



Thames Tunnel Commission

Response to the invitation to submit
evidence

Introduction

1. The Consumer Council for Water (CCWater) is the statutory consumer organisation representing water and sewerage consumers in England and Wales. We have four regional committees in England and a committee for Wales. This response has been prepared by members of the London and South East Committee who have been in close dialogue with Thames Water, Defra and the Environment Agency (EA) over the development of proposals for the Thames Tideway since our establishment. (Our representations at each stage of consultation are listed at Annex A). We therefore welcome the opportunity to respond to the Thames Tunnel Commission's call for evidence.

Executive Summary

2. We recognise the need for increased investment in the capacity of London's main drainage system and in measures to manage surface and storm water in a more sustainable way. Between 2010 and 2015 more than £1.2bn will have been spent on Tideway water quality, paid for by all Thames Water's sewerage customers.
3. The costs of the proposed Thames Tunnel have escalated since it was first proposed, and are now estimated to add a further £3.6bn by 2020, with a risk of further cost escalation.¹ Even before this increase the projected impact on Thames Water's sewerage bills significantly exceeded customers' level of willingness to pay.
4. The Secretary of State for the Environment has indicated that the Thames Tunnel is essential, and she has power to require it to be built.² Our concern, on behalf of consumers, is that the solution or solutions should:
 - deliver required objectives;
 - be robust in relation to future climate and demographic change, and to the intensification of land use;
 - be the most cost-effective measures available;
 - be cost-beneficial and therefore good value for money;
 - be proportionate to the scale of the avoidable harm to public health and water quality, taking account of the improved baseline after other planned investments have been completed; and
 - be affordable, with the costs fairly distributed.
5. These issues need to be addressed in a revised business case or regulatory impact assessment (RIA). We believe this should be available before Parliament is asked to sign off the project as part of the National Waste Water Infrastructure Statement. The revised RIA should include a revised cost benefit statement and assessment of affordability reflecting an estimate of all the potential cost pressures

feeding through to water and sewerage bills and a realistic assumption about movements in real incomes. This is because:

- The projected cost of the Thames Tunnel has doubled;
 - Outstanding questions about benefits need to be resolved;
 - Economic circumstances have significantly changed;
 - Other future cost pressures are likely to be greater than anticipated in 2007;
 - Compulsory metering is now planned by Thames Water, and this will change the distribution of bill impacts.
6. The costs of the proposed Thames Tunnel are already much higher, and could escalate further, and seem disproportionate to the benefits available which are slight in terms of measurable public health impact and uncertain as to the effect on the sustainability of fish species in the longer term. In the current economic climate, with faltering growth and declining real incomes, it is not advisable to commit the company to so much additional debt as it exposes customers to bill increases on a scale that could cause real hardship and payment difficulties. If there are less expensive alternatives that meet legal requirements, they deserve close attention.

Is there a reliable economic appraisal?

7. Ofwat has not signed off an economic appraisal for the present proposals.³ Their advice to the Minister in January 2007⁴ on the options explored in the preceding six months said:

"All the work done to consider yet further improvements to the Tideway demonstrates that it would not achieve value for money. Indeed, the evidence strongly suggests that the benefits would be very limited from the proposed sewer interceptor, whether in terms of health improvement, nuisance reduction, or environmental improvements. Any such improvement would not in any way be proportionate to the very high cost, well over £2bn for each of the variants of Option 1"

8. The 2006 cost estimate of £2bn has since increased significantly, and is expected to increase again once a higher cost of capital related to special project risk has been factored in. A law of diminishing returns on each increment of investment in the Tideway seems to have set in. Ofwat was not persuaded in 2007 that a project at the then estimated level of costs secured value for money in terms of benefits. Their advice continued:

"Thames' report does nothing to allay our concerns over a new Thames Tideway scheme as a whole. . . None of the options investigated have been shown to represent value for money. The costs of all options are huge, several times that of the Thames ring"

main the largest project Thames has undertaken in this country. In contrast the tangible benefits offered by the options are uncertain, marginal at best, and subject to erosion by climate change to the extent that the dissolved oxygen objectives will fail to be met at some point within the first 60 years of operation. The cost benefit analysis has not taken climate change into account and has thus produced net present values that are overstated. Even so, all options have been calculated as having negative NPVs when benefits accruing to Thames customers are used. The evidence to hand shows that Thames' customers are not willing to pay for the improvements. This is set against the background of likely rapidly rising prices after 2010 to ensure that safe, secure water supplies (customers' number one priority) are maintained."

9. We also believed that benefits as assessed at that point were overstated. We supported the proposed investments and planning application for the Lee Tunnel and upgrade of associated sewage treatment works, and continued to work with Thames Water on cost saving opportunities for the Thames Tunnel.

Compliance

10. Defra has generally treated the legal aspects of the case as a confidential matter between itself and the European Commission. We have not seen either the Commission's statement of reasons for opening infraction proceedings, or the Government's response. Ministers have decided that the infraction risk is serious and it forms part of the rationale for their acceptance of the case for a full Thames Tunnel.⁵ They also believe that there are free-standing reasons why the drainage of London needs to be updated, and see the investment as a national priority.
11. Compliance requirements need to recognise the possibility of disproportionate or excessive costs. The wording of the two relevant European Directives defines the scope for national discretion in the following terms.
12. The Urban Waste Water Treatment Directive (UWWTD), to which the present infraction proceedings relate, recognises the possibility of excessive costs: measures must be consistent with "*best technical knowledge not entailing excessive costs (BTKNEEC)*"⁶. There is an opinion on what this means from the Advocate General to the European Court of Justice⁷:

"the Waste Water Directive regulates the escape of waste water from collecting systems, and even accepts this where prevention of such escape in accordance with best technical knowledge would entail excessive costs . . . the scope of the prohibition should be limited in accordance with the principle of proportionality, to the effect that the holder of waste cannot be accused of an uncontrolled

release where he has exercised due diligence. The Waste Water Directive provides precisely for the standard of diligence to be exercised. It lays down the measures to be taken to prevent uncontrolled escape of waste water. Regard is to be had to the best technical knowledge, and the costs of securing the collecting system are to be weighed up against the possible damage in the event of overflows."

13. The EA's view⁸, on the other hand, is that the provision affects only the choice of a least cost solution, and that the standard (presumably the requirement to avoid overflows in all but "unusual rainfall") is absolute, if not defined in a precise numerical form:

"The potential cost of improvement works to overflows or collecting systems to achieve those standards is not a relevant consideration in that assessment save for the purpose of determining which of several competing solutions is the most cost-effective - the BTKNEEC requirement."

14. The Water Framework Directive (WFD) requires specific standards to be set for all water bodies in the European Community. These are an exacting set of standards listing minimum requirements for a range of biological and chemical conditions. Compliance requires "good ecological status" or "good ecological potential" in the case of highly modified water bodies such as the Tideway.⁹ Article 4(5) of the WFD allows the adoption of less stringent environmental objectives where achievement of the standards would be infeasible or disproportionately expensive, subject to conditions. One of the conditions is that there should be no further deterioration in status.
15. Measures to implement the Directive in full will be spread over three cycles of River Basin Management Plans, concluding in 2027. If current estimates of £4.6bn will not achieve "good ecological potential" on the Tideway¹⁰ questions of disproportionate cost will need to be addressed. The questions over whether conditions in the Tideway are likely to improve or deteriorate following present planned investment, and whether there is a duty to prevent deterioration due to climate change, need to be resolved.¹¹

Objectives

16. As the WFD standards were in draft form until 2009, a set of interim standards were used to appraise Tideway options. These were first developed for the Thames Tideway Strategic Study (TTSS) group and are often referred to as the TTSS standards.¹² These were:
- To reduce the frequency of operation of those discharges that cause significant aesthetic pollution or to limit the pollution caused, to the point where they cease to have a significant adverse impact.

- To limit ecological damage by complying with specified Dissolved Oxygen standards;
 - To help protect river users by substantially reducing the number of 'elevated health risk days' following CSO discharges.
 - To comply fully with the requirements of BTKNEEC.
 - To ensure that a solution has sufficient flexibility to accommodate future changes brought about by climate and other effects.
17. We believe it is within the discretion of the UK Government and the environmental regulators to formulate measures in pursuit of these objectives in a way that does not require disproportionate expenditure. So, it is important to establish whether BTKNEEC is a measure only of relative cost-effectiveness, or allows a test of whether the best option is cost beneficial? The EA has a general duty to have regard to costs and benefits in the exercise of its powers, and Article 174 of the Treaty imposes a similar obligation on the Commission.¹³ We cannot offer expert legal advice, but if non-cost beneficial measures and poor value for money are an unavoidable requirement, we would want a clear explanation of the legal reasoning.
18. Compliance questions are a mixture of fact and law informed by medical, environmental and engineering judgement. We do not claim professional expertise in any of these matters, but taking the objectives in turn, our assessment of the key points is as follows.

