

**Part B4 – Quality Enhancements (Sewerage)****Summary Report by REPORTER****Summary of Audit Findings & Reporter Opinion**

The Company has undertaken a considerable amount of work to develop its quality enhancement programme for the sewerage service.

The key changes between DBP and FBP are:

- use of revised Environment Agency (EA) National Environmental Programme (NEP). This has defined the completion dates for the schemes, reduced the number of Flow 1 driver schemes from 35 to 26 and provided further definition of the C1 driver schemes
- provision of the cost for rebuilding Deephams STW to meet several statutory drivers defined in the NEP
- inclusion of additional costs (above FD04) required to deliver the Tideway STW Upgrade programme
- basing cost estimates on individual outline design scheme solutions and appraisal of multiple options where appropriate

We confirm the Company has considered all its quality obligations, both statutory and non-statutory. The Company has developed its programme from its existing commitments (Tideway STWs and Thames tunnels) together with its knowledge of the requirements of Defra, EA and Natural England.

The environmental programme is designed to meet obligations identified by the EA in its NEP dated 21<sup>st</sup> January 2009. This translates the requirement of various statutory and non-statutory drivers. The sewerage quality programme also provides for flood resilience and carbon mitigation.

(TEXT REDACTED) We confirm that Thames has translated current and future legislation into its obligations.

We consider the Company's expenditure profiles to be consistent with the NEP requirements. They are driven to a large extent by the Tideway STW upgrades and Lee and Thames tunnels.

With regard to Deephams STW, we consider that the Company should have appraised the option of down-rating and retaining the existing works. This might result in a more cost effective solution. However, in general, we consider that the Company's proposals have been formulated on a sound basis. Noting our qualification regarding Deephams STW, our audits and reviews of the programme and supplementary information enable us to support the Company's proposals for the final business plan.

We note that the Company has made some late changes to the additional costs it is claiming in relation to the Thames Tideway STW Upgrade programme and consider that a further audit of these costs needs to be undertaken in the period before the Final Determination.

### **Reporter Engagement & Scope of Audit**

Our audits consisted of interviews with the Thames team responsible for the preparation of the Part B4 submission. This included a review of the assumptions and methodology that underpin the submission, a review of the analyses that were undertaken and examination of a sample of scheme solutions. We trailed a sample of data and costs from their sources into the FBP tables.

We have reviewed the Company's submission for its Part B4 sewerage service submission through undertaking a series of audits on the 23<sup>rd</sup> and 24<sup>th</sup> February, 13<sup>th</sup> and 27<sup>th</sup> March 2009 at Company's offices in Reading and including a site visit to Deephams STW.

We confirm that we have fully reviewed Thames Water's Part B4 submission, data tables and supporting documents. Supporting documents included the initial NEP, key correspondence between Thames and the Environment EA and documentation relating to scheme development and costings. Our review confirmed that the supporting information properly and consistently informs the Company's proposals.

We are satisfied the Company's submission is complete and consider that it conforms to the Reporting Requirements.

We have followed the Reporter Guidance and have addressed the points set out in our audit plan. We have included summary statements addressing the guidance and audit plan actions in a template format attached below.

We have seen evidence that the Company's submission has been subject to a good level of internal checking and challenge and are satisfied that there has been appropriate input and oversight from the Company's Senior Managers and Directors. We have noted that the submission has been signed-off by the responsible Senior Manager and Director.

(TEXT REDACTED) We found evidence of Thames Water's dialogue with Quality Regulators, including the EA, Defra and Natural England. We noted in particular that the Company had worked closely with the Regional EA since November 2006 on the development of the NEP. This was confirmed by the EA's Thames Regional Coordinator who attended one of the audits.

### **Summary of Thames Water's Proposals**

With the exception of the Tideway STW upgrade projects, which were always due for completion in AMP5, Thames Water's AMP4 sewerage service quality programme is broadly on programme. The STW upgrades have been delayed by a need to amend the scope of these schemes due to the decision to proceed with the Thames and Lee Thames tunnel projects and revisions to the consent conditions by the EA.

(TEXT REDACTED)

### **Thames Tideway Projects**

On the basis of guidance from Ofwat, we have not reviewed the Thames and Lee tunnel projects as we understand that Ofwat has been liaising closely with the Company and have sufficient details of the proposed works and costs for its needs. However, we have examined the reasons why Thames is seeking additional funding to that defined in the 2004 Final Determination (FD04) for its STW Upgrade programme.

