Why does London **need** the Thames Tunnel?

The River Thames is not as clean as you might think. Sewage from our overstretched sewer network is polluting the capital's river.

Thames Tunnel

Creating a cleaner, healthier River Thames

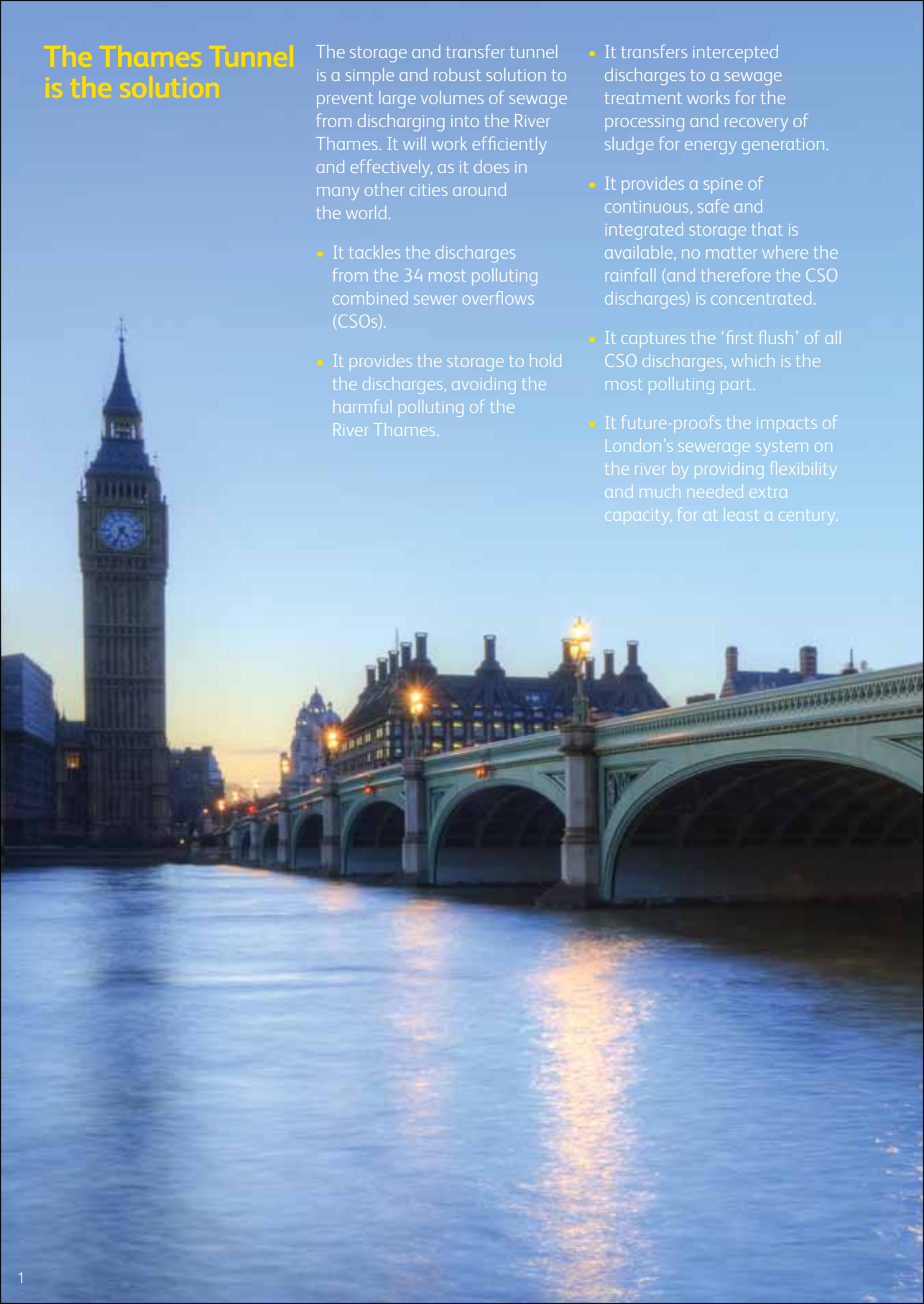
Thames Water

JULY 2011

The Thames Tunnel is the solution

The storage and transfer tunnel is a simple and robust solution to prevent large volumes of sewage from discharging into the River Thames. It will work efficiently and effectively, as it does in many other cities around the world.

- It tackles the discharges from the 34 most polluting combined sewer overflows (CSOs).
- It provides the storage to hold the discharges, avoiding the harmful polluting of the River Thames.
- It transfers intercepted discharges to a sewage treatment works for the processing and recovery of sludge for energy generation.
- It provides a spine of continuous, safe and integrated storage that is available, no matter where the rainfall (and therefore the CSO discharges) is concentrated.
- It captures the 'first flush' of all CSO discharges, which is the most polluting part.
- It future-proofs the impacts of London's sewerage system on the river by providing flexibility and much needed extra capacity, for at least a century.



Ten reasons why London **needs** the Thames Tunnel

1. The River Thames has become an environmental and public health hazard. Sewage regularly overflows into the river from London's Victorian sewerage system.

2. The current network of major sewers, founded 150 years ago, was designed for a city of four million people and is no longer big enough to meet the needs of modern day London. The city's population is now approaching eight million.

3. In a typical year, the city's sewers discharge 39 million cubic metres* of untreated sewage into the River Thames – enough to fill the Royal Albert Hall 450 times.

4. The discharges are the last significant source of pollution in the tidal River Thames. Mixed with rainwater, the sewage content of the discharges ranges from 10 to 90 percent, depending on conditions.

5. This pollution kills fish, damages wildlife and carries pathogens such as hepatitis A and faecal streptococci, which threaten human health. It's a serious problem – and getting worse.

6. More frequent and intense storms, especially in summer, are adding to the problem, as is the loss of permeable surfaces able to soak up rainfall. As little as 2mm of rainfall can now trigger a sewage discharge.