Public Health

19. Tideway conditions impose no risk to drinking water, and there is no evidence that better Tideway water quality could reduce water supply treatment costs. Disinfection of treated effluent at the point of discharge to the river is not required because the Tideway is not designated as bathing water, and the application of World Health Organisation (WHO) recreational standards is not mandatory¹⁴. Nor would the construction of the Thames Tunnel improve conditions to the point where bathing or recreational water standards could be achieved¹⁵. The WFD does not address microbiological parameters or risk. The public health objective is therefore a matter for national or local discretion, and normal evaluation procedures for managing risks to the public should be applied.
20. Risks arise from immersion and ingestion, and from handling foul wastewater or items in contact with it. Immersion risks potentially affect some 5,000 recreational users of the Tideway, with different frequency depending on the type of activity. Thames Water relies on a study by the Health Improvement Authority to prove an association between CSO spills and elevated health risks. We agree that there is an association, but the study shows that the incidence of illness following exposure to the risks is extremely low, and not such as would normally

justify anything like a £3.6bn preventative investment if health benefit were the only objective.

21. There is Treasury advice on appraisal of measures to manage risks to public health.¹⁶ So far as we know it has not influenced the Tideway appraisal, although its aim is to encourage proportionality and consistency of response with regard to:
 - the degree of risk,
 - the severity and extent of illness to be controlled,
 - the prospects for reducing incidence,
 - the degree of personal control over exposure,
 - the vulnerability of those affected, and
 - the cost of mitigation measures.
22. Expert analysis of public health measures would generally require information about exposure, risk and incidence. The Tideway appraisal process has quantified only exposure to pathogens, and evaluation of benefits through stated preference surveys has given information about exposure (microbiological counts) to respondents, but not information about the incidence of illness in the at-risk group or the probability that the proposed intervention will reduce incidence. Within these constraints, evaluation cannot deal with scale.
23. Concurrent evaluations of bathing water improvements and Tideway improvements by the same company, using similar stated preference methods, found approximately similar NPVs for the benefits of national bathing water and Tideway interventions. This is a questionable outcome given that measures affecting all bathing beaches address 1.3m potential cases of illness a year and the Tideway interventions address only some 60 cases of illness a year.¹⁷ They cannot rationally be said to be of equal value. This suggests that stated preference methods are an unreliable way of valuing health interventions, and particularly poor on matters of scale. Expert commentary on the use of stated preference valuations in the health service has said as much.¹⁸
24. We expressed concern about the stated preference valuations of health benefits during the course of the 2006 Tideway cost benefit survey, and suggested that a standard QALY valuation should be used as a cross check. It was not possible to do this at the time, because of time constraints and lack of information about risks and pathogen loads.¹⁹
25. Nevertheless a hypothetical valuation was worked out by NERA (see paragraph 5.39 of the RIA) suggesting a discounted Net Present Value for health impacts of £1.5m. This compares with a value of more than £4bn for health risk alone in the 2005 TTSS cost benefit survey, and a possibility that 60% of the 2007 total benefit valuation of c£2bn related to health impacts.²⁰ The structure of the two Tideway willingness to pay surveys was very similar in terms of attribute description, but the

method of the second survey did not construct separate values for separate attributes.

- 26 We are not aware that a QALY valuation has been commissioned to follow up on the HPA/PLHA study. The incidence of relevant illness amongst Tideway recreational users is approximately 10 times lower than in the population as a whole (12.8 cases/1000/year compared to 190 cases/1000/year) This strongly suggests that £3.6bn spend is not a proportionate response to this, and should not be undertaken without an expert medical appraisal.
- 27 An expert medical assessment, ideally by the Chief Medical Officer or a person appointed by that office, is long overdue. As it stands the health objective is unquantifiable, and needs a robust measure relating to avoidable incidence of ill health to be developed and applied.

Ecological objectives

- 28 In our evidence to the Lee Tunnel planning inquiry²¹ we noted that the fish studies available at the time²² showed no marked difference between the predicted sustainability of fish species in the Tideway with or without a tunnel. Thames Water's Needs Case and fisheries report responds to that by reporting further work revising the predictions of sustainability by taking closer account of likely antecedent conditions.²³ Willingness to pay (and public valuation of tunnel impacts) has been measured by asking the respondents to value a decrease in the frequency of fish kills. Overflows from sewage treatment works have made a contributory or dominant contribution to Tideway fish kills. Indeed, the most often cited fish kill of August 2004 was caused by an exceptional storm over the Mogden catchment and was predominantly if not exclusively caused by an escape of activated sludge from the Mogden sewage treatment works.²⁴
- 29 Ofwat's view that the benefits of the Thames Tunnel are likely to be eroded by climate change remains applicable to fish. It has been implied in past valuations that one of the significant impacts of the Thames Tunnel would be to help re-establish return migration by Atlantic salmon. However rising temperatures in the Tideway and North Sea approaches may well take the river above the usual physiological headroom of salmon and it appears from the most recent fisheries report that sustainable migration by salmon is not expected or cannot be relied on.²⁵ This significantly reduces the relevance of the investment to the rest of the river basin. Salmon are likely to be sustainable only as a stocked species.

Aesthetic objectives

- 30 The Thames Tunnel may further reduce the visible pollution in the Tideway, although it is questionable how often this is noticed by the public. 80% of respondents to the most recent willingness to pay survey

had never or rarely seen sewage waste in the Tideway.²⁶ Such waste is most likely to be obvious only to recreational users or those living on the riverfront. Some of what is taken to be human waste is in fact vegetable matter loosened from the riverbed in storms.²⁷ Sewage waste has been estimated to account for only 10% of all litter.²⁸

- 31 Projections of the amount of solid waste likely to be captured by new screens at Abbey Mills far exceed outturn waste collected, possibly because pumps have a macerating effect. While plugs of sewage waste and congealed fat move up and down with the tides for some time after deposition, the generally high level of turbidity makes it difficult to see them at other than close quarters.²⁹
- 32 It is not clear how far odour from the Tideway is currently a matter of widespread concern, or whether it will tend to worsen, or be diminished by the Thames Tunnel, which will need to be vented.³⁰

The baseline after planned investments

- 33 Planned investments (the Lee Tunnel and sewage treatment works improvements) will have a significant positive effect on the Tideway. It is unclear whether this will be measurable in public health terms, although there will be less offensive and polluting material from Mogden and other treatment works in the stretch of the Tideway from Kew to Putney Bridge, where most rowing takes place.
- 34 The total volume of sewage overflows will reduce by more than half.³¹ The difficulty for compliance assessment is that the frequency of overflows from the collecting system upstream of Abbey Mills is not expected to reduce significantly. As population increases, we are told that may occur in dry or nearly dry weather. Nevertheless, the planned improvements to sewage treatment works and the reduction in overall volumes from overflows will reduce the frequency of fish kills in the Tideway to less than two a year and it is not clear that these kills will be species threatening because many species appear to be able to outrun critical falls in dissolved oxygen. The species most adversely affected by hypoxia, salmon and sea trout, may not be sustainable in any case because of rising water temperatures.³²
- 35 The Lee Tunnel and Abbey Mills improvements without the Thames Tunnel, leads to the frequency of events causing acute hypoxia (breaches of the 1.5mg/100ml dissolved oxygen threshold) declining very substantially from more than 110 tides a year to fewer than 10.³³ The additional £3.6bn buys very little further improvement, suggesting that the very exacting TTSS standard has a very high marginal cost. This may suggest that the TTSS standard is expensive gold plating if it is more stringent than the UWWTD and WFD require.³⁴
- 36 On this basis, the proposed additional £3.6bn investment will secure a disappointing, and to most people scarcely visible return. If the law

permits a comparison of the cost of reducing frequency of spills with the damage that continues if frequency is not reduced, as the Advocate General's advice implies, there is likely to be a disproportionate cost case against the Thames Tunnel.

- 37 The issue is whether the requirement to avoid overflows in all but unusual rainfall overrides disproportionate cost considerations, and if so what is a reasonable numerical interpretation of "unusual"? Sixty spill events a year cannot be described as unusual and is not defensible, but the closer the target is set towards zero the more the cost mounts. It is clear that a zero spill frequency is not required. Some member states appear to be planning on the basis that a spill frequency of the order of 10 events a year is a sensible balance between environmental objectives and acceptable cost, and therefore a reasonable interpretation of unusual.