#### **a) Tideway STW Upgrades**

The costs for these projects (Mogden, Beckton, Crossness, Riverside and Long Reach) which span the AMP4 and AMP5 periods were defined in FD04. Implementation has been delayed due to the need to assess the implications of the decision to proceed with the Lee and Thames tunnels and the EA's decision to revise consent conditions for the upgrade works. At the time of the DBP submission, the Company indicated that it expected to deliver these schemes within the originally agreed cost envelope. However, since the DBP, the Company has obtained tender costs for four of the five schemes and has reviewed the inclusion of related projects. On this basis it now expects to exceed its budget. (TEXT REDACTED) The higher figure has been advised to us late in the Reporting process and its composition has not been reviewed. A further audit to examine the basis of the additional Tideway STW upgrade costs will need to be undertaken during the FBP query period.

The EA revisions to the consent conditions has resulted in a relaxation of the consents set at FD04 for Beckton and Crossness and a corresponding tightening of the consents for Long Reach and Riverside. There has been no material change with regard to the consent for Mogden. This has resulted in a change of scope of works and costs for the four affected sites.

The decision to proceed with the tunnels has required additional flow and load to be treated at Beckton where the tunnels terminate. The initial design for the FD04 solution for Beckton was based on a requirement to treat flows up to 1,800MI/d. This was revised to 1,972MI/d following the modelling work

undertaken as the basis for the consent revisions. This has been increased further to 2,336Ml/d to provide treatment for the tunnel pump out.

The EA has recently confirmed a further tightening of consent conditions at each of the five works, imposing suspended solids consent and revising the principal control mechanism from median composite sample values in summer to year round look up table values from spot samples.

The Company originally agreed that it could accommodate the earlier consent changes within the FD04 cost envelope on the understanding that the cost of providing additional capacity to treat the tunnel pump out would be an additional cost. However, the Company is now seeking additional funding to account for the cost of meeting the new suspended solids consent limits. Furthermore, the Company has identified other changes to its obligation that modify the cost. These are: a revised renewable obligation, an extended design horizon from 2016 to 2021, and facilitation work associated with the anticipated requirement to provide N reduction... As discussed, the Company has revised these costs considerably from the costs we reviewed at audit with the project managers for each project and the quantity survey responsible for the programme. The Company has provided us with revised cost breakdowns late in the Reporting process, but we have not been able to review these in detail with the Company. We therefore propose to arrange a further audit to cover this and will report the results in due course.

With regard to the cost for N reduction facilitation, this relates to work at Beckton and Crossness to provide oversized pipelines to allow for the works to be modified to provide N reduction should the infraction proceedings against the UK government by the European Commission be successful. We challenged the Company on the need to include for these costs as work is not expected to commence on these projects until this autumn, by which time the decision of the European Court of Justice (ECJ) might be known. *(NB decision estimate 3-9 month from March, so might not happen until almost Christmas)* The Company stated that it was in the process of negotiating the contracts for these projects and it was necessary to make a decision to include these works now.

The estimated cost of the Beckton scheme, including capacity for tunnel pump out (2,336Ml/d) but excluding the additional costs referred to above,. This is the scope of works and cost that was reviewed by an independent engineering consultant in October 2008. Thames has estimated the cost of providing the capacity to treat the tunnel pump out by undertaking a process design for treating flows up to 1,972Ml/d, ie without capacity for the tunnel pump out. (TEXT REDACTED)

We have reviewed the process designs and costings for both solutions. We confirm that they are based on meeting the same consent conditions, use the same design criteria and have been costed in a consistent manner.

## c) Lee and Thames Tunnel

The government approved the construction of the Lee and Thames tunnels in 2007. The Lee tunnel is 7km long and 7.2m in diameter will link Abbey Mills pumping station to Beckton STW. The project has more limited planning issues than the larger Thames tunnel. In view of this and the fact that it will deal with 50% of the annual volume of storm discharge to the Thames tideway, it was agreed that work on the delivery of this project could proceed in advance of the Thames tunnel. Design work is well advanced for this project. Delivery of the project is programmed for 2014.

The Thames tunnel will be of the order of 32km long and 7.2m in diameter running from Hammersmith to Beckton STW. The tunnel will collect flows from 34 intermittent discharges that are identified as unsatisfactory. The details of the design have still to be finalised and it has been agreed that funding for the project will be considered as being outside the remit of the business plan. Thames has therefore included funding for project development and an allowance for some land purchase in the business plan.

We have not undertaken a review of the proposed scopes and costs for the tunnel projects in accordance with Ofwat's guidance to the Reporter. We understand that Ofwat has been liaising closely with the Company with regard to these projects and has the information it needs.