7. Years of independent study have concluded that the Thames Tunnel is a timely and cost-effective part of the solution. Alternative options would cost more, be more disruptive and would not achieve the environmental standards required.

8. British taxpayers would be at risk of having to fund hefty fines from the EU if the UK is confirmed to be in breach of the Urban Waste Water Treatment Directive.

9. Other world-leading cities, including Paris, Stockholm, Helsinki and Washington DC, are forging ahead with similar schemes.

10. A clean, healthy River Thames is essential for the prosperity and global reputation of Britain's capital city. Future generations would never forgive us for failing to tackle this unacceptable problem.

*one cubic metre of sewage equals 1,000 litres and weighs around one tonne

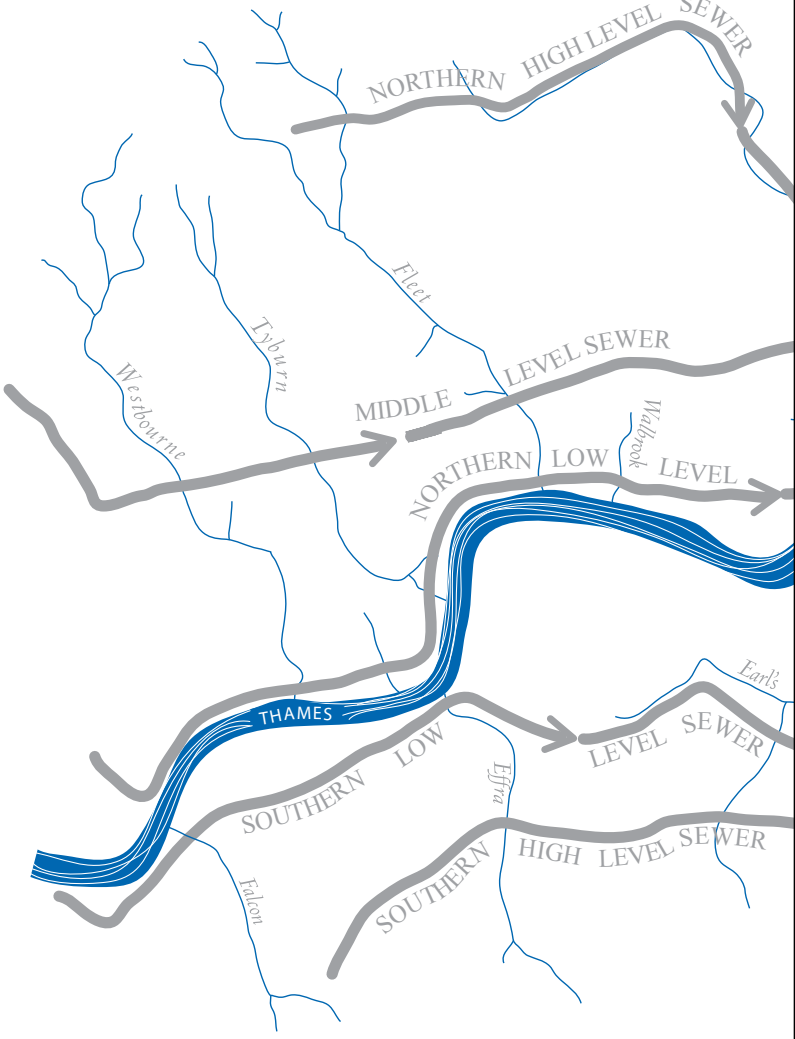
A brief history

Like many older cities around the world, the vast majority of London is served by a combined sewerage system, collecting sewage (from toilets, sinks and washing machines etc) together with rainwater run-off from roads, roofs and pavements.

The magnificent interceptor sewers, constructed by Sir Joseph Bazalgette following the 'Great Stink' of 1858, are still the backbone of London's sewer network today. Rebuilding this system, using modern methods, would cost £50-60 billion today.

The city's natural drainage system, which is a network of waterways (the so-called 'Lost Rivers' of London, such as the Fleet and the Tyburn), had been built over and was already conveying sewage when Sir Joseph Bazalgette incorporated it into his impressive design. The system was designed so that overflows would go into the River Thames, preventing the back up of sewage flooding people's homes and streets. The system does this through a network of CSOs, stretching along the River Thames.

While they are still in excellent condition, London's Victorian sewers now lack the capacity to meet the demands of the vastly increased population and 21st century development of the capital. As one of the world's busiest cities, London's CSOs discharge more and more frequently into a river which, in every other respect, is much cleaner and more valuable to Londoners.



It's time to update the capital's sewer network

In Bazalgette's day, just over two and a half million people lived in London. Sir Joseph had the foresight to design his system to serve four million, but today the city's population is near to eight million – and continues to grow.

Back in the 1850s, not only were there fewer people living in London, but they also used less water per head and there was considerably more green space available to soak up rainfall. This meant that overflows occurred only very occasionally, and when they did they went into a river that was almost entirely biologically 'dead.'