Supplementary or alternative options to the Thames Tunnel

- 38 Even after intensive reappraisal of the TTSS work, leading to the Ministerial decision and Regulatory Impact Assessment of March 2007, there were, and in our view still are, opportunities for cutting the cost of the proposed Thames Tunnel scheme.

The route

- 39 We questioned why the Tideway Tunnel needed to follow the Tideway all the way to Beckton, when a shorter route via Abbey Mills was a possibility if major CSOs such as Deptford could be connected in.³⁵ Although Defra did not think the issue worth pursuing³⁶, we took it up with Thames Water, and are pleased that the Abbey Mills Route was feasible, has now become Thames Water's preferred option, saves £748m, and complies with stated objectives.

The number of directly connected CSOs

- 40 The EA is understood to be reassessing the number of CSOs that need to be connected to the Thames Tunnel. Their initial requirement was 36, and the Tunnel designed accordingly. We understand that a smaller number has now been found to require direct connection, and may reduce again by the next round of consultation in September 2011.³⁷
- 41 The number and nature of these overflows may keep some options open for alternative solutions to be employed. If a tunnel was in place and the main (higher volume) overflows connected to it, we assume that there would be some consequent decongestion of the existing surface level interceptors, and as a result they would overflow less frequently than they do now whether connected to the deep tunnel or not.³⁸
- 42 We suggest that there should be a cost benefit appraisal of each marginal overflow where connection costs are high, and frequency low

(say ten a year now but likely to decline if there is a decongestion effect). The EA should expose their cost benefit assessments.

The volume of overflows and the proposed storage capacity

43. We have asked questions about the proposed storage capacity of the Thames Tunnel, and whether it could reasonably be reduced. The proposal of the TTSS group was to treat all the output of the Tunnel at Crossness. The proposed terminus is now at Beckton. Although Crossness will continue to serve the Southern catchment, all of the flows previously escaping to the Tideway will now go to Beckton. Either by a connecting transfer tunnel or by upstream real-time control and direction of flows, could it be more economic to raise the pump out rate and reduce the storage volume required in the Tunnel?
44. One of the issues addressed by the TTSS was whether it was necessary to intercept the later parts of storm overflows, there being a strong if complex first flush effect, after which the impact of overflows in terms of biological oxygen demand and other pollution is much reduced, although not to zero³⁹. This continues in our view to be a reasonable question to ask.
45. It seems clear from the EA's annual summaries⁴⁰ that the river is at its most distressed when summer flows are lowest and temperatures are highest. Could some part of major storm overflows have a predominantly beneficial effect if allowed to flow directly into the river? We have not seen a quantified exploration of this issue since the TTSS work. Given that flows into the tunnel will be regulated by operating rules and peak flows at drop shafts, there would be a means of control.

Climate change

46. We have two concerns that relate to climate change:

Dissolved oxygen and impact on sustainability of fish species

47. The Ofwat advice referred to the probable failure to meet Dissolved Oxygen standards within the life of the Tunnel. There is new information on Dissolved Oxygen performance to 2020, but not to 2080. We understand that temperature increase is certain to cause further deterioration because it directly affects oxygen levels, and that very low summer flows may become the norm as a result of changing patterns of rainfall.⁴¹ Further investment, unspecified as to nature or amount, would be needed to sustain the standards. The WFD's "no deterioration" rule may or may not apply to deterioration caused by climate change. If the deterioration is beyond the control of Member States, there may be no obligation to take action to offset it. We have asked the EA to clarify this, without a clear response as yet.

Sea level increase and the protection of Beckton STW

48. The Thames Tunnel would be pumped out to Beckton, a low-lying sewage treatment works downstream of the Thames Barrier. Are the costs of protecting the functionality of Beckton at the higher end of the range of predicted sea level rise properly factored in?

Decentralisation of sewage treatment infrastructure

49. This issue interested the EFRA Select Committee. Overflows from the Hammersmith Pumping system are a case in point. A significant length of the Tunnel (west of Lots Road) is primarily to make a connection to Hammersmith and we understand that Thames Water may propose a further westward extension (at a smaller diameter) to Acton.
50. We are advised that it is possible to build a small and highly contained sewage treatment works (in the sense that the impact of odour and other nuisance is minimal) for about £80m.⁴² Clearly it is not easy to broker acceptance of new works in populated areas, but there are plenty of examples across the country where a modern works functions effectively not too far from residential areas. The advantage of a more local solution to Hammersmith discharges would include a return of treated effluent to the Tideway nearer to the point of collection, and a positive impact on what would otherwise tend to become a more saline Tideway in predicted hotter drier summers.
51. We are not suggesting anything on the scale of Beckton, Crossness or Mogden, and where Bazalgette might have planned for a sewage lagoon, an enclosed storage tank would now be needed for holding storm surges. The economics of storage, land acquisition and the need to keep a constant treatment flow through any works may all count against such options. On the other hand the distance between abstraction and discharge points is an ecological problem across the river basin, and sets up a tension between concentration of treatment into giant plants, and uneconomic (but in some contexts environmentally preferable) decentralisation.
52. We understand that the storage capacity of the western end of the tunnel would only be used about four times in a typical year or 110 times through simulation of 40 years of larger rainfall events.⁴³ Four times a year seems to be within the possible definition of "unusual rainfall. So our question is whether there is any combination of SUDs, local treatment and conventional sewer enlargement that could, in combination, provide a more economic and environmentally effective solution than the western end of the 7.2m diameter tunnel (roughly speaking west of Chelsea).

Linked Storage Tanks/Connecting transfer tunnels

53. Linked storage tanks and connecting transfer tunnels were considered but rejected in the TTSS review of options. We note that one of the reasons the option came out unfavourably in terms of comparative cost benefit, was that it was assumed a 6m internal diameter connecting tunnel would be needed.⁴⁴ In recent conversations with Thames Water it has been suggested that tanks can be built with a high level of containment, so effective that it would be possible to build housing developments near them, provided they can be properly vented, drained and cleaned.
54. With the level of cost information available to us, it is not possible to assess whether any permutation of offline storage with a smaller diameter tunnel could be an economic option. We note that the European examples cited in the Needs Report tend not to be wholly reliant on a storage tunnel.⁴⁵

Sustainable Urban Drainage

55. Sustainable Urban Drainage (SUDs) and sustainable storm water management are issues on which the Commission has expertise and relevant evidence from other cities. Thames Water's position is that the contribution made by changing attitudes to permeable paving and parking surfaces, rainfall harvesting, green roofs etc are useful but minor in relation to the scale of the urgent need to deal with overflows. However there appears to be potential for action in selected areas and a more energetic approach through planning, development control and more permeable highway, parking and pavement surfacing has clearly been adopted in some cities.

Lost Rivers

56. We have been struck by the extent to which London's drainage problem is the degradation, often long ago, of lost rivers such as the Fleet, Tyburn, Westbourne, Effra and Falcon so that they have become merely overloaded drains.⁴⁶ There have from time to time been imaginative proposals⁴⁷ to reinstate part of the flow of these rivers on the surface, perhaps by tapping flows near their heads, which are relatively clean, and diverting *selected* surface drainage into them in their lower reaches. Where rivers have survived to the present day, such as the Wandle, Brent, Ravensbourne, and Lee, which bound the central London drainage area, they contribute to an attractive environment and quality of life.
57. The possibility of separating the sewerage and surface drainage functions of the combined drainage system has often been discounted as requiring a wholesale reconstruction of the drainage system, rather than seen as an opportunity to restore natural surface drainage in a selective and environmentally constructive way, as a

feed for green infrastructure. The Commission's assessment of this would be appreciated.

Sewer Flooding of Property

58. The proposed tunnel would protect the river Thames, but would not have a major impact on sewer flooding of homes and gardens. The point of the Thames Tunnel is to provide storage capacity under London. It makes sense to situate this next to the offending CSOs. But there is also a need to improve the capacity of some of the radial storm drains. Pumping out the lower interceptor sewers into the Tideway helps reduce back up in sewers that can lead to sewer flooding.
59. Putting a proportion of the proposed storage capacity into enlarged radial sewers could have a dual benefit. Studies of sewer capacity in the Counters Creek and Effra catchments are in progress. A solution that increased local capacity might relieve some of the pressure on Hammersmith pumping station. If enhanced radial sewers were able to provide significant additional storage capacity, could it offset the need for equivalent volume in the Thames Tunnel? Interviewed in reports for BBC London regional news, civic leaders in at least one North American city appear to regret that relief of sewer flooding was not given priority over investment in deep level tunnels.

