

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

Since the Draft Business Plan (DBP), the Company has undertaken further work to its existing studies and completed new studies to develop a comprehensive quality enhancement programme. Thames has translated current and future legislation and regulatory guidance into its obligations.

We confirm the Company has considered all its quality obligations based on drivers from DWI, EA or DEFRA as well as non-statutory drivers (Biodiversity Action Plan) and we have confirmed the proposed solutions are based on whole life costs. The Company has developed its programme from its knowledge and trends in operational data and new information. These have been agreed with the quality regulators.

The environmental programme is designed to meet obligations identified by the Environment Agency in its initial National Environment Programme (NEP). Other statutory drivers are the European Habitats Directive and Sites of Special Scientific Interest (SSSI). The resulting programme addresses sustainability reductions and low flow investigations.

(TEXT REDACTED)

The Company's studies into its lead pipe hot spots are significant and highly detailed pieces of work which go beyond zonal level to street and property level. For the proposed replacement of lead communication pipes the costs for Company side pipes are robust and are based on recent costs experienced through the Victorian Mains Renewal (VMR) project. There is greater uncertainty of the costs of replacing the customer side pipe because of the mix of surfaces at customers' properties. The Company has responded to our challenge in DBP to undertake further work to refine its cost estimates for lead pipe replacements. The Company has completed detailed work in this area which provides confidence in the estimates.

(TEXT REDACTED)

The Company's proposals have been formulated on a sound basis. Our audits and reviews of the programme and supplementary information enable us to support the Company's proposals for the Final Business Plan (FBP).

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 attended a scoping session on 12 November 2008 where we confirmed the AMP4 outturn position regarding Water Quality Enhancements and the Company's overall strategy and areas of focus for AMP5. Our detailed assessment took place on 24 February 2009 and 11 March followed by a review of the Projects Database on 19 March to confirm the quality schemes were properly represented in the database.

We confirm that we have fully reviewed Thames Water's Part B4 submission, data tables and supporting documents. Supporting documents include Drinking Water Safety Plans, risk assessments and detailed studies by external expert consultants. 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 liaised with Ofwat, followed Reporter guidance and addressed all the points in the agreed Audit plan. (TEXT REDACTED) We found evidence of Thames Water's dialogue with Quality Regulators, including the Drinking Water Inspectorate, the Environment Agency and Natural England.

Summary of Thames Water's Proposals

We confirmed that Thames Water's AMP4 quality programme has been delivered. The Hornsey Bromate scheme encountered delays due to unforeseen ground conditions. These delays resulted in the agreement of a new commissioning date of January 2009 which we confirmed was met by the Company. We note that the Company considers a scheme is complete when it becomes operational. Formal completion of the S19 Undertaking will be in

February 2010 when 12 months of post commissioning monitoring data are available.

Thames Water's AMP5 water quality enhancement programme is of a similar level of investment to AMP4. (TEXT REDACTED)

The Company's programme for AMP5 has been developed through continuation of its close monitoring of raw and potable water quality, review of operational data and tracking of trends. New information has emerged/developed in 2008 (since the DBP) relating to metaldehyde, nitrates and cryptosporidium. (TEXT REDACTED)

The Company has discussed its approach with the DWI and demonstrated that it has assessed the risks of failing quality standards. In three cases the preferred solution is a catchment management option rather than installation of additional treatment.

The Company is proposing schemes in the following areas: (TEXT REDACTED)

Drinking Water Quality Schemes

- Pesticide removal at one site with catchment management in three other catchments
- Reducing the risk from Cryptosporidium at three sites
- Nitrate treatment at two sites
- Plumbosolvency treatment at five sites
- A revised lead strategy which includes a collaborative programme of replacement in hot spot areas.

Environmental water quality schemes (as identified in the NEP)

- Six sustainability reduction investigations
- Drought baseline monitoring
- An investigation into the environmental impact of, and the need for permits to operate, water treatment works sludge processing plants under the new environmental permitting regulations.
- An environmental monitoring and assessment study on metaldehyde.