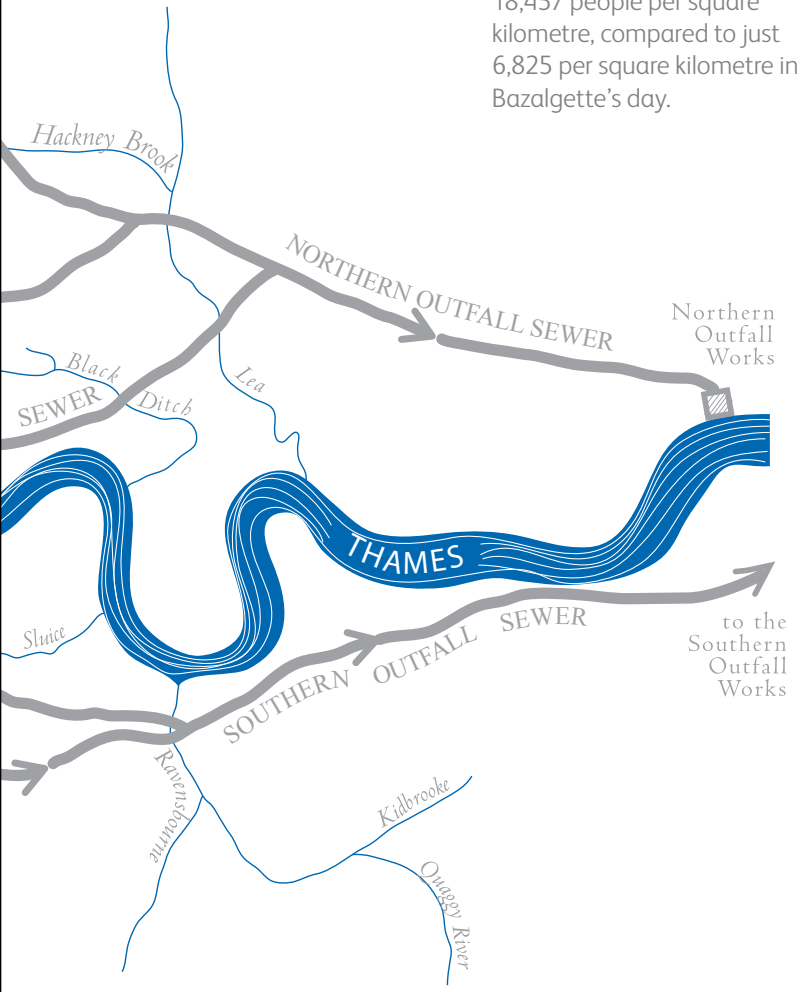
In 2001, Greater London's population density was 18,457 people per square kilometre, compared to just 6,825 per square kilometre in Bazalgette's day.

As the population of London has grown, so has the development of the capital, involving the building on and paving over of large areas. This has altered the natural drainage of the area so that now most rainfall and surface water run-off goes directly into London's sewers, rather than being naturally absorbed into permeable ground. An area twice the size of Hyde Park has been lost to hard surfacing every year*.

CSO discharges now happen more than once a week on average and as little as 2mm of rainfall can trigger a discharge.

Climate change adds to the need for action. Rises in average temperatures will make the river water warmer and therefore able to hold less dissolved oxygen, which in turn will make its aquatic life more sensitive to any pollution.

*Daily Telegraph 8 June 2011

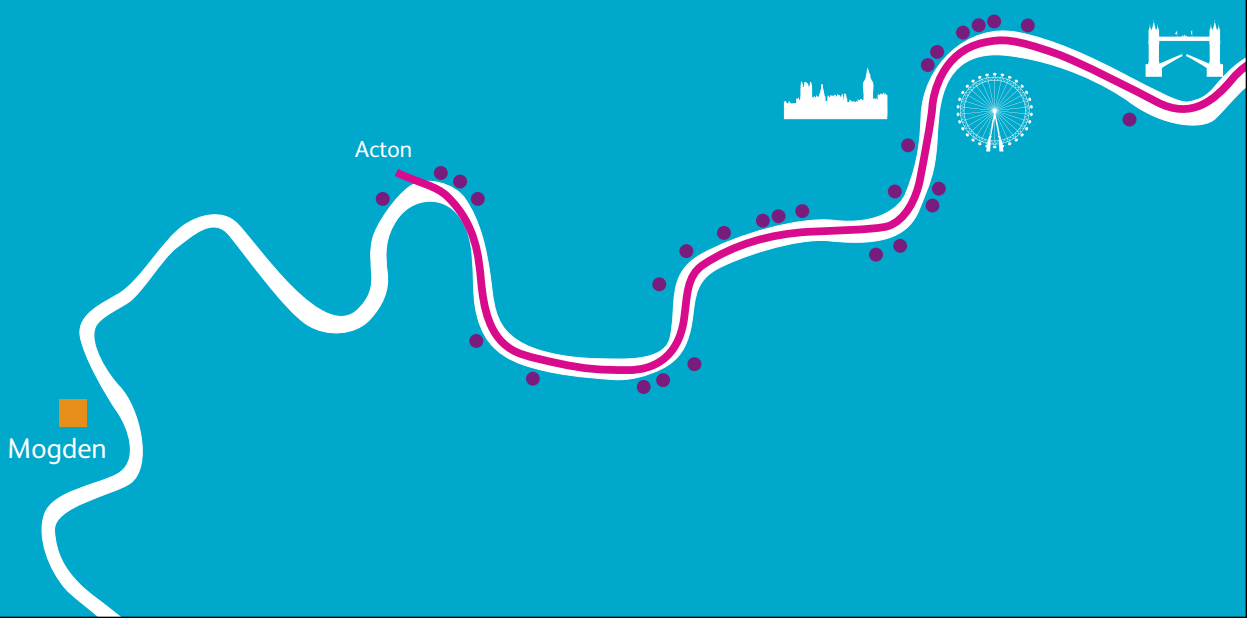


Case study

On 6 June 2011, after 30mm of rainfall, more than 250,000 cubic metres of sewage from CSOs at the western end of the River Thames discharged into the river. This is equivalent to over 40,000 builders' skips full of sewage. Mogden sewage treatment works also discharged around 230,000 cubic metres. The CSO at Hammersmith Pumping Station discharged about 80,000 cubic metres of sewage over a period of about eight hours. This is equivalent to one builders' skip every two seconds.

The **big** picture

Without the London Tideway Improvements, the annual CSO discharges would reach 70 million cubic metres in a typical year by 2020.



The proposed Thames Tunnel is the final part of the overall solution needed to significantly reduce sewage discharges into the River Thames.

