= Bow Back Rivers =

Bow Back Rivers or Stratford Back Rivers is a complex of waterways between Bow and Stratford in east London , England , which connect the River Lea to the River Thames . Starting in the twelfth century , works were carried out to drain Stratford Marshes and several of the waterways were constructed to power watermills . Bow Creek provided the final outfall to the Thames , and the other channels were called Abbey Creek , Channelsea River , City Mill River , Prescott Channel , Pudding Mill River , Three Mills Back River , Three Mills Wall River and Waterworks River .

The rivers have been subject to change over centuries , with Alfred the Great diverting the river in 896 to create a second channel , and Queen Matilda bridging both channels around 1110 . Because the river system was tidal as far as Hackney Wick , several of the mills were tide mills , including those at Abbey Mills and those at Three Mills , one of which survives . Construction of the New River in the seventeenth century to supply drinking water to London , with subsequent extraction by waterworks companies , led to a lowering of water levels , and the river was gradually canalised to maintain navigation . Significant changes occurred with the creation of the Lee Navigation in 1767 , which resulted in the construction of the Hackney Cut and the Limehouse Cut , allowing barges to bypass most of the back rivers . A major reconstruction of the rivers took place in the 1930s , authorised by the River Lee (Flood Relief) Act , but by the 1960s , commercial usage of the waterways had largely ceased . Deteriorating infrastructure led to the rivers dwindling to little more than tidal creeks , and they were categorised in 1968 as having no economic or long @-@ term future .

However , British Waterways decided that their full restoration was an important aim in 2002 , and the construction of the main stadium for the 2012 Summer Olympics on an island formed by the rivers provided funding to construct a new lock and sluices which stabilised water levels throughout the Olympic site . It was hoped that significant amounts of materials for the construction of the Olympic facilities would be delivered by barge , but this did not happen . Improvements to the channels which form a central feature of the Olympic Park included the largest aquatic planting scheme ever carried out in Britain .

= = Name = =

It is unclear when the individually named rivers became known collectively as Bow Back Rivers . Charles Tween , writing on behalf of the Lee Conservancy , referred to them as both the Stratford Back Rivers and the Stratford Back Streams in 1905 . The section to the west of the more recent City Mills Lock was labelled Bow Back River on a map of 1895 , but had previously been part of Pudding Mill River . Powell , writing in 1973 , still referred to them as the Stratford Back Rivers .

The 1939 edition of " Inland Waterways of Great Britain " , an early attempt to provide a guide for the leisure use of canals , noted that the River Lee had " several subsidiary canalised waterways " , and listed Bow Creek , Old River Lee , City Mills River and Waterworks River , but did not describe them collectively . Boyes and Russell writing in 1977 referred to them as the Bow Back Rivers or Stratford Back Rivers , and by the sixth edition of " Inland Waterways of Great Britain " , published in 1985 , they were referred to as Bow Back Rivers .

The river which supplies the Bow Back Rivers has been known as the River Lee or River Lea , but modern usage tends to use " Lea " when referring to the natural river , and " Lee " when referring to the navigation , so that the Lee Navigation is a canalisation of the River Lea . The name Bow may derive from either an arched bridge over the River Lea in the 12th century or a bend in the road east of Bow Road station .

= = History = =

The Bow Back Rivers cross an area originally known as Stratford Marsh , an area of common Lammas land , where inhabitants had common rights to graze horses and cattle between Lammas Day (1 August) and Lady Day (25 March) , but which was used for growing hay for the rest of the

year . The Marsh was between Stratford @-@ Langthorne and Stratford @-@ at @-@ Bow . Little remains from pre @-@ history , but the names suggest that the two settlements lay at either end of a stone causeway across the marsh . Remains of a stone causeway have been found , but no traces of an associated road . The ford at Old Ford is of pre @-@ Roman origin , part of a route from London to Essex which crossed Bethnal Green . In the Roman era , a new road was built from London to the ford , which carried the principal road to Colchester . There may also have been a ford further south at Bow , and a further causeway existed between Homerton and Leyton , known as Wanstead Slip .