Appraisal

60. As stated previously, the appraisal and cost benefit calculations that were included in the RIA of 2007 have been overtaken and are now inadequate. Costs have doubled, and there is continuing doubt about the adequacy of the willingness to pay and benefits assessments.⁴⁸ Economic circumstances have also changed dramatically since late 2006, when the last willingness to pay survey was conducted. Defra is understood to be working on a revised RIA, but it has yet to appear and may take some time.⁴⁹
61. Costs for the Thames Tunnel may escalate further still, for example because the current economic crisis raises the general cost of capital, or makes capital unobtainable cheaply for a project with a high level of construction risk. Without a revision or new appraisal there is no up to date comparison of costs with benefits, and therefore no current business case for the Thames Tunnel. Cost benefit in relation to Thames Water's customers' willingness to pay in 2006 was negative for all options, and current estimates of average bill impacts (£90/yr/hshld) vastly exceeds the then estimated willingness to pay (£13/yr/hshld). Since 2006 the financial circumstances of very many households have worsened.⁵⁰
62. The absence of an up to date business case is a cause for serious concern. This needs to be remedied *before* Parliament is asked to

approve the adoption of the Tunnel as a major infrastructure project. The proposed inclusion of the Tunnel in a National Waste Water Infrastructure Statement would have the effect of closing down opportunities for further formal challenge at planning inquiry.⁵¹

63. While we note the case for streamlining planning procedures, the need for urgency, and the argument that a planning inquiry may not be the best place to test a business case, we believe that the absence of any form of revised business case for a project of such immense cost and risk is a serious omission at this late stage.
64. A great deal of information has been put out over the years, but there remain some surprising gaps and unanswered questions. There is, perhaps, less transparency now about appraisal and the relative cost-effectiveness of different options than at any previous stage in the long gestation of the proposals. The planning process itself may add additional costs if groups of residents succeed in making a case for re-siting access arrangements, and alternative sites have higher land acquisition or compensation costs. There needs to be clarity about costs and benefits before these decisions are taken.
65. There are also outstanding issues about sustainability and the cost and tolerability of the construction process:
 - The steel and concrete used in tunnel construction has a major embedded carbon cost;⁵²
 - There are perpetual energy costs in pumping out the tunnel;
 - Waste removal and disposal has a transport and also a carbon cost;
 - There is significant congestion and loss of amenity arising from construction sites, some of which will be needed for seven years. Cost benefit appraisal has not so far addressed this.
 - There may be compensation and other land costs arising from the substitution of brownfield for greenfield sites, although we understand from Thames Water that it will generally take a “no pain, no gain” approach to its own land acquisition and disposal costs, neither profiting nor losing from the process of buying and eventually disposing of necessary land.
66. As it is our duty to represent the interests of all consumers we are not taking a position on the relative merits of different sites for access and drive shafts, although we have questioned whether the number of direct access shafts could be further reduced.

Customer impacts - affordability and fairness

67. Our concerns in this area relate to the scale of the proposed investment, resulting bill impacts and the effect this will potentially have on a region that already has a significant affordability problem.

68. The affordability assessment in the 2007 RIA and estimate of bill impacts is now out of date and needs to be urgently repeated because:

- costs have escalated and could increase further: previous estimates of bill impacts are obsolete;
- the willingness to pay survey was flawed as a proper measure of consumers' attitudes to bill impacts and is again out of date;
- the true impact of price increases arising from the Thames Tunnel will be much worse, given the changed economic situation;
- other forthcoming cost pressures not previously quantified and/or foreseen will increase prices even without the Tunnel, and should now be properly factored into the assessment of impacts on consumers;
- compulsory metering in the region was in prospect in 2007 but is now set to happen (and is already happening in some other parts of the South East), the potential adverse effects of metering on affordability and child poverty if not mitigated are becoming evident and will be exacerbated by the added costs of the Tunnel.

Costs

69. The estimated cost of the Tideway projects has escalated, from £1.7bn in 2004 (including Lee Tunnel and sewage treatment works costs) to £2.4bn in 2007 (also including Lee Tunnel and STW costs) to £3.6bn now for the shortened Thames Tunnel via Abbey Mills, plus some £0.8bn for the Lee Tunnel and upgrade at Beckton (all costs at relevant year prices).. The total costs of all the Tideway schemes have therefore increased from £1.7bn six years ago to £4.4bn. A further £0.5bn to be spent at other Tideway STWs brings the total water quality investment to more than £5bn in today's prices, and there is no guarantee that the Thames Tunnel will not be subject to further escalation.

70. These costs will potentially be borne by all Thames Water's sewerage customers, in and outside of London. Yet there have been varying estimates of how projected spend of £3.6bn will increase customer bills: around £60-£65 per year, according to the Secretary of State's statement on 7 September 2010; £52-£55 on the average bill by 2018, according to Thames Water's recent public consultation; and £40 per year, according to a recent Parliamentary Question; and £120 per year-£10 per month-according to the Commission itself. It is time for an independent re-appraisal of bill impacts.

Willingness to pay

71. As discussed previously, we question whether previous stated preference valuations and willingness to pay surveys can be relied upon as proper evaluations of consumers' attitudes towards the

significant expenditure to be incurred and ultimately recouped from them.

72. It is imperative that customers are provided with an accurate picture of bill increases derived from the costs of this project, and other likely pressures on bills, how such bill increases will accumulate over time, and how long they will last. It is important for the legitimacy and fairness of the Government decision on major infrastructure projects that those people who will have to pay are given a say in how it is taken forward.
73. We would also wish to see the costs attributed to this and other major infrastructure schemes shown separately on water bills to allow customers to see how these investments are impacting on their bills and so that assurances about bill impacts are seen to be delivered.

Changed economic circumstances/Affordability

74. Even with the present, relatively low, level of water and sewerage charges in the Thames region, there is currently more water poverty than in any other region, a situation in part explained by higher living costs and a concentration of areas of extreme poverty within certain London Boroughs with some 600,000 children living in households below 60% of median income. A steep rise in an essential utility bill will clearly exacerbate this situation.
75. Incomes at the bottom end of the earnings scale have declined in real terms in most years since 2004. The current fiscal stringency and depressed economy may continue for some years to come, with a continuing negative impact on real income growth for the majority and an acute impact on some households. Household water and sewerage charges will exceed 3% of income after housing cost for approximately 20% of the population, and exceed 5% for some. The 3% figure is widely quoted as an indicator of water poverty. This will combine with other long term rising trends in the costs of other essential household expenditure, namely electricity, gas, food and clothes.
76. It seems likely therefore that the rise in household sewerage charges will come at a time of extremely difficult economic conditions for most households, and will intensify the pressures of child poverty and water poverty already experienced by this region.

Other cost Pressures

77. In addition to the Tideway costs there are other forthcoming cost pressures yet to be finalised that will add to customers' bills. These include: costs of the second cycle of WFD expenditure; transfer of ownership of private sewers and possible sustainability reductions

requiring major resource development. Such other cost pressures, mean that customers are already facing bill impacts that are likely to be far higher than those estimates given so far. Graphics showing a rounded projection of future bill movements (and identifying Tideway costs and financeability as part of the whole) were prepared in 2007 and should now be updated.

Compulsory Water Metering

78. The extent of bill increases for individual households will be influenced, and for larger households exacerbated, by Thames Water's proposed compulsory metering programme. There would also be variation around the average bill impact. At present, with 70% of households paying a fixed charge based on rateable value (RV), there is some degree of progression in water charges, with households in higher RV property paying more and lower RV households paying less than the average RV bill.⁵³
79. Thames Water's Water Resource Management Plan is awaiting approval by the Secretary of State subject to further evidence from the company. It provides for a gradual move to 80% meter penetration (77% in London because of the high proportion of flats).⁵⁴ Quite independent of the Tideway impacts, this will tend to mean larger bills for larger households, with the biggest increases for large households in property with lower rateable values. The metered bill of a five or six person household is typically about 150% of the average metered bill; the metered bill for one person households about 75%.⁵⁵ Discussions continue on ways to mitigate increases associated with compulsory metering⁵⁶, but even if some form of permanent relief becomes available it will not eliminate the additional burden of Tunnel costs, and is more likely to shift the burden between different groups of customers.
80. Moreover, despite the strong arguments for volumetric charging, there is very little prospect that reductions in usage will lead to corresponding reductions in company costs. If the aspirational reductions in per capita consumption set out in the WRMP (from 157litres/person day to 135/ litres/ person day) are achieved, there is likely in due course to be a corresponding increase in the unit price for water and sewerage services. Metered customers will be able to manage their personal consumption, but will find their bills rising unless they make significant reductions.
81. There are also significant uncertainties about the treatment of households in difficult to meter flats and social rented housing. If such households are not metered, or metered only late in the programme, it is possible they could be affected by a rising differential between measured and unmeasured bills. In the South West the differential has risen very substantially as meter penetration approaches 70%.⁵⁷ Over the same period the landscape of

Government policy on benefits and tax credits will be changing, with the possibility of large reductions in local housing allowances especially in inner London where rents can be very high, and some changes in wider benefits as rates of increase become linked to the Consumer Price Index instead of the Retail Price Index.