The independently-chaired Thames Tideway Strategic Study (TTSS), established in 2000, led to three integrated solutions, known collectively as the London Tideway Improvements, to solve the problem of London's overloaded sewage works and overloaded sewers:

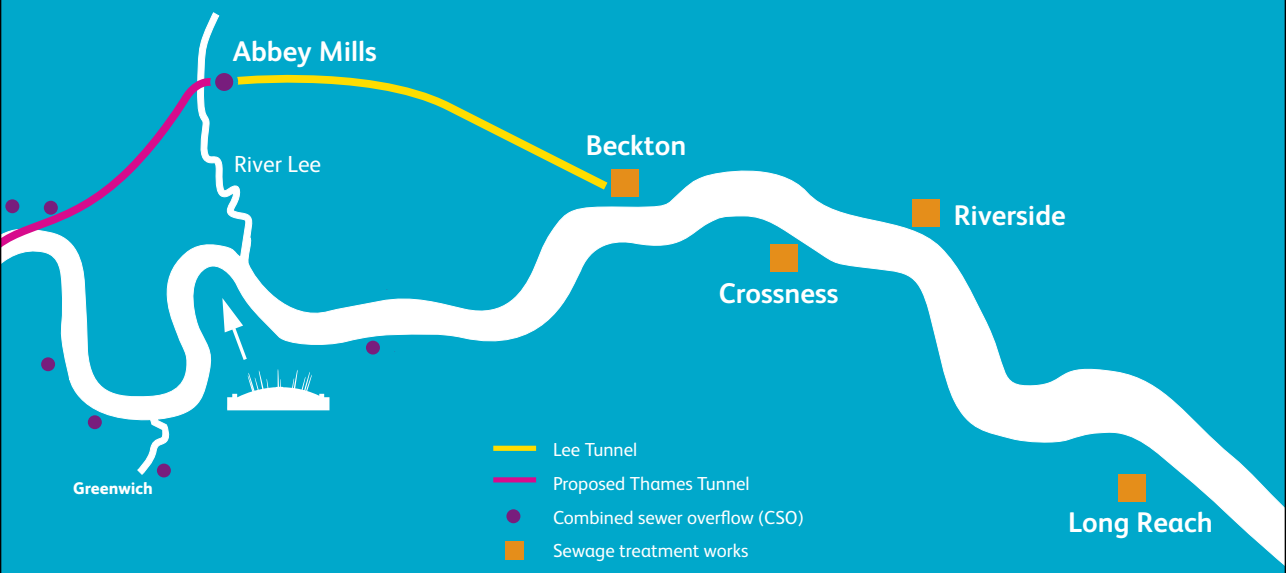
- upgrades to tidal sewage treatment works (now under construction)
- the Lee Tunnel (now under construction)
- the Thames Tunnel.

Without the London Tideway Improvements, the annual CSO discharges would reach 70 million cubic metres in a typical year by 2020.

Once all three parts of the solution are implemented, that figure is estimated to fall to 2.6 million cubic metres in a typical year. The annual number of CSO discharges would fall from an average of 60 a year to just four or less. The Environment Agency is satisfied that the predicted water quality impacts of these remaining discharges are acceptable.

When both the tunnels are operational, overflows should only happen very occasionally, after sustained periods of intense rainfall and after the tunnels have captured the most damaging 'first flush' from the sewers. This will be a huge improvement on the current situation.

If only the sewage treatment works upgrades and the Lee Tunnel were implemented, the annual average volume of all CSO discharges to the River Thames would be 18 million cubic metres. Discharges would still occur nearly 60 times in a typical year. That is still far too high. Many of the CSOs would continue to cause unacceptable environmental damage and would not fully meet the requirements of the UWWTD.



The Thames Tunnel route is **indicative only.**

Identification of the most polluting CSOs

The Environment Agency (EA) has identified the 36 most polluting CSOs.

The Thames Tunnel needs to control or intercept 34 of these CSOs that discharge to the River Thames through central London.

The Lee Tunnel, which is already under construction, will address the largest single CSO at Abbey Mills Pumping Station. We have already adapted the sewer network to tackle the 36th CSO, located at Wick Lane, in Newham, which also previously discharged into the River Lee.

Jacobs Babtie Review

Ofwat commissioned a report by Jacobs Babtie to review the work and reports of the TTSS. This was published in February 2006 and proposed additional options for dealing with the CSO discharges at potentially lower cost, but with lower CSO control.

The primary option comprised a hybrid solution based on four elements:

1. Enhanced primary treatment at Abbey Mills
2. Construction of a west tunnel – a 9km tunnel, 7.2m in diameter from Hammersmith to Heathwall, with an associated screening plant at Battersea and another at Earl Pumping Station
3. The deployment of skimmer vessels
4. A medium to long term strategy of implementing SUDS and other measures to reduce sewer flows.

The west tunnel, following a route under the River Thames, would store sewage until there was capacity within the current system to transfer it to the Beckton and Crossness sewage treatment works. The screening facility at Battersea would discharge into the River Thames when the west tunnel was full. Unscreened discharges would continue at all other CSOs not connected to the tunnel, with the exception of Earl Pumping Station.

This scheme was not adopted because, although cheaper to construct, the much shorter tunnel would not have enough volume to capture a sufficient proportion of the discharges into the river. Also, the current collection system has virtually no spare capacity that could be utilised to convey stored storm sewage from the tunnel for treatment. This would mean that sewage would need to be stored in the tunnel for long periods, waiting for spare capacity. This would lead to septicity and odour problems in the vicinity of the tunnel. A single length of tunnel

Isn't tackling sewer flooding to customers' properties more important than the Thames Tunnel?

We are planning to continue major investment to tackle the separate problem of sewer flooding of customers' properties. In the five years to 2015, we are investing £350m to tackle this equally unacceptable problem, protecting 2,500 homes most at risk. We will carefully co-ordinate work on these schemes in London with the planning for the Thames Tunnel to obtain the best overall benefits, and to minimise cost and disruption for Londoners.

