Thomas Fanshawe, lord of the manor of Ware and a major instigator of the improvement scheme along the Lea, took advantage of this natural disaster to close down the navigation above Ware. Instead of rebuilding the turnpike he ordered that a dam be built across the mouth of the Black Ditch. It was over 50 years before the navigation between Hertford and Ware was once more improved.²⁹

It is not clear who was responsible for these improvements above Ware. Theoretically the Commission of Sewers had no jurisdiction over the river above Ware. However there was a Court of Sewers at Hertford in October 1578,³⁰ so perhaps they were responsible. There is no evidence that the work was carried out by either the Duchy of Lancaster or the Borough of Hertford.

4.6 The lower tidal river

The lower tidal Lea below Hackney was the responsibility of the Commissioners of Sewers. The problems along this stretch of the river were different from those of the non-tidal river, so it is unlikely that the policy was identical.

Of the measures introduced, it is known that the commissioners made a special investigation of which channel 'at the partinges benethe temple milles of ij Streames' was the traditional river channel.³¹ There is also evidence that the river bed was scoured, for the miller at St Thomas Mills wanted his rent reduced to compensate for the fact that the removal of a shoal from the river bed reduced the amount of water flowing to his mills.³²

Since there was sufficient water along this part of the river, and the problems of flooding were more important, it seems likely that the commissioners concentrated on scouring the river bed and defining and strengthening the existing banks. Such was the traditional policy of any commission; there was no need for the novel measures adopted further up river. Bow Lock had been rebuilt in 1573 by the miller as part of normal maintenance procedures.³³ There is no evidence that the commissioners interfered with these arrangements. It must also be emphasised once more that no navigation cuts were built along these lower stretches (see 3.1 and 12.1).

NOTES TO CHAPTER FOUR

1. BL, Harleian MS. 570 fo.10.

2. Bodl., MS. Rawl. Essex 11 fos.98-99.
3. W.T. Jackman, *The Development of Transportation in Modern England* (London,1966 ed), T.S. Willan, *The Inland Trade* (Manchester,1976); T.S. Willan, *River Navigation in England 1600-1750*(London,1964) ed
4. Section based on two documents unless otherwise stated. 1) BL, Landsdowne MS. 38 no.36, 'A note of all the defectes matereall in the Water of Lee from Waltom holy cross all a longe the iij milles benethe Stratford of the Bowe'. Catalogued as 1583, but should be c.1575-76. Defects are those which would be noted when work commenced, and note is made about which was the navigable channel near Temple Mills, a problem which was sorted out about the 17th year of the reign (PRO, S.P. 12/248 no.97) This document is referred to as the 'early survey'. 2) PRO, S.P. 12/109 no.19. A list of orders issued on 20 October 1576. Referred to as the 'commissioners orders'.
5. BL, Landsdowne MS. 25 no.11. In 1588 it was stated that 'The greatest bardg laden draweth xvj ynches': Hatfield House, CP 166/47.
6. ERO, Calendar of Queens Bench Indictments Ancient relating to Essex 1558-1603, 99,100,113.
7. BL, Landsdowne MS. 32 no.34; PRO, S.P. 12/111 no.43.
8. BL, Landsdowne MS. 32 no.41.
9. BL, Landsdowne MS. 38 no.36; PRO, S.P. 12/109 nos. 2,33; S.P. 12/177 no.10; D.L. 1/187/A.34; T. Hearne, editor, *The Itinerary of John Leland the Antiquary* (9 vols,Oxford,1768-69), v. page xvi.
10. Before the Dissolution, Bow Bridge had been maintained by Stratford Abbey, but the secular owners of the confiscated lands ignored this responsibility. By the end of the 1570s the bridge was in such decay that a temporary wooden frame had to be erected whilst repairs to the stone bridge were organised. In 1568 the City of London refused to accept responsibility for the bridge, and in the mid-1570s the secular owners of the confiscated lands followed suit(it was forced on them the following century). It was not until the mid-1580s that a new stone bridge was erected at an estimated cost of £600. The City voluntarily subscribed £50 towards this, the remainder was collected by rates upon local inhabitants as well as rates raised within the counties of Essex Suffolk. In addition a temporary two year toll was imposed on users: APC, 1578-80,287-88; *ibid*, 1580-81, 108,114,129; CLRO, Repertories, 16 fo.341; *ibid*, 20 fos.96,107; PRO, E123/6 fos.34,35,58; GLRO, Acc 79/9; W.H. Overall, H.C. Overall,editors, *Analytical Index to the Series of Records known as Remembrancia preserved among the Archives of the City of London A.D..1579 – 1664, (London 1878) 34-35*