82. The overall impact of compulsory metering will make water charges more regressive in relation to income, and may set up a significant tension between the objectives of water charging and policies to reduce child poverty unless mitigation/protection is provided. Company modelling which maps the incidence of winners and losers from metering tends to confirm this.⁵⁸ The modelling bears a striking resemblance to maps of income deprivation and child poverty, with those seeing bill increases from metering concentrated in inner and North East London, and those benefitting from bill reductions in more prosperous areas. This poses a further threat to revenues because both the amount and frequency of household debt to water companies is very strongly correlated with income deprivation.⁵⁹
83. We commend the work that the company has done on the potential for social tariffs, and the efforts it has made to work out the affordability implications of metering.⁶⁰ None of the parties (Defra, Ofwat, EA or companies) has followed through with a full distributional impact assessment of metering policy, despite advice and guidance in the Treasury Green Book that encourages such analysis where it is feasible and a policy has a significant distributional effect.
84. Thames Water's own modelling demonstrates that, in the context of metering, the 'hardest hit' are likely to be large households with children, in the most deprived areas, for which robust, proportionate and fair relief/mitigation measures will be needed. The necessary further bill impact assessment that all customers deserve in the context of the tunnel, must take into account this, as well as the other factors explained above.

Conclusions

Social Impact

85. It is important to look critically at the costs, benefits and affordability of the proposed Thames Tunnel. There is a pressing need to control Thames Water's capital spending and growth in debt because it is not at all clear that the economic and social implications of a step change in water and sewerage bills are manageable. Until the Government has made its intentions on social tariffs clear, there is no guarantee that severe hardship can be avoided, and no way of measuring how far policies to reduce child poverty will be undermined by rising water charges and associated household debt.

Cost Reduction

86. In addition to the potential engineering options that could reduce costs there are financial and tariff management options including:
- Making sure if at all possible that the one third of cost estimates covering risks do not materialise, and are not automatically consolidated into price increases.
 - Recognising the distinction between construction risk and the relatively secure returns on completed investment in the water and sewerage sector.
 - Exploring options to consolidate post construction debt, possibly by transferring it to a mutual or non-profit distributing holding company on the lines of Glas Cymru: this could substantially reduce financing costs if the holding entity could borrow more cheaply than Ofwat assumes other water and sewerage companies can do.
 - Covering part of the risk by Treasury guarantees against default or cost overruns
 - Providing adequate Treasury funding for social tariffs, although we understand that pressures on government budgets are great and unlikely to relax.
 - More inventive thinking about the distribution of costs - e.g. to highway authorities reflecting their share of responsibility for permeability and surface water drainage, to property developers through connection fees, to high value commercial and domestic property near the river and in the central business district who stand to benefit most from improvements.
87. We hope that the Commission will explore any alternative approaches to project costs and financing in their review of overseas experience.

Enquiries

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August 2011

NOTES

¹ See Thames Tideway Regulatory Impact Assessment, Defra, March 2007 for cost estimates and willingness to pay, especially table 1 which estimates willingness to pay/hshld/yr as £13.02 for TW customer households. The then estimated financial cost of the Tideway package including Lee Tunnel and associated sewage treatment works improvements was £2,530m capex and £363m opex for option 1c phased (See TT RIA Table 7, 2006 prices). In Ofwat's final business determinations for the PR09 price review there was provision of £599m for the Lee Tunnel and £185m for the Beckton STW extension, plus £451m for enhancements at other Tideway sewage treatment works (Crossness, Tideway, Riverside and Long Reach and improved provision for sludge treatment)(All 2008 prices). The total cost of the Tideway improvements package, including the Tideway tunnel as estimated in Thames Needs report comes to £5.055bn in 2010 prices. Part of the reason for cost escalation, despite the saving of some 10km tunnel length by adopting the Abbey Mills Route, appears to be increased provision for risk and optimism bias on capital works, which we understand now stands at approximately one third of estimated capital costs. See Richard Beynon Oral Evidence to EFRA Select Committee on 16 February 2011 "This scheme has increased from around £1.6 billion in 2007 to £2.9 billion now; or £3.6 billion if the optimism bias costs of £0.7 billion are added. That is a lot of money for the Thames Water charge payer to face." Q158.

The probability of further cost escalation has been referred to in interviews by Thames WUL's Chief Executive. In the New Civil Engineer, 16-06-11, Martin Baggs is reported as saying that the £3.6bn price tag "is simply an indicative 2008 price used to benchmark options and so will inevitably increase at outturn once project risk and the financing cost is added in". See also DEFRA's consultation on Regulation on the Provision for special water infrastructure projects in England, Regulatory Impact Assessment, February 2011: "As for the capital cost, a project delivered under the new regime will very likely be financed by a special-purpose entity (a "special-purpose vehicle" or "SPV") that exists solely to deliver the project. The SPV may or may not benefit from guarantees or other financial support from the sponsor. Regardless of these guarantees, however, it is very likely to have a higher cost of capital than the undertaker does today, which might significantly raise the overall cost of a project, relative to the existing regime. However, this assessment needs caution. It is inappropriate to assume, for example, that Thames Water would be able to finance the Thames Tunnel at its *current* cost of capital. Rather, it would require both a significant equity injection and significant incremental debt. Given that the cost of capital is, like most commodities, determined by supply and demand, Thames's significant demand for incremental equity and debt capital would almost undoubtedly *raise* that cost. Therefore the cost of capital achievable by the SPV should be compared with the cost of capital that would be achievable under the existing regime, but not the existing rate the undertaker has faced for smaller loans and capital projects."

²See "Environment Secretary Caroline Spelman supports Thames Tunnel Plans" Statement on Defra Website, September 2010, associated written statement and Ministerial evidence to the EFRA Select Committee Inquiry, see Fourth Report Session 2010-11, Oral evidence Qn 48 et sec.

³ See EFRA Committee Oral evidence from Regina Finn and Keith Mason, 18 Jan 2011, especially Qns 3.4. "It was a policy decision that this particular project was needed to avoid infraction risk or infraction costs, given that our role is to make

sure that it's delivered as cost effectively as is absolutely possible, and we will do everything we can to do that", Regina Finn at Qn 3; "there have been discussions about whether this project was needed or was the only solution to this particular problem. The conclusion has been that there aren't alternatives and therefore this project needs to go ahead" Qn 4. Barry Gardiner summarised the position in a question to the Minister: "You will recall that in paragraph 2.5.2 the NPS says that the need will be considered as demonstrated if "Ofwat has concluded that investment in the infrastructure is justified on economic grounds...and included it in the latest water company Asset Management Plan". The evidence that we had from Ofwat did not quite agree with that. They suggested that just because a scheme is listed in a company's Asset Management Plan it should not be assumed that we have agreed that it must be done." Fourth Report Session 2010-11, Oral evidence, Qn 168.

⁴ Letter from Philip Fletcher to Ian Pearson, 31 January 2007

⁵ Richard Benyon: "I am afraid there is no alternative and we are pretty far down the line in facing proceedings on that. There is not much luxury of time to be able to argue the toss on that. It is our belief that we have to give comfort to the Commission on this, and it is more than that; we just want to have a clean river as well. It is important that we comply with directives and it is important that we use this new aspect of the planning process to give a coherent, cohesive view across 14 different local authorities and that we can carry forward a piece of work that is needed, that is of national significance." Fourth Report Session 2010-11, Oral evidence Qn 180.

⁶ The Urban Waste-water Treatment Directive (91/271/EEC) the words are in a footnote to the heading of Annex I (A). Under Article 3(2) in conjunction with Annex I (A), the design, construction and maintenance of collecting systems are to be undertaken in accordance with the best technical knowledge not entailing excessive costs. In this connection express mention is made of prevention of leaks and limitation of pollution receiving waters due to storm water overflows.

⁷ The opinion was given in the context of a reference from the High Court of Justice (Queen's Bench) to the European Court of Justice for a Preliminary ruling in case of *The Queen on the application of Thames Water Utilities Limited v Bromley Magistrates Court*, in which the Environment Agency was an interested party. Extracts come from The Opinion of Advocate General Kokott delivered on 8 February 2007, para 38-41.