The Thames Tunnel will provide some direct assistance in preventing sewer flooding to properties, in certain circumstances, without further local investment. A further benefit of the tunnel will be to provide a discharge route for local flood alleviation schemes that would otherwise have to discharge direct to the river.

just serving a few CSOs in the west would have even more limited volume and therefore provide less overall CSO control.

The enhanced primary treatment plant at Abbey Mills would only remove a small proportion of the polluting load. Therefore the environmental objectives would not be met. The deployment of skimmer craft to remove sewage-derived litter in the river from the remaining unconnected and uncontrolled CSOs would not reduce the polluting load in the river. It would also not be compliant with the UWWTD.

More recent developments

In March 2007, the Government tasked us with taking forward a tunnel solution to substantially reduce discharges of untreated sewage into the River Thames and its tributary, the River Lee.

In September 2010, the incoming Coalition Government confirmed its support for the Thames Tunnel, subject to a strict review of costs, and instructed us to continue developing the project.

"A Thames Tunnel continues to offer by far the lowest cost solution to the problem."

Caroline Spelman – Secretary of State for the Environment, Food and Rural Affairs, September 2010.

Case study

The 30mm of rainfall on 6 June would have completely filled the west tunnel of the Jacobs Babtie option and overflowed more than 50,000 cubic metres of sewage to the river. The CSOs between Vauxhall Bridge and the Thames Barrier, which would not have been intercepted by this option, would have discharged approximately 500,000 cubic metres of sewage into the river.

It would have taken over four days to empty the west tunnel via the existing sewage system, meaning that the tunnel would not have been completely empty for the next significant rainfall, which arrived on 10 June. The west tunnel, therefore, would not have been fully empty for over 16 days, resulting in septic sewage and odorous conditions. By comparison, the Thames Tunnel would have intercepted all the CSO flows for treatment, with no discharge into the river, and have been emptied within 48 hours.

Reasons to act **now**

A personal view from Olympic gold medal rower Andy Triggs Hodge

"I regularly row on the River Thames, which means paddling through human faeces, tampons, condoms and other such nasties. It is no fun at all and the volumes involved are frightening.

It's a problem that risks the health not just of rowers but of river-users of all kinds, not to mention the devastation it causes to fish and other wildlife.

I do have a personal interest. But there's more to it than that. This is about protecting London's river, not just for today but for future generations, making it something we can all be proud of – rather than a great big overspill sewer for a 21st century city that should know better. "

Human

The human and domestic waste content of the discharges, along with waste from businesses and commercial properties, is mixed with rainwater in varying proportions, but the discharges are unmistakably sewage and must be treated as such.

Raw sewage entering the River Thames contains urine and faeces, as well as sewage-derived litter such as toilet paper, wipes, sanitary products and other 'flushable' items, including hypodermic needles. Such raw sewage typically contains health-harming pathogens, viruses and bacteria such as E coli, hepatitis A and faecal streptococci.

The frequency of CSO discharges is therefore a hazard to all who use the river. There are over 30 canoeing, rowing and sailing clubs using the tidal Thames, the foreshore is used by thousands of people every day and the river is a draw for hundreds of thousands of tourists every year.

It cannot be acceptable to allow the River Thames to be used as an open sewer.

Environmental

The Thames Tideway is an important habitat for a wide variety of fish. It is an important breeding and nursery ground for many species, including smelt and others. Some of these, such as sole, are commercially important.

Improving water quality in the River Thames will improve the conditions to sustain healthy fish populations and permit the upstream migration of species, such as salmon, bass and flounder, which use the tidal Thames as an important part of their lifecycle.

The River Thames is particularly vulnerable to pollution because of its limited dilution capacity. The tidal effect moves water up to 15km up and down the River Thames on each flow and ebb tide. The net movement, during neap tides and low river flow, is as little as one kilometre per day towards the sea, with very little mixing. Larger rainfall events create slicks of polluted water that move with the tide and it can take up to three months* for sewage that has entered the uppermost reaches of the Thames Tideway to reach the sea. Furthermore, solid material such as 'sewage-derived litter' will tend to be deposited on the foreshore during the ebb tide. In fact, much of the fine silty mud found on the river's foreshore and slipways is derived from sewage.

It can take up to three months* for sewage that has entered the uppermost reaches of the Thames Tideway to reach the sea.

Expected increases in temperatures linked to climate change will make the River Thames more sensitive to pollution. The CSO discharges to the river will deplete dissolved oxygen at a faster rate, endangering the number and variety of species of wildlife able to survive in its waters.

*Figures supplied by the Environment Agency.

Legal

The EU Urban Waste Water Treatment Directive (UWWTD) requires that urban wastewater (sewage) should be properly collected and treated, other than under 'exceptional' conditions.

The Water Framework Directive (WFD) also aims to maintain and improve the aquatic environment in the EU by 2027.

The European Commission initiated so-called 'infraction' proceedings against the UK in relation to the Thames Tideway as long ago as 2004 and has repeatedly made clear its intention to enforce the UWWTD. Any delay in compliance makes infraction proceedings more likely. The case has now been referred to the European Court of Justice.

If the court finds against the UK, the Government is at risk of substantial fines if the Thames Tunnel is not completed quickly.

Fines are calculated using equations that consider the 'duration' and 'seriousness' of the infringement and the individual Member State's capacity to pay. The maximum daily penalty payment that could currently be imposed on the UK is £620,000 per day. The minimum size of a lump sum payment that could currently be imposed on the UK is £8,500,000 and there is no maximum lump sum payment. All UK tax payers may have to help foot the bill.

Even if the Directives did not exist, London still needs the Thames Tunnel. Without it, the pollution of the river will get worse and improvements made will be lost, given the increasing population, new development and the impact of climate change.