These crossings passed across a true marsh , either side of the River Lea . This wide , fast flowing river was then tidal as far as Hackney Wick , and navigable as far as Hertfordshire . Dates for the earliest use of the rivers by boats are unknown , although a late Bronze Age dugout canoe and parts of a Saxon barge have been found in the marshes at Walthamstow . The first alteration to the natural river may have been made by Alfred the Great , who cut another channel to strand a force of Danes in 896 , according to the Anglo @-@ Saxon Chronicle . This lowered the tide head to Old Ford , and prevented large boats sailing the river until the 15th century .

During the reign of King Henry I between 1100 and 1118 , his wife Queen Matilda (or Maud) , on hearing of the problems of crossing the river at Old Ford , directed that the road should be routed further south , and paid for two bridges , one to cross the Lee and the other to cross the Channelsea River , from her own funds . She also paid for the road to be built between them , and the location of the bridge became known as Stratford @-@ atte @-@ Boghe , later Stratford @-@ le @-@ Bow , and finally dropped Stratford to become Bow or Bow Bridge . John Leland , writing in the 1500s , gives a more fanciful account , in which the queen falling into the water prompted the action . The addition of le @-@ Bow probably had less to do with the shape of the bridge than the fact that arch was derived from arcus , meaning bow .

In 1135 , Stratford Langthorne Abbey was founded . The Abbey continued the process of draining Stratford marsh begun in the Middle Ages , and creating artificial channels to drive water and tide mills . A small river port developed at Stratford , mentioned in the 15th century , to serve the needs of Stratford Abbey and the mills at Stratford , and there is similar evidence in later centuries . The Abbey took on responsibility to maintain the marsh walls around Bow Creek , to keep the tidal waters out . The river was being used for the transport of goods and passengers by 1571 , when an Act of Parliament empowered the Lord Mayor of London to make improvements to the river to ensure that supplies of grain continued to reach the capital . These works included a new cut near the Thames , probably the section of river between Bow Tidal Gates and Old Ford , on which no tolls were to be charged , and a pound lock was constructed at Waltham Abbey , only the second to be built in England .

Between Bow Bridge and Channelsea Bridge there were three others , said in 1303 to have been built to fill the gaps caused by the cutting of mill streams through Maud 's causeway , although there is evidence that the mills pre @-@ dated the causeway . However , the mill owners took responsibility for the bridges , which crossed the mill streams for St Thomas 's , Spileman 's and Saynes mills . The last two were owned by the City of London , and the bridges were called Pegshole and St Michael 's Bridges . An administrative mistake around 1814 resulted in the City of London taking responsibility for St Thomas 's Bridge , but the miller did not complain as Pegshole bridge was smaller and therefore less costly to maintain . The names were eventually swapped , and all three were replaced by Groves Bridge in 1933 , which crossed the widened Three Mills Wall River , the two branches of the Waterworks River having been combined into Three Mills Wall River , while Three Mills Wall Back River was filled in .

Crossing the Back Rivers by a series of low @-@ level bridges is the Northern Outfall Sewer which leads to the Abbey Mill Pumping Station , both of which were designed by Joseph Bazalgette in the 1860s . Today , the route of the embankment that encloses the sewer from Bow to Beckton is followed by a public footpath , The Greenway .