⁸ This is quoted from Closing Submissions from the Environment Agency, Hearing of Appeals by United Utilities Water PLC (paras 6-7).

⁹ Directive 2000/60/EC Water Framework Directive: Good status means that the values of the biological quality elements for the surface water body show low levels of distortion resulting from human activity but deviate only slightly from those normally associated with the surface water body type under undisturbed conditions. For the discretion to set less stringent objectives where condition is such that the achievement of objectives would be infeasible or disproportionately expensive see Article 4 (5) (a-d) including requirements to avoid deterioration in status.

¹⁰ The implication of Thames Water's Needs Report (August 2010) is that the Tideway package of investment is a platform for, rather than itself achieving, full satisfaction of WFD requirements for highly modified water bodies. We know from other information and discussions that in addition to dissolved oxygen requirements, there is a possible requirement, subjective to disproportionate cost, to remove more nutrients and priority substances by additional sewage treatment processes. This could cost £1bn or more.

¹¹ Section 4 of Thames Water's August 2010 Needs Report summarises the needs case in relation to both European legal requirements and water quality objectives specific to the Tideway. It seems from the Needs Report and its Annex F on fisheries, that CCW drew reasonable conclusions from the fisheries studies available in 2004, i.e. that they showed no species for which the Tunnel made the critical difference. See p19, Annex F, Fisheries Report). Pages 21 to 29 of Annex F show various fish mortalities, at various permutations of intervention. Tables at pages 21 and 22 of Annex F are those that supported our conclusions based on the 2004 data. The revised conclusion to the effect that the Thames Tunnel does make a difference is also presented. The graphics on page 53 of the Needs Report, Fig 5.2,, address permutations for various dissolved oxygen thresholds by 2020,

The conclusions of the revised water quality assessment are that the STW upgrades and the Lee Tunnel are insufficient to meet water quality objectives and leave the UK exposed to infraction risk, but that the Thames Tunnel should "demonstrate the UK's intent to achieve compliance within the target timescale of 2020". The possibility of disproportionate cost is not discussed, and there is no guarantee that with the Thames Tunnel in place the Tideway will meet the stated water quality objectives through to 2080. For UWWTD requirements see p70 of the Needs Report. The 2007 RIA said that compliance with DO standards would fail by 2080, possibly by 2050; p37 of the fisheries report, under bullet d, notes that recent modelling has shown that WFD fifth percentile statements for good status will not be met in the middle reaches of the Tideway, even with the solutions in place. There is also a discussion at s3.5.4 p 36-37 of the Fisheries report, suggesting that in certain cases the WFD standards are more lenient than the TTSS standards, and that the TTSS standards may offer better protection. If this is the case the duty on the EA under s39 to have regard to both costs and benefits should certainly come into play. Although TTSS standards are offered as more appropriate to the Tideway than one size fits all WFD standards, there is no indication that the benefits of setting more stringent standards than the WFD have been subject to a proportionate cost assessment.

¹² Objectives as first summarised in the TTSS Objective working group report of February 2005, Vol I, and adapted in s5.2.1 of Thames Water's August 2010 Needs Report.

¹³ See s39 of the Environment Act 1995, and Article 174, TITLE XIX Environment, of the Consolidated Treaty establishing the European Community. Both the Environment Agency and the Community are required to take account of the "the potential benefits and costs of action or lack of action".

¹⁴ Letter from Phil Woolas, Minister for the Environment to Dame Yve Buckland, 14 January 2008, "I am not convinced that the further work you have suggested would add to the considerable amount of information that was available to Ian Pearson

and Government Colleagues when the decision was made in March." An Annex to the letter referred to the Thames Recreational Users Study, see next note, and said "in summary investigations found the tidal Thames is not designated bathing water and there are no microbiological standards to be applied.'

¹⁵ For facts on risks to recreational users see the Thames Recreational Users Study, 2007, Lane, Surman-Lee, Sellwood and Lee, a collaborative study by the City of London Port Authority and the Health Protection Agency. The study found that background concentrations of microbiological indicator organisms exceed the World Health Organisation's recommended Guidelines for Safe Recreational Water Environments at sampling locations at Kew, Barnes and Putney, that water quality improves downstream from Kew (suggesting the influence of Mogden), that on 99% of days the indicators were above (ie worse than) the WHO's No Observable Adverse Effects Limit (ie 40 cfu/100ml enterococci, and 91% of samples observed E.coli counts of more than 1000cfu/100ml.

There was evidence of an elevated health risk to recreational users from 2-4 days after CSO discharge events, and evidence of other potential human pathogens including *Campylobacter*, *Salmonella* and Enteroviruses at at least one sampling location on 99% of sampling occasions. Some of the salmonella detected was consistent with sources in animal or wildlife waste in the lower Thames catchment.

The majority of reported illnesses were short-lived and self-limiting gastro intestinal infections, caused by or similar to Norovirus infection. There was a greater likelihood of enteroviruses being present in autumn and winter than in summer and spring. There was potential for more serious illnesses to occur such as Hepatitis A and leptospirosis.

Storm overflows from Mogden have a microbiological quality very close to that of raw sewage. Secondary treatment at Mogden removes 75%-90% of pathogenic bacteria and viruses. Pathogens will also be present in discharges from CSOs. Elevated pathogen counts were found after wet weather, but dry weather counts were above WHO standards. "Pathogenic content will undoubtedly change with seasonality and frequency of raw CSO discharges, but there is evidence to suggest that the influence of secondary treated effluent from Mogden sewage treatment works is as great as that of the less frequent but common CSO discharge events."p54

The reported rate of gastroenteritis among the recreational users in the survey was 12.8/1000/year, which the study describes as "particularly low, given that the incidence of infectious intestinal disease within the general population is considered to be in the region 190/1000 person years." (p49). This could be because the studied population was fitter and healthier as a result of their recreational activity, because continued exposure raised their immune response, or they had a raised awareness of hygiene issues and reacted to warnings of adverse conditions issued by their clubs. (p50).

77% of rowers reporting illness had been rowing within 3 days of a CSO discharge, and the likelihood of reported cases was six times greater after CSO events than in weeks with no discharge. The study found that the relatively high frequency of discharge events, and the small numbers of cases associated with the study, combined to reduce the statistical significance of the results by increasing the potential likelihood of events occurring by chance. (p51)

“The construction of the Thames Super Tunnel will undoubtedly reduce the potential health risk to recreational users, simply by removing one of the major sources of faecal pollutants. It remains to be seen whether the suggested improvements to London’s major sewage treatment works (particularly Mogden in West London), will result in a reduction in the baseline microbiological water quality. Water companies are not required to treat effluent to a tertiary level unless the body of water receiving the effluent is used for drinking water abstraction, and then only ultraviolet radiation or Ozone treatment is allowed. It is likely that Mogden’s effluent will continue to affect the quality of water in the tideway. Further research into the contribution of Mogden’s treated effluent on tideway water quality is needed.”

The study concluded with various proposals on real time advice to recreational users and further research.

The issue that the study did not address is whether expenditure of £3.6bn is a proportionate response to the very low incidence of minor illness amongst the affected community. We suggest that expert independent medical assessment on that question is essential.

¹⁶ The Treasury advice is published at http://www.hm-treasury.gov.uk/managing_risks_public.htm: “Managing Risks to the Public: Appraisal Guidance”, June 2005. “One objective of this guidance is to achieve greater consistency and transparency in government decision-making. It aims to achieve this by recommending greater use of evidenced based values of preventing fatality, and other harms, and supports further studies to inform our understanding of the appropriate economic values to use given differences in context. More widespread use of evidence-based values would help to achieve greater consistency in decision making, increasing (in certain areas) risk management activity, and preventing or curbing it in areas where the benefits are not justified by the costs. Cost benefit analysis (CBA) is an important tool that can provide an assessment of how much society wants devoted to reducing the risk of fatalities and other harms, given its limited resources and competing demands. Both CBA and cost effectiveness analysis can help decide where and how best to deploy its resources in reducing risk and preventing harm. Government needs to take action that addresses risks in a proportionate, consistent way, based on the evidence of what is most cost effective.”

The discussion at s4.8.2 of the Needs Report shows no awareness or discussion of the principle of proportionality, or application of evidence-based benefit values and does not apply “concern assessment” or “QALY” techniques.

¹⁷ The comparison is between stated preference surveys completed in 2003 by EFTEC for the Thames Tideway Strategic Study Group, and for DEFRA as reported in a Partial Regulatory Impact Assessment for further bathing beach measures. Further details can be provided.