**Deephams STW**

The EA has also identified the need for a significant improvement in the quality of the discharge from Deephams STW in order to meet requirements under the Urban Wastewater Treatment and Freshwater Fish Directives as a result in the change of the nature of the receiving water following impoundment of the River Lee.

The Company did not include the cost of meeting new consent conditions for Deephams STW in the DBP because its appraisal for the scheme was not sufficiently developed. An appraisal has now been completed and the Company has included a quality enhancement scheme to be implemented over AMP5 and AMP6.

(TEXT REDACTED)

- The Company has considered two main options to meet the new consent standards as well as three other options. (TEXT REDACTED)

(TEXT REDACTED)

We have reviewed the process design, which is based on the provision of a BNR activated sludge treatment plant with deep bed gravity sand filter tertiary treatment plant and chemical dosing facilities to provide standby and support

for phosphorus removal. We consider that the process design provides a sound and satisfactory basis for scoping the works and estimating the costs.

The direct costs have not been derived from the Company's EES cost models and the size of works are outside the confidence ranges, but have been developed from an elemental bottom-up price based on similar works (TEXT REDACTED)

The construction programme is estimated by Thames at three to four years from start on site; which seems reasonable. The total programme period of seven years is based on the reasonable expectation that obtaining planning permission will be a lengthy and difficult process.

(TEXT REDACTED)

The Company has reviewed the option of rebuilding on the existing site. The Company has been told that the EA would not permit any relaxation of the existing consent conditions during construction. Therefore, this option involves redevelopment on a section by section basis, keeping the plant in continuous operation by over-pumping (and other techniques). In consequence the programme is considerably longer than one based on taking out entire treatment streams. Thames has consulted a contractor who considers the work on site could take up to 12 years (effectively three streams of work at 4 years each). This could be so but there may be efficiencies to be gained during, and thereby reducing, the period. (TEXT REDACTED)

(TEXT REDACTED)

The Company has not subjected the third option of down-rating the existing plant and building a smaller extension on the adjacent site to detailed appraisal. Instead, it has dismissed the option based on a high level judgement that the existing works is approaching the end of its design and book life, is in poor physical condition, has problems with flow distribution and is not suited to providing treatment to the level needed to meet the new consent conditions. This may be the case. However, we visited the site and noted that although there is evidence of some structural deterioration and some of the electrical and mechanical equipment appears to be in need of maintenance, it is not apparent that the existing works could not be retained in a scheme to meet the new consent condition. We consider that retention of the existing assets could result in a lower cost solution and that this option is worth detailed investigation. We note that the Company has committed to developing such an option to a comparable level of detail to the other options.

The Company's proposals for the scheme include implementation of peroxide dosing and provision of phosphorous reduction to be delivered in 2011 and 2012 respectively. The facilities to provide phosphorus reduction comprise chemical dosing and tertiary treatment plants that will become redundant when the proposed new works to meet the main consent requirements are

commissioned. (TEXT REDACTED) In view of the fact that this is investment that would be written off within five years, we challenged the Company on whether provision of phosphorous removal in advance of delivering the other quality improvements required by the consent would make a material improvement to the water quality in the River Lee. The Company acknowledged that it was difficult to quantify the extent of improvement that phosphorus removal would deliver on its own, but stated that this was an overdue statutory obligation; the Lee had been designated a Sensitive area (eutrophic) under UWWTD and P-reduction should already be in place. The EA had confirmed that meeting the phosphorus consent by 2012 is a requirement, and this is specific in the latest version of the NEP.

### **UWWTD / Crow Act**

This programme comprises five schemes (in addition to the Tideway STWs and Deephams STW) to meet phosphorus consents. The Company has extensive experience of delivering schemes of this type by means of iron dosing and has good cost data. The programme also includes two investigations in connection with the CroW act. We confirm that the schemes are required and are satisfied that the costs are robust.

### **Water Framework Directive**

It is likely that a significant programme of work under the Water Framework Directive will emerge when River Basin Management Plans are issued in December 2009. The extent of the investment requirements for these plans is unclear at present. The NEP therefore only includes a small programme of two schemes where there the EA and Thames have agreed that there is a high level of certainty over the requirements. We support the inclusion of these schemes and confirm that the costs are robust.

### **Revised Flow Consents**

Improvements have been identified for 26 works where there are river water quality issues and flows are not consistent with existing consents. There are no strict statutory drivers for these schemes, but the Water Framework Directive requires 'no deterioration'. The requirements are based on river water quality modelling work and the schemes are supported by the EA. The costing of this programme has been improved by costing solutions based on outline designs for each works. At the DBP costs were based on solutions for just three works. We consider that there is sufficient justification to warrant the implementation of the proposed programme of work and consider that the costs are robust.