Case study

After heavy rainfall during the first weekend of June 2011, more than 250,000 cubic metres of sewage was released into the river from CSOs and at least 230,000 cubic metres of sewage from the Mogden Sewage Treatment Works in Isleworth. These discharges, exacerbated by the warm, dry weather and subsequent low river flows, resulted in very low oxygen levels and fish deaths in a two kilometre stretch of water. This moved with the tide, depositing dead fish onto the foreshore over a wider area. More than 26,000 fish were killed between Barnes and Chiswick. Species affected included flounder, bream, roach, eel and dace. In addition, significant amounts of other aquatic life, such as water shrimps, were also killed. The Environment Agency confirmed it was the second largest sewage pollution incident along the River Thames in the past ten years.

Isn't the River Thames the cleanest it's ever been for wildlife? Why do we need to do anything?

Since the privatisation of the water industry in 1989, major investment at our sewage treatment works throughout the Thames Valley, paid for by customers, has greatly accelerated the clean up of the River Thames. But we will lose ground if we do not tackle the CSOs in London. Once the sewage treatment works upgrades are complete, the CSO discharges will be the tidal river's last remaining significant source of pollution.

Biologically dead for many years, there is now a much greater diversity of wildlife in the river that needs to be protected from the increasingly frequent overflows of sewage into the river. The proposed Thames Tunnel will ensure that the excellent progress in cleaning up the river is not reversed.

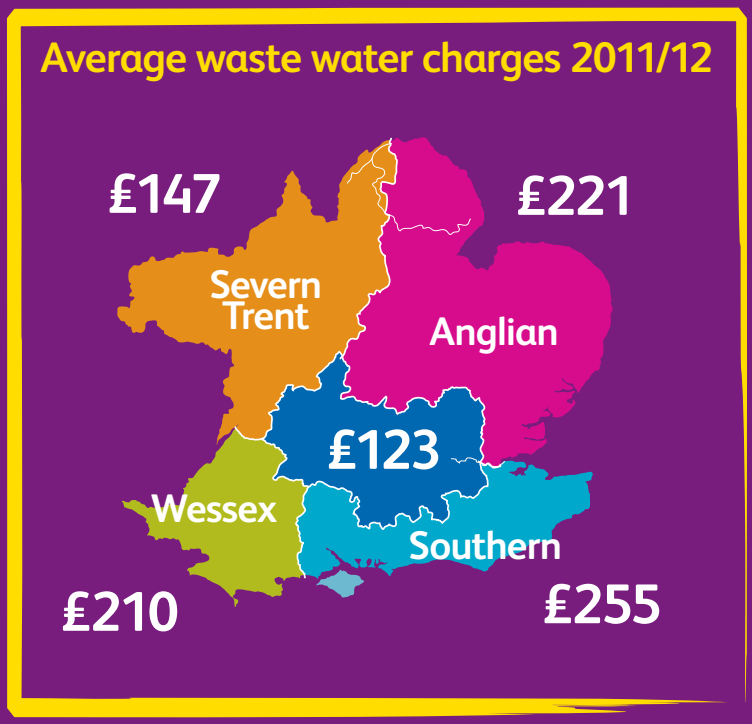
Effects of raw sewage on the fish population are both immediate and long term. Bacteria feeding on the sewage diminishes oxygen levels which can have a devastating effect, especially on juvenile fish, as they are less likely to swim away from the affected areas. This leads to large numbers of fish fry being killed and a significant reduction in future fish stocks.

Challenges

Ensuring value for money

Ofwat sets limits on water bills in line with the work that water companies need to do, and will continue to scrutinise the Thames Tunnel costs to ensure they are kept as low as possible.

As a result of Sir Joseph Bazalgette's foresight and previous low levels of investment, Thames Water sewerage bills are almost the lowest in the country. Building the Thames Tunnel will require a significant increase to bills. This is a necessity if we are to carry on Sir Joseph Bazalgette's legacy and invest in a sewerage system that will last for future generations.



Why should all Thames Water customers have to pay for the Thames Tunnel when it will only be Londoners who will benefit from it?

The costs of serving the Thames Water region are spread out over a very large number of customers, including all those in London. Those outside London are benefiting, and will continue to benefit from this fact.

It is only fair that bill increases are shared across our region.

Customers outside London have seen big improvements from investment in sewage treatment locally, while paying the lowest water and sewerage bills in the country for most of the past 20 years.

While the Thames Tunnel is a very prominent example of a project taking place in one part of the region we serve, there are numerous examples of investment benefiting towns, villages and hamlets throughout the area we supply outside the capital. These are often projects costing several millions of pounds to improve pieces of infrastructure that serve tens of thousands or even just a few thousand people.

For instance, we are upgrading Crawley and nearby Merstham sewage works, which includes increasing their capacity to meet population growth, at a total cost of £36.5m. These sewage works serve a combined estimated population of just 169,000 people.

As the diagram shows, in the more rural areas that neighbouring water and sewerage companies supply, bills are significantly higher.

Minimising disruption

A key focus for us has been to optimise the route of the Thames Tunnel, to ensure we can deliver the most cost-effective solution and minimise disruption.

The number of construction sites now required for the preferred route is less than half that we outlined in our initial plans, and we are working hard to try and reduce this number further.

We will use modern tunnel boring machines (TBMs) to build our main tunnel from Hammersmith to Abbey Mills and many of the smaller connection tunnels to our CSOs.

The CSOs tend to be located where the sewers enter the River Thames, which is also where the original natural drainage channels of the land entered the river. These channels were generally at right angles to the river and were incorporated into the trunk sewers in Sir Joseph Bazalgette's design.

These sewers need to be connected to the Thames Tunnel via drop shafts and smaller tunnels. Each drop shaft needs a construction site near the river. The difficulty is finding a suitable location close to the river for the drop shaft construction site.

