

# London Councils' TEC Executive Sub-Committee

## Thames Tideway Tunnel – Alternative Options Item no: 5

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### Summary

This report informs members of the Government's decision on the options for dealing with combined sewer overflow (CSO) problems in London and the concerns of the consumer group, Consumer Council for Water (CCWater) about the potential costs to Thames Utilities supply region bill payers. Government has given the go-ahead to the construction of a 'super sewer', the Thames Tideway Tunnel. An appendix to this report sets out the options considered and discarded as part of the process. The report surmises that there are grounds for re-visiting these options and seeks a steer for London Councils' future engagement with this issue.

### Recommendations

Members are recommended to:

- Note the Government's decision on a solution to the combined sewer overflow problems in London;
- Note the concerns raised by the Consumer Council for Water (CCWater) with regards to affordability and the watchdog's suggestions for alternative approaches to the combined overflow problem;
- Agree that officers explore representation for London Councils on the proposed Defra Tideway Progress Group;
- Agree that officers explore representation for London Councils on the proposed Environment Agency Olympics Measures Group;
- Agree to receive further reports on this issue if CCWater are able to better quantify the affordability and delivery benefits of their proposed alternative options.

### Background

1. The London sewer system combines foul sewers with the system for collecting rain water run-off. Sewer overflows are a design feature of such combined systems and overflows will occur in certain circumstances. When the system becomes overloaded from rainfall, overflows of sewage and rainwater discharge some of the excess into the Rivers Lee and Thames to reduce the risk of sewer flooding of properties, and the overloading of London's sewage treatment works. As a result of current weather patterns of heavy rainfall and flash flooding, overflows into the Thames are occurring at the rate of about once every week, sometimes with severe consequences for ecology and amenity of the Thames.
2. In 2000 the Thames Tideway Strategic Study (TTSS) Group including members from Thames Water Utilities (TWU), Defra, the Environment Agency (EA) and the Greater London Authority (GLA), with the Office of Water Services (Ofwat) in an observer capacity, examined the issue of the combined sewer overflows (CSO) affecting the Thames Tideway and the River Lee. Their remit was to identify the overflows of concern, understand their impact and define objectives against which solutions could be developed.
3. In June 2004 the TTSS Group produced a report proposing a 34km tunnel beneath and following the course of the Thames Tideway to collect the overflows, and treatment of the waste water in east London. Following consideration of the report and given the time it would take to deliver this solution – estimated at up to 15 years - Government asked the TTSS to look into smaller-scale measures which could provide earlier solutions, and for further information on the proposed tunnel option. The TTSS received a final study report in February 2005 and a supplementary report to Government in November 2005
4. Ofwat commissioned Jacobs Babtie consultants to review the reports and to suggest alternatives to the TTSS preferred solution. This report was presented to Ofwat in February 2006.
5. In December 2005 a Defra led Working Group was convened to consider the findings of the TTSS reports and the Jacobs Babtie review. This work resulted in a shortlist of two options being produced in July 2006. Defra subsequently asked Thames Water to develop and assess these two options in detail and report back by 31 December 2006. The options were:
  - Option 1: A tunnel over 30km long to intercept intermittent discharges from unsatisfactory overflows along the length of the tidal Thames and convey the waste water for treatment in east London. Alternatives within the option were a 6 metre diameter tunnel (the minimum assessed to avoid operational problems), and a 7.2 metre diameter tunnel (the TTSS preferred alternative).
  - Option 2: Two shorter tunnels, in west and east London, to intercept intermittent problem discharges along these stretches of the river, and probably additional treatment in east London.
6. For each of these options, alternative tunnel diameters/routes were assessed and costed by Thames Water. Thames Water provided its assessment of the options in a summary report submitted to Defra Ministers on 29 December 2006.
7. The Consumer Council for Water<sup>1</sup> (CCWater) has been involved in the discussions and assessments of the options for dealing with the combined overflows. The Chair of CCWater's Thames Committee, Professor David Bland met with the Chairman of London Councils and the Chairman of London Councils TEC on 15 June to discuss a range of issues, including the Thames Tideway tunnel.

## Current Situation

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<sup>1</sup> CCWater is a watchdog representing water and sewerage consumers in England and Wales. It took over this role from WaterVoice on 1 October 2005.