### **Sludge Treatment**

Thames is proposing quality enhancement investment in sludge treatment to meet the requirements of new Nitrate Vulnerable Zone Regulations and in relation to treating additional sludge that will result from the Tideway STW Upgrade programme and the Thames and Lee tunnels. Details of these schemes are provided in our Chapter B5 report on sludge.

### **Local Priority Improvements**

The main investment included by the Company under this driver is a programme of improvements to some 20 intermittent discharges on the River Lee that are now considered to collectively have an 'unsatisfactory' impact on the watercourse. The River Lee borders the London Olympics site and the EA labelled these schemes in the draft NEP as Olympic schemes on the basis that they were needed to provide a satisfactory environment before the 2012 games. Ofwat excluded funding for these outputs from the draft Baseline Report on the basis that they considered they should be funded by the Olympic Delivery Authority.

The current version of the NEP includes these outputs under two lines without reference to the Olympics. There is a requirement to provide screening as one output by 2012 and additional capacity by 2015 as the second output. The first output would be provided before the Olympics and the second output afterwards.

We note that there is no statutory driver for the programme, but that it has strong support from the EA. The Company is proposing a range of responses to meet the identified needs. The Company has improved its costings for this programme and we consider that they are now reasonably based.

### **Fresh Water Fish Directive**

The Company has included one scheme, Berkhamsted STW BOD Removal in the draft programme. We confirm that the scheme is required.

### **First Time Sewerage**

The Company has included a cost (TEXT REDACTED) for delivery of four Section 101a schemes. These schemes have yet to be identified. The costs are based on AMP4 experience and the assumption that a similar level of activity will be needed in AMP5. We consider that this is a reasonable estimate of the level of obligation that is likely to arise. We suggest that the funding should be set against an output for both number of schemes and connections.

(TEXT REDACTED)

### **Studies**

The Company has included a programme of studies relating to SSSI sites, removal of priority substances and IPPC and Environmental Permitting.

The SSSI investigations relate to sites at Tring Reservoir and the Kennet and Avon canal where there are concerns over pollution. These studies are supported by the EA.

With regard to priority substances, although there is not a statutory driver, we have confirmed that there is strong government and EA support for a scheme which involves monitoring at 41 sites.

The NEP does not contain any requirements with regard to IPPC and Environmental Permitting. However, we confirm that the EA supports a proposal to undertake investigations in the AMP5 period to establish the impact of changes that will be needed as a result of these regulations, so that the scope of works can be determined for implementation in AMP6.

We have reviewed the proposals with the Company and EA and are satisfied that they are appropriate. We therefore confirm our support.

(TEXT REDACTED)

(TEXT REDACTED)

### **Summary of Audit & Review**

We are satisfied that the Company has fully disclosed its assumptions, methodology and data sources used for the preparation of its B4 sewerage service FBP submission and confirm that it has cooperated with us fully in the audits we have undertaken.

We consider that the Company's commentary provides a good explanation of its investment plans. Thames Water has used the latest guidance and has translated legislation into its obligations in an appropriate manner.

The programme is dominated by the Thames Tideway STW upgrades and Lee and Thames tunnels. We consider that the cost estimates for the STW upgrades and Lee Tunnel should be robust, being in most cases based on tendered costs. However, the additional costs being claimed by the Company warrant further review and we therefore propose to undertake a further audit during the FBP query period.

The Company has proposed a major investment at Deephams to meet several statutory drivers and very tight consent conditions set out by the EA.

The Company has proposed a suitably scoped and costed solution based on rebuilding and extending the existing works. We consider that the Company should also develop the option of retaining the existing works and building a smaller extension, as if this were to prove viable, it may result in a lower cost solution. We note that the Company has agreed to do so.

The remainder of the programme is relatively small in comparison to the Tideway and tunnel projects. Generally, we consider that these plans will deliver the expected outcomes because, in general, solutions are clearly established and the Company has experience of implementing most of them elsewhere.

With the exception of the three schemes listed above, the plans are supported by customers' willingness to pay as well as compliance drivers. We are satisfied that the Company has undertaken rigorous analyses in most areas and has presented a soundly based plan.

We found no inconsistencies with our previous understanding or activity elsewhere in the industry.

Our audits confirmed that Thames Water's submission, tables and supporting documents are complete and consistent with its SDS.

**Date:** 17 April 2009  
**Prepared By:** HMS  
**Version:** Final