The further away the drop shaft is from the sewer, the longer the new sewer connecting the old sewer to the drop shaft will need to be, which means more disruption to streets and houses.

Also, to build our tunnels, we need different types of construction sites. The main tunnel drive shaft sites are at the start of a tunnel drive and are where most of the tunneling activity will take place. At these sites, we will construct a shaft and assemble the TBM at the bottom of it. The TBM will then be used to construct the tunnel by boring through the ground and then lining the hole with precast segments. As these sites are where the TBMs are launched and received, they require much larger construction sites, for which there are very few areas that can be considered.

We plan to remove the material excavated to create the main tunnel at the three main drive sites by river, unless there are good reasons not to do so at a particular site. We will also be investigating the ways in which we can incorporate sources of renewable energy into the operational energy supply for the project.

How other cities are **tackling** CSO discharges

In the UK

People living in other cities around the UK, such as Blackpool, Brighton and Cardiff, have already funded solutions to CSOs through charges from their local water companies.

Cleaning up the Mersey in Liverpool, which has a population of 480,000, cost £170m, while a similar scheme, estimated at £110m, is under way in Preston, where the population totals 132,000.

Across Europe and beyond

Cities including Helsinki, Naples, Stockholm and Vienna have already implemented tunnel solutions to tackle CSO discharges.

Major schemes involving tunnels are also under way in other parts of the continent to ensure clean rivers and compliance with the UWWTD.

Major storage and transport tunnels are also the backbone of solutions put in place to tackle CSOs across North America, in cities including Milwaukee, Wisconsin; Portland, Oregon; and Washington DC.

The scale and cost of the solutions being implemented in Paris and the Rhine-Ruhr conurbation are comparable with those of the Thames Tunnel proposed for London.

Paris has a similar CSO problem to London and is in the final stages of investing £3.4 billion on additional storage and transfer capacity, including large-scale tunnels, to keep sewage out of the River Seine.

Germany is investing £3.8 billion on a solution for the Rhine-Ruhr area.

People living in other cities around the UK, such as Blackpool, Brighton and Cardiff, have already funded solutions to CSOs through charges from their local water companies.

Alternative options considered

Other options considered have been assessed as costing more, being more disruptive and not achieving the required environmental standards.

Separating the sewerage system

Separate systems for rainwater and foul sewage are now required for all new developments.

Retrofitting such systems across densely developed London already congested with infrastructure, both above and below ground, would be hugely expensive and impractical.

A sewer separation feasibility study looked at five study areas and the cost of building a separate storm or foul sewer in each. The costs were then extrapolated across the whole London catchment. The study calculated it would cost £40bn to individually separate the local sewerage collection system in each catchment. The study therefore concluded that, rather than try and separate the sewerage system in individual areas, it would be more cost-effective to construct a whole new local foul sewer network, from scratch, throughout London. This was estimated to cost £13bn.

Separating the network would require the construction of a new sewerage system over 5000km long; deep pipes would need to be constructed in almost every street; the drainage system of virtually every property would need to be modified; and new foul pumping stations would need to be built to compensate for low gradients.

Constructing a new separate sewerage system would be three times the cost of the tunnel and would cause disruption to nearly every street in London.

It would take far longer than the construction of the Thames Tunnel and could not be completed within any reasonable timescale.

Case study on separate systems

In the Putney Bridge area, nine kilometres of foul sewer network would need to be constructed under streets and roads at a cost of £27m. In West Putney, 16km of sewer network would need to be constructed at a cost of £34m. A total of four pumping stations would also need to be built in these two areas to pump the foul sewage through the network. This work would cause massive disruption.

Sustainable urban drainage systems (SUDS)

SUDS involve a variety of measures to reduce the amount of rainwater entering the sewerage system, and to slow down the rainwater that does enter the sewerage system. These include green roofs (such as grassed 'living' roofs) and soakaways. They require a lot of space and are generally both costly and disruptive to retrofit.

We fully support the use of SUDS, as they can enhance the environment, can effectively manage surface water flooding and have a low carbon footprint, not to mention very low whole-life operating costs. However, there are limitations to sustainable drainage, particularly in the Greater London area, where the drainage systems are complex, most of the land is already developed and there is huge potential for flooding.

There is not enough space in London to retrofit sufficient SUDS to control the CSO discharges and meet environmental objectives within the required timescale. London is also built mainly on clay and 'saturated gravels' so that surface water will not soak away quickly.

Retrofitting SUDS in the densely populated, urban environment of London would have a detrimental impact on virtually every household, driveway, road and open space in every borough.

The maximum practical level of retrofit SUDS would take over 30 years to implement and cost several times as much as the Thames Tunnel. The cost is estimated to be at least £13bn, and would not solve the problem.

The implementation of SUDS in new developments is essential to help stop the situation getting worse. This will play an important part in ensuring the future-proofing of the Thames Tunnel, by helping to reduce the amount of surface water entering the system. We are therefore playing a full part in promoting the use of SUDS through the London Plan. However, SUDS cannot resolve the massive problem of CSO discharges that already exists, and certainly not in any realistic timescale.

The TTSS concluded that, because London's catchments are densely urbanised, widespread retrofitting of SUDS techniques would be disruptive, costly and technically difficult, as insufficient land is available.

As an example, in the small catchment area of West Putney, retrofitting SUDS would:

- impact on about 2,500 houses for roof drainage
- require 22 hectares – the size of 44 football pitches – of open space for detention basins
- require eight hectares of roadways, driveways and parking areas (equivalent to 11.5km of roadway) to be reconstructed.

Pooled capacity

Rain storms across London historically do not have equal intensity, creating varied amounts and volumes of surface water run-off. The major advantage of the Thames Tunnel is the pooled capacity it will provide. It will be able to take massive volumes of surface water run-off from all areas of London – something SUDS could never do, as they are only effective in the areas they are located.