(TEXT REDACTED)

The drinking water quality programme includes several schemes that the Company did not include at DBP stage, and other schemes which have been significantly modified. The Company has received support from the DWI for all of these modifications and additions for inclusion in the FBP.

We confirmed the status of the Quality programme as set out in Ofwat's Baseline of December 2008. DBP schemes included in the Baseline are:

- Cryptosporidium – Fairford and Marlborough WTW;
- Pesticides – 1 work; and
- Plumbosolvency – Aylesbury (3 works);

DBP schemes not included in the Baseline:

- Lead pipe replacement;

We note the position of the pesticide catchment management schemes in Ofwat's baseline is unclear because the text does not explicitly state whether the schemes are included or excluded.

The Company has revisited the following schemes for the FBP:

- Revised Lead strategy; and,
- Pesticides – 1 work.

The Company is proposing the following new schemes as part of the FBP:

- Nitrate schemes at Wantage and Westerham;
- A new scheme for Cryptosporidium treatment at Playhatch;
- Catchment control for metaldehyde at all surface water treatment works; and
- Two plumbosolvency schemes in the Henley area.

We challenged whether all schemes included in the FBP have an AMP5 timescale for completion. At the time of audit, DWI letters of support for all but two of the schemes confirmed completion within the AMP5 period. DWI letters for two schemes stated that completion dates were "to be confirmed". We note at this stage it is for Thames, not DWI, to specify the completion dates based on need and technical feasibility. The final regulatory deadlines will not be determined until DWI requires Thames to submit a S19 Undertaking or other legally binding agreement. The Company has written to DWI to confirm the completion dates for Wantage and Playhatch and confirmation of completion within the AMP5 period has been received.

Pesticide Removal

The DWI has indicated its support for schemes related to drinking water quality standards.

- The Company's pesticide schemes have been identified by monitoring both statutory and operational compliance (TEXT REDACTED)

To address compliance with the pesticide standards, Thames Water has proposed two approaches involving treatment (text redacted) and catchment control (text redacted). For the latter two sites, the Company has investigated treatment options however considers that the current risk does not justify the associated Capex and therefore favours the option to manage the problem by working pro-actively to identify the source of the pesticide and manage this with the landowner or operator. We support this approach and note that the DWI has also recorded its support.

(TEXT REDACTED)

(TEXT REDACTED)

Plumbosolvency Treatment

Prior to AMP3 the Company had no treatment processes designed to reduce the plumbosolvency of water supplies. Plumbosolvency treatment was installed during AMP3 in anticipation of the planned changes in the lead standard. However a more stringent standard was introduced from 2003 and this required the introduction of plumbosolvency treatment during AMP3. As a guide, DWI introduced a requirement that where >5% of samples were not achieving this standard, companies should implement a treatment solution. In the run up to AMP3 Thames Water's "Hawridge group" of treatment works in the East Aylesbury and Tring areas did not exceed this criterion. More recent and comprehensive sampling has shown an increase in failures. Consequently the Company sought a treatment solution, noting that phosphate dosing at similar, nearby works had successfully achieved the standard.

The Company is therefore proposing installation of dosing equipment at the Hawridge group. DWI has supported the introduction of phosphate dosing at the three works. We reviewed the study reports and consider the solutions are supportable. We confirmed that the costs align to those set out in the Company's Cost Base submission.

Henley and Harpsden

Since the submission of the DBP, two plumbosolvency schemes have been added following further analysis of several years of lead concentration data in the Henley area. DWI has supported the dosing solution based on monitoring results showing over 5% of samples exceeded the lead standard. We challenged the Company on alternative options such as lead pipe

replacement. Thames explained that the DWI will not support lead pipe replacement unless phosphate dosing has already been installed and although lead pipe replacement had been considered it was clearly more expensive than the treatment option. The proposed treatment scheme is therefore supportable.

Replacement of Lead Communication & Customer Supply Pipes

Thames Water's lead strategy is to deliver the future 10µg/l standard (currently 25µg/l). Despite the lack of longer term guidance from the DWI, DEFRA's Statement of Obligations (December 2007) states that Ministers expect companies to develop alternative strategies for lead compliance.