8. Following 6 years of assessment of the options, Government has now decided on a solution. The preferred option is for a single 30km tunnel of 7.2m diameter under the Thames, to intercept discharges from Hammersmith to Beckton, with an early phase side link from Abbey Mills to Beckton. The project is expected to cost at least £2 billion and is expected to be delivered by 2019/20. On 22 March 2007, the former Environment Minister, Ian Pearson announced the Government's decision and asked Thames Water to progress the chosen solution to planning and financial approval stage.
9. The early phase work involving construction of a link tunnel from Abbey Mills to Beckton to collect the large and frequent discharges occurring at Abbey Mills is projected to proceed more quickly to meet the requirements of the Urban Waste Water Treatment Directive as soon as possible, and with the aim of being completed in time for the Olympic and Paralympic Games. However this is a large and complex project likely to entail use of established technology but at an unprecedented scale in this field of operation. This carries high risks of delays occurring which could significantly affect planned delivery timetables. In case a permanent solution to Abbey Mills discharges cannot be in place by the time of the Olympic and Paralympic Games, interim contingency measures to mitigate the effects of the discharge are being investigated in parallel.
10. CCWater is strongly of the opinion that the current Government proposal is unaffordable for Thames Water supply region customers. Additionally, CCWater feel that a range of alternative options were discarded too quickly without thorough investigation of their overall benefits in cost, delivery timescale, disruption caused, social impacts and environmental impact terms. Their submission for the Committee's initial consideration is attached as appendix 1 to this report.

### **Affordability and Alternative Approaches**

11. Thames Water, and by implication, its customers will pay for the delivery of this infrastructure. The Government's announcement on 22 March indicated that the Tideway Tunnel option would add an estimated £37 to Thames Water sewerage bills by 2017. Ofwat, the economic regulator must ensure that Thames Water is able to properly finance this project in determining the company's price limits for future years.
12. A recent update from Ofwat on the financing of the Tideway project sets out the regulator's approach. Ofwat is examining alternative financing models with the overall objective of delivering a mechanism that provides the best value for customers. The Ofwat update notes that this project is different in scale and duration when compared with the capital programmes that Thames Water has delivered to date and therefore presents a different set of risks. Ofwat is working with Thames Water to explore two broad financing alternatives:
  - Option A – Thames Water financing and procuring the construction of the Tideway and maintenance thereafter as a regulated company, with the regulatory regime adapting to take account of the specific risks associated with the project. Thames Water is due to provide further details of the risk sharing mechanisms that would need to underpin this option in the next month.
  - Option B – A special purpose vehicle (SPV) established solely to finance and procure construction and maintenance of the Tideway. There are various ways under this option that the project could be regulated by Ofwat and the legal constraints to this option are being looked at by Ofwat's legal advisors. There are likely to be variants to this option in terms of the scope of the contracts (constructions and/or maintenance) and/or who might procure the contracts (who would be the client).
13. Ofwat will be putting a proposal on the broad alternatives to its Board in July.

14. The Regulatory Impact Assessment (RIA) of the Tideway Options notes that Ofwat has estimated the incremental bill impacts but only in relation to design and construction costs. The modelling, with contributions from the Consumer Council for Water (CCWater) does not take account of longer term issues such as ongoing costs associated with the maintenance of the tunnel solutions and asset replacement costs which will impact on bills beyond the construction phase. Even with these limitations, The RIA modelling suggests that more than 20% of Thames Water customers would be in water poverty (i.e. paying over 3% of disposable household income on water bills by 2012/2013 if the Government's preferred option goes ahead.
15. CCWater contend that even these projections are turning out to be an underestimation. They now project the minimum construction costs for the main tunnel at £2.4 billion in addition to £800 million for contingencies and an unspecified amount for servicing the financing package. The link from Abbey Mills is estimated to cost about £800 million. The Abbey Mills Pumping Station, situated about 1km downstream of the Olympic Park, is the source of around half of the 32 million cubic metres of untreated sewage estimated to be discharged per year from London's combined sewers in an average year. CCWater have suggested that constructing the link tunnel would deal with half of the problem for less than a quarter of the projected overall cost and as construction of the main sewer is not scheduled to begin until 2014, Government should then look again at some of the previously discarded options for other sections of the River Thames. CCWater also predict significant inflation in design and construction costs projecting a doubling of water bills for customers, with the Tideway increasing bills by £120 and putting more people into water poverty much earlier.
16. The CCWater submission (appendix 1) sets out alternatives that could have been considered in more details as part of an integrated, longer term, lower impact solution. These included measures such as:
- Sustainable Urban Drainage systems (SUDS) - Jacobs Babbie considered that SUDS could be implemented where appropriate in suburban fringes over the medium to long term.
  - Rainfall Harvesting/Storm water harvesting – dismissed as having only limited benefits
  - Real time control and sensing to retain the damaging first flush and subsequent clearance of solids, and allow diluted storm volumes into the Tideway.
  - Selective separation – especially of storm flows along the lines of the lost rivers.
  - Search for selective sites – perhaps in public parks on common land where temporary storage of rainfall might be feasible, with overflow channels for relatively clean water to escape into the Tideway.
  - Search for selective sites for concealed or covered treatment works to treat storm flows nearer source without long distance transfer tunnelling.
  - A shorter storage and transfer tunnel which would intercept selected base flows only, reducing congestion and therefore spills at other combines overflows which at present discharge only intermittently and in relatively small volumes.
17. An alternative to the Government's proposed scheme might be a hybrid of one or more of these approaches. CCWater believes that there is latitude within the requirements of the Urban Wastewater Treatment Directive<sup>2</sup> to consider options with some 90% of the