11. BL, Lansdowne MS 25 nos.11,12; PRO, S.P. 12/248 no.97.
12. CJ, i.77-80. First bill passed the Commons, but did not get to the Lords. The second was defeated in the Commons by 65 votes to 62.
13. Harte, fos.169-73. Evidence of John Younge.
14. Bodl., MS. Rawl. Essex 11 fo.99. Is 'Hobling' (?) an ebbing weir? Such weirs stood in tidal stretches of rivers. A survey, catalogued as c.1560, suggests that the tide came up to Lock Bridge beneath Tottenham Mills: PRO, S.P. 12/15 no.11.
15. BL, Lansdowne MS. 25 no.11.
16. Bodl., MS. Rawl. Essex 11 fo.96.
17. K.R. Fairclough, 'The Waltham Pound Lock', *History of Technology*, iv(1979),31-44. (See back folder)
18. W. Vallans, 'A Tale of Two Swannes' in T. Hearne, editor, *Itinerary of John Leland*, v. pages viii-xiv.
19. Hatfield House, CPM supp. 20; HRO, B479; Sir Walter Roberts, *An answer to Mr Ford's booke*. In the 1740s Lea bargemen vaguely remembered that the mill river had once been the navigable channel: HRO, B1110.
20. BL, Harleian MS. 1579 fo.155; Lansdowne MS. 32 no. 41; PRO, D.L. 42/97 fo.48.
21. BL, Lansdowne MS. 32 nos.33,41; *ibid*, 53 nos.76,78; *ibid*, 60 no.38; Hatfield House, Maps 11.53.
22. BL, Lansdowne MS. 32 no.40.
23. 'We shall begin by shewing how the Stream is to be contracted, to carry off Shoals or sand Banks, without the Assistance of human force': C. Vallancey, *A Treatise on Inland Navigation, or, the Art of making Rivers navigable, of making Canals in all Sorts of Soils, and of Constructing Locks and Sluices* (Dublin, 1763), 29. 'The only permanent method of lowing soft shoals ... is by reducing the width of the channel along the site of the shoal, thus producing its removal by increased scour, which also prevents it forming again' 'The regulation of a channel is more effectually accomplished by longitudinal embankments': L.F. Vernon-Harcourt, *Rivers and Canals* (2 vols, Oxford, 1896), i.52.
24. Hatfield House, CP 166/47. Hertford market was on a Saturday, Ware market on a Tuesday: J. Norden, *_Speculi Britanniae Pars, A Description of Hartfordshire*, (Ware, 1903), 3.

25. BL, Lansdowne MS. 53 nos.76,78; Harte, fos.2-15.
26. PRO, S.P. 12/177 no.10.
27. HRO, BHR Vol. 39 fo.1.
28. BL, Lansdowne MS. 32 no.36; Hatfield House, CP 166/47.
29. PRO, D.L. 42/98 fo.268; HRO, BHR Vol. 39 fo.1.
30. Hist MSS. Com. 13, Salisbury, p.165.
31. BL, Lansdowne MS. 38 no.36.
32. PRO, S.P. 12/111 no.13.
33. CLRO, Repertories, 18 fo.42.