= = = Public water supply = = =

Water was extracted from the rivers to provide a public water supply . The opening of the New River in 1633 , a 40 @-@ mile (64 km) channel built to bring water to London from Amwell springs , and soon afterwards from the River Lea near Ware , had a detrimental effect on both navigation and milling by reducing water levels . Around 1745 , the West Ham Waterworks Company built a waterworks at Saynes Mill in Stratford , the river on which it was located later being known as Waterworks River . The East London Waterworks Company was set up in 1807 , and built works at Old Ford , where they extracted water from the river . The supply to the works was moved further upstream in 1829 , and in 1830 they built a canal , running parallel to the Hackney Cut , so that water could be obtained from Lea Bridge . Much of the work was carried out by the contractor William Hoof , who had gained a reputation as a specialist tunnelling contractor , after working on Strood Tunnel for the Thames and Medway Canal and Harecastle Tunnel on the Trent and Mersey Canal . He worked on the waterworks project from 1829 until 1834 . Where there had been a reservoir to the south of the Middlesex Filter Beds weir in 1850 , maps from 1870 show the site occupied by a waterworks , and the canal which supplied the Old Ford works running beside the Hackney Cut . Another large reservoir , triangular in shape , was located between the old river and the Hackney Cut at Old Ford , with two connections to the old river . The water supply canal passed under the old river to feed two compensation reservoirs to the north of the Great Eastern Railway tracks . A covered reservoir was situated on the west bank of the old river .

The Waterworks River underwent considerable change over the years . In 1850 , it left the channel of the Old River Lee much further to the north , to the south @-@ west of Temple Mills railway depot . It was called Lead Mills Stream at this point . Near Temple Mills bridge , now on the A12 road , Channelsea River split off . The two channels ran parallel to the Old River Lee , before Channelsea River turned to the south @-@ east . There was another small connection between the Old River Lee and the Waterworks River called Bully Fence , where the northern Channelsea River is shown on modern maps . By 1870 , it was called Waterworks River as far north as Temple Mills depot , and by 1896 , its present connection to the old river near to Carpenters Road had been established . Twenty years later , the northern Waterworks River rejoined the Lee at Bully Fence , and the section between there and Carpenters Road had been filled in . At some point , the connection at Bully Fence became the main source for the Channelsea River , although the 1953 / 66 map still shows it connected to the remnants of the system to the north , for drainage . Administrative boundaries still follow the northern course of the Waterworks River .

= = = Navigation = = =

Although the River Lee was navigable up to Hertford , this had been achieved by the use of flash locks , where a single gate created a channel through a weir . These caused conflict between the bargemen and the millers , since operation of the lock lowered the water level above it , hindering the operation of the mill . In 1765 , the engineer John Smeaton was asked to survey the river , with a view to improving it " for the good of the public " . His report of September 1766 highlighted the need to replace the flash locks with the more modern locks or pen sluices , each with two sets of gates . Significantly for the Bow Back Rivers , he suggested a new cut from Lea Bridge to Old Ford , and another from Bow Tidal Gates to a basin at Limehouse . The first became known as the Hackney Cut , and the second as the Limehouse Cut . An Act of Parliament was obtained on 29 June 1767 , and work began .

The Limehouse Cut would give direct access to the River Thames , avoiding the tidal Bow Creek . It was expected to open in July 1770 , but some of the brickwork collapsed , and had to be repaired before the cut opened on 17 September 1770 . It closed again briefly in December , when a bridge collapsed into it , and it was soon decided that it was too narrow , and so was widened to allow barges to pass each other along its complete length . This work was finished on 1 September 1777 . The contract for the Hackney Cut was given to Jeremiah Ilsley on 18 January 1768 , and a bricklayer called Henry Holland was asked to build two locks on the cut on 23 April 1768 . A millwright from Bromley called Mr Cooper was given the job of building Bromley Lock (close to Bow tidal gates) . Work progressed quickly , and the cut was opened for traffic on 7 August 1769 .

The Act of 1767 had specified points on the river at which tolls could be collected , but had made no mention of tolls for use of Bow Creek , Bow Back Rivers , or the section of the navigation between Bow tidal gates and Old Ford , and these had remained toll @-@ free . An Act of Parliament obtained on 14 August 1850 allowed the trustees to build a pound lock at Bow tidal gates . To prevent opposition from the bargees , the Act had formalised the freedom from tolls on the Bow River section . Once the lock was built , however , the trustees charged a toll for using it . This was unpopular , but there was still the option of using the tidal gates at certain states of the tide , which did not incur a toll . A clause to authorise the lock toll was deleted by Parliament from a subsequent Act of 1868 , and it was still the case in 1977 that a charge was made for using the lock but not for using the gates .