¹⁸ Richard Cookson, Willingness to pay methods in health care: a sceptical view, *Health Economics* 12: p891-894, 2004 “stated preference WTP methods suffer from two serious (and possibly related) measurement biases that render them unattractive to health care decision makers. First, WTP responses tend to be under

sensitive - although not necessarily totally insensitive - to the magnitude of benefit Second, WTP methods tend to inflate valuations of the specific intervention that respondents are asked about, relative to interventions that respondents are not asked about. Asking respondents to focus on one specific intervention in isolation acts as a kind of magnifying glass for stated WTP. When asked to consider an intervention in isolation, people are willing to pay sums of money far in excess of what they are willing to pay when asked to consider the same intervention in relation to a range of other interventions.”

It is suggested that both these flaws in state preference valuations are demonstrated in the literature on Tideway evaluation. See the inability to distinguish between the value of Tideway and bathing beach interventions, despite the great difference in the scale of illness addressed, as an example of under-sensitivity to magnitude. Typically the high values found for particular improvements in isolated stated preference surveys, fall to approximately one tenth of that value when similar single issue improvements are addressed within a wider basket of possibilities, for example in water companies’ PR09 general surveys, wtp for water quality typically falls to £1-£2, within a valuation of some £50 for a basket representing all the other service enhancements that are up for consideration in the price review.

¹⁹ Paragraph 5.9 of the 2007 Tideway RIA includes an illustrative valuation of project impacts derived from Quality Adjusted Life Year Methods. The valuation appears to be reasonably consistent with the data on incidence of illness in the subsequently published HPA/Study. As the illustrative NPV derived from QALY methods is £1.5m, and stated preference methods have assessed an NPV of more than £4bn for the health impact alone (TTSS CBA 2005 in respect of reducing elevated health risk) benefit values in the 2007 RIA may not survive triangulation against the methods more widely and realistically used in the health service.

²⁰ The breakdown of wtp by objective in the 2005 cost benefit study can be found in the Cost Benefit Report. There is no similar breakdown in the 2007 RIA and cost benefit report because the valuation technique used did not permit a breakdown of wtp by objectives. However the descriptions of attributes and intervention effects in the two surveys were substantially similar, and there is no reason to suppose that respondents were giving different relative priorities to human health and fish mortality. |

²¹ CCWater evidence to Lee Tunnel Inquiry
http://www.ccwater.org.uk/upload/doc/Lee_Tunnel_and_Beckton_Sewage_Treatment_Final.doc

²² Research by Fawley Aquatics, 2004, see tables 10.4 and 10.5, reproduced on pages 22-23 of the Needs Report Annex F, see note above.

²³ See note 12 above.

²⁴ The Mogden fish kill event of 3 August 2004 was caused by an intense 1/60 year storm centred over the Mogden catchment. This led to an escape of activated sludge from the storm tanks at Mogden sewage treatment works, with severely fish lethality. A fish census one month later in the lower Tideway found five times the usual count, suggesting that some species were able to outrun the event, even

though fish mortality was the worst reported since 1994. (See Thames Water presentation to London Health and Public Services Committee, 14 September 2004. The event was not attributable to short capacity in the collecting system, although until recently it was the usual example given in support of the need for the Tunnel.

²⁵25 “While adult salmon have not been tested, the virtual absence of a Thames adult salmon run in the last few years reduces the significance of this omission. With the predicted continuing background temperature rises associated with climate change, it is not clear that there is any real chance of salmon runs continuing in the future, although the STW works upgrades may improve the situation.” (Fisheries Report, Annex F, p11) Sea Trout is the next most vulnerable species, followed by Smelt (*Osmerus eperlanus*). Flounder and shellfish are relatively tolerant of hypoxia. The physiological ceiling for salmon has been reported at around 18degrees C. Temperatures of 23degreesC have been reported in the upper Tideway, and expected increases in the range 3-4degrees C (50% probability) and 4-5degree C (90% probability) are recorded in UKCP09 projections (see table 4.5 needs report, p42).

²⁶ See table 4.9, EFTEC, Tideway Cost Benefit Report, 2006. Asked about their personal observations of different types of litter in the Tideway, 15.7% of respondents living in the TW area said that they had rarely, and 66% had never seen human waste in the Tideway. There were similar levels of sightings of sanitary waste. More people had seen fat and grease, and the great majority had seen general litter: packaging, bottles etc.

²⁷ Environment Agency Briefing Note, July 2009, “Sewage Reported in the River Thames”: “Our findings indicate that the persistent brown solids seen floating in the river and stranded on the foreshore are not sewage related. They are a natural organism, moss like in appearance, which pose no health risk but can give the appearance of sewage on the water . . . During storm events, faecal solids are discharged in the storm sewage. However these are usually broken up and break down within two to four days. Other sewage litter can also be seen immediately after an event, but this too usually dissipates fairly rapidly”

²⁸ See Jacobs Baptie, Independent review of economic partial solutions to problems caused by intermittent storm discharges to the Thames Tideway, Final Report. “our conclusion is that it would not be immediately apparent that the debris is any more than wind-blown litter and vegetation”, p8

²⁹ The Thames Recreational Users Study, p54 “The problem has been over looked to some extent because of the lack of visible signs of risk as the turbidity of the waterway is such that only very recent pollution events may be noticed. Shortly after discharge, floating matter disseminates relatively quickly, so the plug of sewage effluent moves unnoticed with the ebb and flood of the tide”.

³⁰ The Needs Report discusses the need for odour prevention once wastewater is stored in the Tunnel, but does not assess whether odour is an existing nuisance elsewhere than at storm tanks.

³¹ Table 5.11 Needs Report. The STW enhancements and the Lee Tunnel are shown as reducing overflow volumes by 55% in relation to the existing baseline, although the total number of CSO spills is reduced from 900 to 819 (9% reduction) in a

typical year by the Lee/STW package, with the Thames Tunnel leading to a further reduction to 100 spills (89% reduction). Table 5.12 shows sewage litter at Abbey Mills reduced from 1,565 tonnes to 43 tonnes with the Lee Tunnel. In the Tideway the spillage from the network in its existing state (8,435 Tonnes) falls to 7,375 tonnes with the STW and Lee packages and to 926 tonnes (considered to be an overestimate) with the Thames Tunnel. Note that of the much quoted 39m tonnes estimate annual overflows of sewage, less than 10,000 tonnes (0.03%) is sewage solids. 10,000 tonnes of solids is consistent with the estimates produced for the TTSS. Jacobs Baptie was unable to establish the derivation or accuracy of this figure, although it was within the range of their own estimate of between 4,000 to 11,000 tonnes of solid waste. It was observed that 40%-50% could be inorganic grit that will settle quickly and cause little aesthetic nuisance. (See Jacobs Baptie, TTSS Independent Review, Phase 1 Final Report, October 2006, p11.)

³² See note 27 above.

³³ See tables on page 55 of the Needs Report.

³⁴ The issue is for the Environment Agency rather than for Thames Water, who have designed the Thames Tunnel to meet the TTSS standards, and in the matter of dissolved oxygen standards and return periods these were based on work by Environment Agency experts. We do not question that they have been scientifically derived, but as with many standards the specification has been drawn up without regard to the costs of meeting it. That is the appraisal process that should now take place.

³⁵ Dame Yve Buckland's letter to Ian Pearson, Minister for the Environment, 14 November 2007

³⁶ See Note 14.

³⁷ We find it difficult to assess this because of the absence of data modelled with a partial tunnel in place. Thames tells us that the sewage treatment works are at capacity during storm events, so no pump out is possible. But is this true during the minor rainfall events which are said to cause overflows at very low levels of rainfall?

³⁸ Some 18 of the CSOs targeted for control spill either at a frequency of less than ten a year, or at volume less than 10,000 cubic metres in a typical event. The majority are near much larger volume overflows which will in future be diverted directly into the tunnel. Common sense suggests that the residual flows from the smaller gravity overflows will also be reduced.

³⁹ First flush effects are said to account for most litter waste (see note to Table 5.12) Thames Needs Report. Hotter drier summers, with extended dry periods, may increase the quantities of solids washed out when storms come. (TTSS, Objectives Working Group Report Vol 2, p21) Early TTSS reports included some measurement of the difference between biological oxygen demand from overflows in the first and second half of storm events, suggesting much greater dilution in the second half.

⁴⁰ The EA reports annually on the state of the environment in London and logs the number of days with dissolved oxygen saturation below 30% and below 40% in the Tideway. In the last decade, 2005 was by some distance the worst year, with 125 days below 35% dissolved oxygen saturation compared to fewer than 40 days in most other years. There was very little summer rainfall and overflows from both STWs and CSOs were much lower than in other years. This suggests that low river flows and high temperatures were the main causes of poor DO. (State of the Environment in London, 2010, figs 31 and 32)

⁴¹ Thames Water says that more information on resilience to climate change will be available during their phase 2 consultation as part of a Preliminary Environmental Information Report and Environmental Impact Assessment, and that they continue work on modelling in the light of revised UKCIP data that may suggest earlier onset of hotter drier summers.