The practical implementation of SUDS in the West Putney and Putney Bridge areas would not reduce the number of discharges enough to comply with the environmental objectives. The implementation of SUDS in the Frogmore area would reduce the number of discharges to meet the required standards of the UWWTD, but at a cost that far exceeds the cost of connecting this CSO to the Thames Tunnel.

The total number of hectares required to retrofit SUDS in the areas of West Putney, Putney Bridge and Frogmore is equivalent to 446 football pitches and would cost £128m. Even then, despite the improvement in environmental quality from tackling the CSO discharges in this area, it would still not be sufficient to meet the requirements of the UWWTD.

Real-time control

Real-time control systems aim to maximise the use of available capacity in the sewerage system. Extending real-time control is simply not an option as there is just not enough spare storage capacity within the existing system to make any impact on CSO discharges.

The Thames Tunnel project will, however, include a significant level of real-time control to optimise control of flow to the Thames Tunnel.

Screening

Screening at CSO outfalls, which acts as a filter and helps to capture sewage-derived litter, cannot be a complete solution since the polluting mass is largely dissolved or in very fine particles, and so can pass through the screens.

The large volumes of odorous material that is collected at the screens would need to be pulled out from the river and taken away somehow, be it by road or river. There is also insufficient land available near each CSO for this process.

The number of overflows would remain the same and so water quality objectives would not be met. Construction of screens at a number of CSOs would also be completely impractical, requiring major existing infrastructure to be relocated, causing large-scale disruption across the capital.

Bubblers and skimmers

We currently use 'bubbler' and 'skimmer' boats to reduce the impact of untreated sewage overflowing into the River Thames. These inject oxygen into the river and skim off the surface litter that gets into the river when the sewers overflow.

These measures only alleviate the effects of the CSOs discharging sewage into the river, rather than solve the problem. They do not meet the requirements of the UWWTD and there are severe limitations as to where these boats can go, due to tides and bridge heights.

Retrofitting of SUDS in the Putney and Wandsworth areas

Catchment area and number of hectares for modification	Cost (£m)	Reduction in the volume of discharge %	Approx number of football pitches required	Would the UWWTD standard be met?	Cost of connecting the CSO to the Thames Tunnel (£m)
West Putney, 36 hectares	27	33	72	×	6.9
Putney Bridge, 52 hectares	45	76	104	×	44.6
Frogmore (Buckhold Road), 135 hectares	56	93	270	✓	25.4

Doing nothing is **not an option**

The current sewerage system is full to capacity, with simply nowhere for excess flows to go, apart from into the River Thames. As the population increases and further permeable surfaces are lost, CSO discharges will continue to rise. It is no exaggeration to say that, in the future, we are likely to see CSO discharges during dry weather and not just after rainfall.

Doing nothing will simply result in:

- more frequent overflows
- more frequent environmental damage
- continued increased health risks to recreational users
- worse litter blight
- an adverse impact on the attractiveness of the water frontage
- the risk of heavy fines being imposed on the UK.

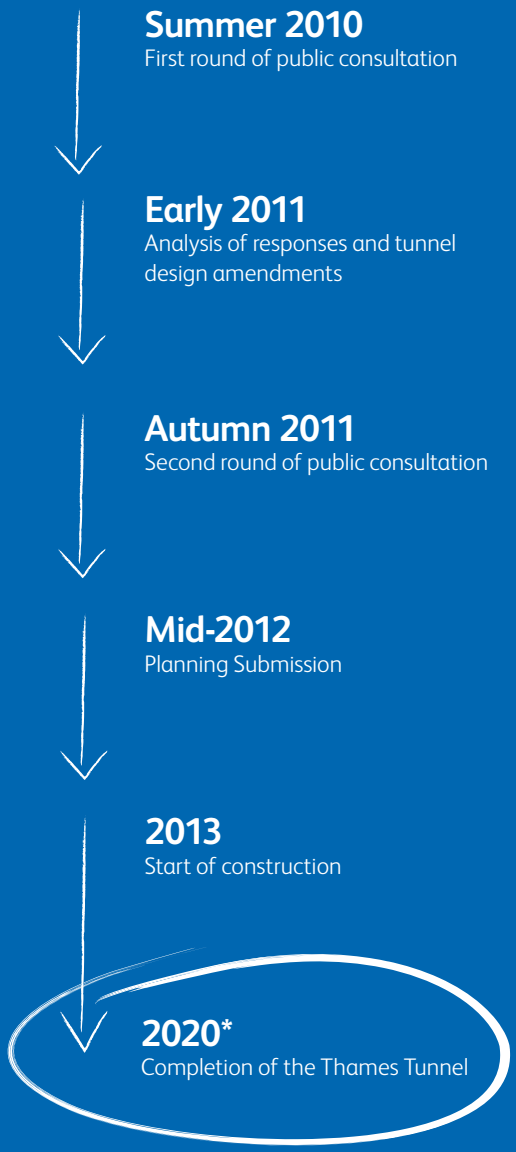
The Thames Tunnel will provide greater robustness and flexibility for the future impacts of population growth and changes in the pattern of rainfall.

The recommended full-length storage tunnel (Abbey Mills route) achieves compliance with the UWWTD and environmental objectives. It is the most cost-effective scheme, involving the least disruption to residents, businesses and transportation when compared to alternatives. It also has the shortest implementation time, which will facilitate Defra's target date for completion.

At the same time the Thames Tunnel, which will last for at least 100 years, will ensure our sewerage system is modernised and ready to meet the needs of a growing population and the demands of future generations.

Our generation has reaped the benefits of visionary 19th century planning and construction by Sir Joseph Bazalgette and his contemporaries. The needs and expectations of future generations of Londoners will surely be no less than our own. With the Thames Tunnel, we can create our own legacy for them, which will still be functioning in the 22nd century.

We need to be visionary and act now for the benefit of future generations.



*Subject to review

For further information see our website:
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