By 1821 , Stratford was served by a number of wharfs , some located on the Lea and others on the Channelsea River or other branches . In addition to wharfs for general goods , some specifically handled timber , chalk , stone , coal , or wheat . Several of the factories and mills had private wharfs . By this date , a dock had been built near Bow Bridge to the south of the High Street . It was about 80 by 50 yards (73 by 46 m) , and was connected to the river by its own channel . It was initially called Stratford Dock , later becoming Meggs Dock and was probably constructed by the Middlesex and Essex Turnpike Trust . Half of it had been filled in by 1896 , and the rest by 1920 .

In the 1860s , the income from the navigation had dropped , as a result of attempts to compete against the railways , but economies were made , and capital works continued . The lock at Lea Bridge was removed , and replaced by Old Ford Lock further to the south , which was built to take 100 @-@ ton barges , rather than the 40 @-@ ton barges specified by an Act of 1805 . Although the original Lee trustees , and after 1868 the Conservators of the River Lee , were officially responsible for the Bow Back Rivers , there was little incentive to maintain them , since they did not generate any revenue . Nor could they be closed , since they allowed surplus water from the upper river to reach the Thames , without causing flooding .

= = = Regeneration = = =

The rivers were run down by the 1920s and , with high unemployment in the area , West Ham Corporation and the Lee Conservancy Board applied for a government unemployment relief grant , with which to fund major improvements . In addition to work on the channels , Bow Tidal Lock was duplicated , Marshgate Lock was rebuilt further east as City Mill Lock , and a second new lock at Carpenters Road was constructed . It used up @-@ and @-@ over radial gates operated by winches , rather than the traditional mitre gates used at City Mill Lock . The gates were quadrant @-@ shaped , and were lowered into the bed of the river to allow boats to enter or leave the lock . An Act of Parliament was obtained in 1930 to authorise the work , called the River Lee (Flood Relief) Act , and work began the following year . The project was completed in 1935 . Before the work , there had been a floodgate on the Waterworks River above its junction with the Three Mills Wall River , and a large pool , the City Mill Pool , connecting to the City Mills River and Bow Back River . Marshgate Lock was situated to the west of the junction between the Pudding Mill River and Bow Back River . It was originally built in 1864 , by adding a second set of gates to Hunters Gates , a floodgate which had been built around 1847 . The reconstructed lock was built on the site of the City Mill Pool , and had two sets of gates at its eastern end , to prevent high tidal levels in Waterworks River flooding the waterways to the west . It was labelled Marshgate Lane Lock on the 1948 map , but was called Ward Lock , after a local councillor , and is now known as City Mills Lock . The course of the Bow Back River was then straightened , and the original Marshgate Lock was bypassed . Pudding Mill River became a dead end when the lower section was filled in , as was most of the Three Mills Back River , and the floodgate on Waterworks River was also removed . Reconstruction of the channels included widening City Mill River to 50 feet (15 m) , while Three Mills Wall River and Waterworks River were made twice that width .

Prior to the work , the arrangement had been to regulate the navigation with the Pond Lane Flood Gates and Marshgate Lane tidal lock . The new lock at Carpenter 's Road gave access to the Waterworks River , providing barge access to Temple Mills . At high tides , the low headroom of the

Northern Outfall Sewer aqueduct prevented access to the southern reaches of the system , and to allow access City Mill Lock was constructed near Blaker Road . In 2005 , the lock was partially restored as part of the planning gain required from the developers of the adjacent Bellamy Homes housing scheme .

The 1930s improvements included the construction of the Prescott Channel , designed to allow flood water to bypass the Three Mills tide mills . The channel included sluices to regulate water levels above it , but these became redundant once the tide mills ceased to operate , and eventually seized up . They were removed soon after parts of the Channelsea River were culverted .