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<sup>2</sup> The EC Urban Waste Water Treatment Directive 91/271/EEC covers the collection and treatment of urban waste water and the disposal of sewage sludge. The treatment standards and the deadlines set for in the Directive for treatment vary according to the sensitivity of the receiving water, the type of receiving water (i.e. fresh waters,

performance of a full tunnel, at a significantly reduced cost and with scope for future extension. A hybrid scheme could also contribute to London's resilience at periods of extreme drought by making more effective use of rainfall over London. It could also cut the embedded carbon in a full tunnel, and the disruption caused by attempts to build 36 interception points.

## London Councils Involvement

18. London Councils and boroughs have been outside the development process up until now. However, the issues raised by CCWater's submission could have significant impacts for residents and businesses and deserve consideration. London Councils has been successful in the past in securing a better deal for residents such as in the intervention over Thames Water's charges for the installation of pumps in high rise buildings to deal with low water pressure. The Tideway tunnel is an even bigger project of national significance with potentially severe social and environmental impacts, and its delivery options should be influenced by the voice of boroughs.
19. London Councils could seek to influence proposals in the context of a comprehensive assessment of the region's needs and seek a joined up strategy for all its water problems, including water supply. There are a number of ongoing Thames Water and related projects as part current investment programme, the effects of which might remove the need for such a large and expensive tunnel. There are also a number of very large scale projects – the Olympics, Crossrail, - which will be running in parallel with the construction timetable for the Tideway tunnel. These pressures are likely to result in higher and rising costs as well as intolerable disruption over an extended period. The need for London's water environment to meet legal requirements has to be balanced against the capacity and willingness of consumers to support and pay the costs of these major projects.
20. The June meeting of the Thames Tideway Advisory Group (TTAG) which replaced the Thames Tideway Strategic Study<sup>3</sup> (TTSS) group and the later formed Working Group on the Thames Tideway and the 2012 Olympics<sup>4</sup>, wound up the Group. Defra are now looking to set up another Group to bring the two groups above together, with a focus on implementation and officers are exploring the opportunities for London Councils to engage with this issue through this proposed Tideway Progress Group.
21. Further, the Environment Agency will be setting up a specific strategic implementation group, the Olympics Measures Group, to explore the specific measures required to be taken to deliver the Olympics objectives for London's waterways and to manage the projected discharges. This Group will take account of both the Urban Waste Water Treatment Directive and the Water Framework Directive obligations. London Councils officers have expressed an interest in being involved with this group although it may be more appropriate or sufficient to have representation from an Olympic borough.

## Financial Implications for London Councils

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estuaries or coastal waters) and the size of the agglomeration (usually urban areas) which produces the waste water.

<sup>3</sup> Incorporating Thames Water (TW), the EA, Defra, the GLA, plus Ofwat as an observer, meeting under independent chairmanship.

<sup>4</sup> Incorporating the members of the TTSS and London Thames Gateway Development Corporation, British Waterways, the Olympic Development Authority, and several other Government departments.

22. The detailed financial implications for London Councils or for boroughs are as yet unclear. The implications will become clearer when the current options for a financing mechanism have been fully considered and agreed.