⁴² Example of STW cost and containment based on rebuilt STW at Reading, so would not reflect London land acquisition costs.

⁴³ A written response from Thames. Thames also says that their hydraulic model shows no use for offline storage capacity at the western end (if there is an extended tunnel?) but they have not shared estimates of the comparative costs of offline capacity and deep tunnel construction.

⁴⁴ TTSS 6m diameter needed for connecting local storage tanks.

⁴⁵ Needs Report, section 5.6 and table 5.13: Sewer separation and or dispersed storage/detention tanks, and or real time controls are mentioned in connection with Helsinki, Paris, Vienna, Barcelona, Lisbon, Marseilles, Zagreb, Prague, Berlin, Hamburg, Rhine-Ruhr, Naples, and Rotterdam. Few solutions rely wholly on a deep storage tunnel, and those mentioned are generally not more than 12km length.

⁴⁶ The number and substantial size of the rivers absorbed into the drainage system is traced in *The Lost Rivers of London*, Nicholas Barton, Phoenix House and Leicester University Press, 1962, revised 1992

⁴⁷ The length and substantial size of the rivers absorbed into the drainage system is traced in *The Lost Rivers of London*, Nicholas Barton, Phoenix House and Leicester University Press, 1962, revised 1992

⁴⁸ The 2007 RIA (Regulatory impact assessment - sewage collection and treatment for London, Defra, March 2007) The Cost Benefit Working Group Report of December 2006 looked at residual uncertainties in the benefits valuation. s5 lists 10 headings for uncertainty including single issue bias, inadequate survey information on environmental outcomes, uncertainties over distance decay in the aggregation methodology (especially beyond Thames service area), Olympic issues, timeframe (using an appraisal period of 100 rather than 60 years) the extent of optimism bias adjustments, the potential use of QALY values as a cross check, possibility of incorporating regeneration benefits, possibility that non Thames customers might give unrealistic wtp values knowing that they would not have to pay, and possibility that the order in which options were presented might affect wtp. New evidence is available on at least the single issue, QALY and realism issues, and we suggest that the evidence tends to confirm benefit overvaluation.

⁴⁹ DEFRA's public position on a revised RIA is a commitment to put it in the public domain when it is ready, said in February to be unlikely for several months, and a commitment that it will be ready for the IPC to look at before any planning application. (See oral evidence to the EFRA Select Committee, Qns 207 and 208, February 16th 2011).

⁵⁰ The Institute of Fiscal Studies prepares data on changes in real incomes derived from the annual Family Resource Survey. The time sequence shows a decline for the lowest two income deciles after housing costs in each year since 2004-05, except for 2008-09, the latest year for which final data is published. (<http://www.ifs.org.uk/bns/bn19figs.zip>) The effect of tax and benefit reforms introduced between June 2010 and April 2014 are found to be regressive up to the 9th decile, leading to income reductions of up to 6% between 2010 and 2014 for bottom decile households with children. (Figure 4.4)

The impacts of housing benefit and local housing allowance plans are particularly severe in London, because more low income households are in high rent properties (see <http://www.dwp.gov.uk/docs/impacts-of-hb-proposals.pdf>) 100,000 losers in London lose on average £17 per week. (Table 1 in above link) The Anatomy of Economic Equality in the UK, Report of the National Equality Panel, January 2010, finds in Chapter 12 that "inequality in any dimension is wider in London than in any other region, and inequality in earnings and incomes has increased faster in London over the last decade than anywhere else." Ibid Table 10.12. (<http://sticerd.lse.ac.uk/dps/case/cr/CASereport60.pdf>)

⁵¹ The consultation document on the National Infrastructure Requirement for Wastewater made it clear that challenges to the needs case for a national infrastructure project would not be admissible at planning inquiry. This would be more acceptable if an appraisal or business case is available for public consultation or response before the revised National Infrastructure items are presented to Parliament. In the absence of this step it is not at all clear who is responsible for appraisal or project sign off.

⁵² Carbon costs were estimated in the 2007 RIA, but will now be overtaken.

⁵³ Thames RV charges are calculated on a geographical basis and therefore differ between Local Authority areas, so the effect is not uniform. The Walker review pointed out that at a national level, RV does not correlate closely with income. Some households in high RV property have low incomes, and vice versa. There is nevertheless a degree of progression.

⁵⁴ Thames Water, draft revised Water Resource Management Plan, 2010

⁵⁵ This is derived from the Family Resource Survey work done for CCWater by York University.

⁵⁶ In the absence of clarity on social tariffs, companies with rapid metering programmes are working out transitional tariffs that give households time to adjust when their metered bill is higher than their RV bill. Some but not all companies plan to give the option to newly metered households of remaining on their former RV tariff for a period (probably two years) after a meter is installed, whether on a

tapered (ie phasing down) basis or not. This is to avoid overnight bill increases of up to £200 for a significant proportion of households. In all analysis the most adversely affected households are the larger households in the lowest rateable value property, usually households with children.

Defra has completed preliminary consultation on social tariffs, and is expected to return the issue in a forthcoming White Paper on water. S44 of the Floods and Water Management Act 2010 permits social tariffs, subject to DEFRA guidance that has yet to be consulted on.

There may be improvements in the terms of existing Watersure assistance for households with a qualifying medical condition or households on benefits with more than three children. Following the Walker review, DEFRA has consulted, but not yet decided on, options such as linking the tariff paid by those qualifying for Watersure to the average regional or national bill, or to the average measured bill.

⁵⁷ The average unmeasured charge for customers of South West Water rises to £935 by 2015 in Ofwat's final determinations. The Government is consulting on mitigation measures for SW customers.

⁵⁸ Maps of the incidence of winners and losers from Thames metering programme are included in unpublished submissions to DEFRA, January 2011.

⁵⁹ UKWIR, Debt collection performance and Income deprivation, Report Ref 09/CU/04/6, summarised with UKWIR's position in CCWater's evidence to the Thames WRMP Inquiry. The report found a very strong and consistent relationship between levels of debt and levels of income deprivation in small census areas, and postulated that water companies with higher levels of poorer customers would have greater problems of revenue recovery. It expected the debt position to get worse over the next few years (publication date 2009).

⁶⁰ See HMT Green Book, Annex 5. The difference between the procedure recommended in Annex 5 and an affordability assessment is considerable. Affordability assessments of metering predict how far metered bills, especially of lower income households, will differ from rateable value based bills. The change may be expressed both as a money impact and as a change in the proportion of income taken by the water and sewerage bill. A distributional impact assessment would apply weighting factors to households in different income quintiles, equivalising incomes so that they reflect the different living standards of households of different compositions. Use of unequivalised incomes tends to overstate benefits to smaller households, and undervalues losses to larger households. As this is the central impact of compulsory metering, equalisation is important when plotting poverty impacts.

Annex A: Representations and responses to consultation by CCWater

Press Release in response to Ministerial Announcement, March 2007

<http://www.ccwater.org.uk/server.php?show=ConWebDoc.1272>

Press Release on willingness to pay, October 2007

<http://www.ccwater.org.uk/server.php?show=ConWebDoc.1448>

Letter to Minister Ian Pearson, October 2007

http://www.ccwater.org.uk/upload/pdf/IanPearson_letter310107.pdf

Submission to the Lee Tunnel and Beckton Inquiry, August 2008

http://www.ccwater.org.uk/upload/doc/Lee_Tunnel_and_Beckton_Sewage_Treatment_Final.doc

Comments on TMS Draft Business Plan, October 2008

http://www.ccwater.org.uk/upload/doc/Thames_Water_Annex.doc

Response to Mayor's Water Strategy, November 2009

http://www.ccwater.org.uk/upload/doc/CCWater_response_Mayors_draft_water_strategy.doc

Statement on Final Determination Price Limits 2010-2015, November 2009

<http://www.ccwater.org.uk/server.php?show=ConWebDoc.2182>

Press release on launch of TMS's Thames Tunnel Consultation, September 2010

<http://www.ccwater.org.uk/server.php?show=ConWebDoc.2310>

Response to TMS's Consultation, January 2011

http://www.ccwater.org.uk/upload/doc/TW_Thames_Tunnel_Consultation_Response_Jan11.doc

Response to the consultation on draft National Infrastructure Statement on Wastewater.

http://www.ccwater.org.uk/upload/docx/ConsultationdraftWasteWaterNationalPolicyStatement_CCWR.docx

August 2011