By the 1960s , only the Bow Back River , the City Mills River and the Channelsea River were still being used for commercial traffic . A section of the Channelsea River between Stratford High Street and Lett Road was culverted between 1957 and 1958 . As traffic ceased , the lock structures deteriorated , and by 2006 , City Mills Lock and Carpenters Road Lock were officially disused . The 1968 British Waterways Act had classified most waterways into commercial , cruising and remainder waterways . Remainder waterways were those for which the government of the time could see no economic future , and which would only therefore be subject to maintenance to prevent them becoming unsafe . The Bow Back Rivers fell into this category , and remained neglected until their full restoration was enshrined in a British Waterways policy document in 2002 .

= = Olympics = =

The Olympic Stadium for the London 2012 Summer Olympics is constructed on former industrial land between the Lea Navigation to the west and the City Mill River to the east . The land was formerly bisected by the remains of the Pudding Mill River , but this was filled in to provide a site which was large enough . As part of the construction phase for the event , Three Mills Lock was constructed on the Prescott Channel . This consists of a barge lock , suitable for 350 @-@ tonne (344 @.@ 5 @-@ long @-@ ton ; 385 @.@ 8 @-@ short @-@ ton) barges , and an adjacent sluice , which enables the water levels above the structure to be regulated , rather than navigation being subject to the tides . The lock was built to allow construction materials to be delivered to the site and spoil to be removed , and the final cost was £ 23 million , which included a sluice on the Three Mills Wall River . Work began in March 2007 , and the project lasted for just over two years . Despite hopes that it would transport 1 @.@ 75 million tonnes while the stadium was being built , very little commercial traffic used the new lock .

With water levels above the structure remaining fairly constant , £ 400 @,@ 000 was spent on refurbishing City Mills Lock . Although some work had been carried out in 2006 , including the fitting of new metal gates , it was not operational , and had not been used for around 40 years . The second phase of restoration included fitting the equipment to automate its operation . The first public use of the lock occurred on 31 July 2010 . British Waterways hoped to restore the Carpenters Road Lock soon afterwards , but the project was postponed until after the completion of the Olympic games , as temporary ' Land Bridges ' were erected over the site of the lock to enable pedestrians to reach the stadium , some of which will be removed after the event . Following the Olympic games , it is hoped the waterways will continue to be used by both commercial and leisure craft .

The Olympic Delivery Authority took the decision to culvert more of the Channelsea River , where it crossed the northern part of the site . It remains a designated main river , and so they had to liaise with the Environment Agency on matters of flood @-@ risk management , and a site was identified which would provide compensation for the loss of habitat caused by the culverting . Much of the old River Lea was inaccessible to the public prior to the project , but is a central feature of the northern parklands that have been created . Two ' wetland bowls ' were designed , which have been planted with water @-@ loving plants such as reeds , rushes , sedges and iris . They also provide spawning grounds and refuges during flood conditions for fish , as well as providing storage capacity for flood water . It was the largest aquatic planting scheme ever carried out in Britain when it was completed , and most of the 350 @,@ 000 plants were grown in Norfolk from seeds and cuttings removed from the site . At the southern end of the site , the Waterworks River was reconstructed . Improvements in the 1930s created channels with vertical concrete sides , and little thought for habitat . The channel

was made 26 feet (8 m) wider , with sloping banks and ramps down to the water 's edge , and was improved visually and ecologically by the planting of aquatic marginal plants .

With the exception of Bow Creek , the Bow Back Rivers were closed for public access during the Olympics construction works , and remained closed until after the events . Access to sections of the Lee Navigation which pass close to the Olympic Stadium , including part of Bow River , part of the Hackney Cut , and the Hertford Union Canal were restricted during the summer of 2012 . The Bow Back Rivers were intended to form a major feature of the Olympic site . The stadium formed the centrepiece of the Olympics on an island site , with the Waterworks River to the east , and the Aquatics Centre on the eastern bank . Five new pedestrian bridges were built across the waterways to provide the principal access to the stadium .

= = Locks = =

The locks on the Bow Back Rivers are not built to a single standard , and sizes vary .

= = Points of interest = =