### **Legal Implications for London Councils**

23. There are no specific legal implications for London Councils from this report.

### **Equalities Implications for London Councils**

24. There are no specific equalities implications for London Councils from this report.

### **Recommendations**

25. Members are recommended to:

- Note the Government's decision on a solution to the combined sewer overflow problems in London;
- Note the concerns raised by the Consumer Council for Water (CCWater) with regards to affordability and the watchdog's suggestions for alternative approaches to the combined overflow problem;
- Agree that officers explore representation for London Councils on the proposed Defra Tideway Progress Group;
- Agree that officers explore representation for London Councils on the proposed Environment Agency Olympics Measures Group;
- Agree to receive further reports on this issue if CCWater are able to better quantify the affordability and delivery benefits of their proposed alternative options.

## Appendix 1

### THAMES TIDEWAY OPTIONS: NOTE BY CONSUMER COUNCIL FOR WATER (CCWater)

1. There have been three stages of review, each reducing the number of options to address Tideway storm overflows.

#### **Preliminary:**

2. In its early stages the Thames Tideway Strategic Study Group looked at four possible strategies:

**Strategy 1: Before the run-off rain water enters the sewerage system** – e.g. storage at source, including Sustainable Urban Drainage Systems. It was considered that this could only be applied in the uppermost reaches of the Beckton and Crossness collecting system catchments, and not in the densely urbanised environment of central London where there is a lack of suitable surface sites for SUDs, and underlying impermeable clay reduces the scope for soakaways.

- Further development of SUDs in the less central areas was recommended but not taken further. This is an option the London Boroughs are well placed to explore. It will not resolve but could as part of a sustained long term strategy reduce the problem of storm overflows.
- As Bazalgette's mid level interceptors run quite close to the river and take significant volumes of storm overflows directly to interceptor junction points at Abbey Mills and Deptford/Greenwich, an intensive examination of the scope for SUDs in the relatively small area between the Tideway and the mid level interceptors could also be worthwhile.
- No consideration has been given to storm water and rainfall harvesting, largely because of lack of space in inner London and a belief that fragmented collecting systems soon fill up and have very little potential to capture and hold storm flows. Several other cities have taken such options more systematically – e.g. Peking and Chonqing.
- A combination of SUDs and rainwater harvesting has the potential advantage that it contributes to sustainability and continuity of water supply, and therefore to resilience in drought.
- If new collecting systems which run off directly to the river could be constructed, a solution could also contribute to fresh water volumes in the Tideway itself, which are forecast to be depleted by as much as 50% in long term climate change modelling.
- Most overflows to the Tideway are characterised by slicks of fats and grease. The Boroughs have an enforcement role in reducing disposal to sewers and creating constructive alternative disposal routes, including recycling.

**Strategy 2: Within the sewerage system** – e.g. flow separation, local flow attenuation and offline storage.

- This was dismissed on the grounds that an entirely new separate sewerage system would cost at least £12bn, and separated off-line storage tanks would be expensive, difficult to find sites for and less efficient than the tunnel solutions.
- Because dry weather flows in the sewers leave limited spare capacity there is little potential for attenuation. New dispersed storage was costed at £5bn to £12bn with a delivery period in excess of 30 years.

- Little attention has been given to selective separation. London's topography concentrates rainfall in storm sewers under the former lines of lost rivers. There have from time to time been proposals to return selected rivers to surface flow (e.g. the Effra) by building new channels from the point at which they can be observed to flow substantially clean. This has not been taken forward.

**Strategy 3: At the interface between the sewers and the river** i.e. by interception of each CSO judged to constitute a nuisance. This was the selected strategy and was further developed into the eight options considered further by TTSS.

**Strategy 4: after storm flows have entered the river** through skimming, collection, oxygenation etc. This was considered ineffective by the Environment Agency.

**The eight options considered by TTSS were all variants of strategy 3**

#### **A: a storage and transfer tunnel**

- This allows overflows to be intercepted at all 36 CSOs judged to be a nuisance, stored with a tunnel, removed by gravity to Beckton (initially Crossness was proposed) and pumped out within two days for treatment. Various diameters and capacities have been considered. The preferred option and considered further in work commissioned by DEFRA last July. This has throughout been considered the most acceptable option by the Environment Agency although it is also the riskiest in terms of engineering difficulty because of the 80m depth of the tunnel at the eastern end, which leads to potentially difficult though not unprecedented techniques.

#### **B: Transfer**

- Also entails a long interception tunnel but stormwater/sewage is simply carried downstream to be pumped out at less damaging locations – rejected on grounds of limited contribution to environmental and health objectives and high pumping and construction costs.

#### **C: Multiple screened outlets**

- Rejected as difficult and disruptive and also on grounds of cost, because it was thought to require a connecting tunnel or tunnels to remove waste water.

#### **D: Multiple screened outlets with storage** – effectively a hybrid of A and C.

- Also dismissed on grounds of cost, complexity, disruption and complex operation. One feature of this option that of some interest was that it would be designed to store the first flush of overflows, and not the whole flows the later parts of which are thought to be highly diluted.
- The real time control aspects of selective separation at the point of overflows has not been considered deeply or innovatively. It is a potential area for a further assessment.

#### **E: Storage shafts** –

- large shafts on the foreshore holding a third of CSO discharges for return to the interceptors after storm conditions have passed, with two thirds pumped out after screening. Rejected on grounds of difficulty of construction, site sensitivities, cost, impracticality, and limited contribution to objectives. However the costing of this option was undertaken at a stage when it was thought that many more than 50 shafts would need to be constructed.

#### **F: Screening at individual CSOs**

- although widely used throughout England this option was thought impracticable in London, difficult to construct at most locations and expensive – possibly £12bn

### **G: Displacement**

- the option was based on a conduit normally left full and discharging to a large wetland area for natural processes to take over. No suitable sites were found, but there were also hydraulic and pumping difficulties.

**H: A West London scheme** as a first phase of option A, which developed into the two tunnel option considered in the:

**July/December 2006 phase**, when the two tunnel option was eventually rejected because it was incomplete in terms of its delivery of objectives and did nothing to abate discharges between Vauxhall and Beckton. Willingness to pay for a two tunnel option was also weak, as it appeared to respondents that half a solution was less worthwhile than a whole solution.

### **Scope for further work on an alternative scheme**

3. Despite more than 6 years of examination, there appear to be several options that have been given only scant attention;
  - SUDS
  - Rainfall Harvesting. Storm water harvesting.
  - Real time control and sensing to retain the damaging first flush and subsequent clearance of solids, and allow diluted storm volumes into the Tideway.
  - Selective separation – especially of storm flows along the lines of the lost rivers.
  - Search for selective sites – perhaps in public parks on common land where temporary storage of rainfall might be feasible, with overflow channels for relatively clean water to escape into the Tideway.
  - Search for selective sites for concealed or covered treatment works to treat storm flows nearer source without long distance transfer tunnelling.
  - A shorter storage and transfer tunnel which would intercept selected base flows only, reducing congestion and therefore spills at other CSOs which at present discharge only intermittently and in relatively small volumes.
  - An alternative scheme might be a hybrid of one or more of these approaches. CCW believes that there is latitude within the requirements of the Urban Wastewater Treatment Directive to consider options with some 90% of the performance of a full tunnel, at a significantly reduced cost and with scope for future extension. A hybrid scheme could also contribute to London's resilience at periods of extreme drought by making more effective use of rainfall over London. It could also cut the embedded carbon in a full tunnel, and the disruption caused by attempts to build 36 interception points.
4. Because of the risks of construction costs overruns and unanticipated difficulties in finalising the location and construction of each interception shaft an alternative option could also be designed to be constructed on a cautious and incremental basis.
5. Even at the present estimated construction cost of £2-£2.5bn, a Tideway tunnel will put unacceptable pressure on water and sewerage charges, and will have severely regressive effects. Unless some reduced cost option can be developed, Londoners face

a decade of real terms increases in water charges in excess of 10% per annum, leading to extensive water poverty (ie water charges in excess of 3% of disposable income after housing costs) and taking more than 6% of the income of some of the capital's poorest families. Our provisional calculation is that nearly 50% of households with children in inner London could be in water poverty by 2017. Rapid price increases could be made worse by:

- cost overruns;
  - transfer of financial risks to customers in the course of finalising a financial package for the scheme;
  - unanticipated costs of new sewage treatment capacity;
  - compulsory metering which could have the effect of transferring a significant share of costs from occupiers of higher rateable value property to occupants of lower rateable value property.
6. The social consequences of this have not been thought through, and are likely to be unacceptable. We would welcome a constructive interest in alternative possibilities from the London Boroughs.