Thames Water's lead pipe replacement scheme in the DBP was rejected by Ofwat because DWI had not confirmed support for the initial strategy. Subsequent DWI requirements specify that companies' lead strategy should be an integrated and collaborative approach with local and health authorities and not solely based on lead pipe replacement. Thames has responded and developed an enhanced lead strategy including pipe replacement, working with local authorities and housing associations, a communication programme and the extension/optimisation of plumbosolvency treatment. The Company has since received support from DWI for its revised strategy.

For the DBP Thames undertook significant and detailed investigations beyond zonal level to street/postcode/property level to identify lead hot spots. Since the DBP, the hot spots have been further defined and categorised into category one and category two hot spot areas. Category one hot spot areas are where 20 % or more of the samples exceed the lead standard. Category two hot spot areas are where 15-20 % of the samples exceed the lead standard. We challenged the Company on these percentages. Thames explained that they were arbitrary percentages used to facilitate a risk based approach and representing a sensible cost for the solution. Furthermore phosphate dosing has been successful at controlling lead concentrations and areas with lower percentage exceedance could be resolved by continued phosphate treatment. Therefore, we consider categorisation to be a pragmatic approach to prioritising and addressing the risk.

The Company is proposing 100% replacement of lead communication pipes in category one hot spots and 80% of customer supply pipes in these areas (this was previously 50% in the DBP). We challenged delivery of replacing 80% of customers' supply pipes in view of the increase from DBP which we similarly challenged at the time. The Company agreed that a 80% replacement is challenging to achieve where properties are privately owned but the Company would seek and rely on support from Local Authorities and Health Authorities to maximise delivery.

We consider there is an element of uncertainty in the 80% assumption, however we acknowledge that the Company has set itself a target, albeit challenging, and the Company has a sensible and flexible contingency plan should it be unable to achieve the assumed rate of uptake (see below).

We challenged why Thames was proposing to replace any lead pipework belonging to property owners because these pipes are the owner's responsibility. The Company stated that it is driven by DWI (and Ministerial guidance) to comply with the lead standard and in some areas this can only be achieved by the replacement of a significant proportion of any lead pipework serving individual properties. Replacement of lead communication pipes will have only a limited impact on lead concentrations or compliance. Industry experience and DWI guidance is that property owners are unwilling to meet the cost of replacing their lead pipes. In these circumstances the Company has decided that in order to make any improvement in compliance with the 10ug/l standard it is necessary encourage targeted replacement of lead pipework belonging to consumers. The Company is only proposing to replace lead pipes up to the point of entry into or under the building. The replacement of any internal lead pipes that remain would be encouraged but this would be at the cost of individual property owners. We consider this to be a logical rationale and, if implemented, should make a meaningful improvement in compliance with the 10ug/l lead standard.

We reviewed the Company's detailed study which is a significant piece of work which goes beyond zonal level, to a street by street level in the hot spot areas. The Company provided demonstrable evidence that the programme, in our opinion, should be supported.

The estimated costs are based on rates used in the VMR project which are contained in the Engineering Estimating System (EES). These costs are relatively certain because they are based on recent costs experienced through the VMR project. We found that the Company has made an appropriate adjustment to its EES models to exclude rates from DMAs in the City of London which are typically higher. This is appropriate because none of the hot spots involve constraints experienced in the City.

Thames responded to our DBP challenge to survey a further two lead hot spots to obtain more robust information on pipe lengths and surface types to inform units costs. We consider the costs for replacement of customer side lead pipes are more certain as a result. We reviewed the survey work undertaken (text redacted) which identified differences in property type and location relative to the mains in the road. These differences have been taken into account and are reflected in the Company's updated unit rates.

The Company has applied rates for small diameter pipe laying under different surfaces (pavement, concrete & open land) and has carried out a detailed

assessment in four hot spots. We found that the Company had also carried out a sensitivity analysis using the (text redacted) rates for all London hot spots and compared this with using average rates from all four survey areas.

We discussed at audit how the Company was treating the costs of replacing external lead pipes that belong to customers. Since the new pipework will not be a Company asset, the cost of replacement is treated as Opex. The Company confirmed this approach with Ofwat.

The Company has addressed the assumptions we challenged in the DBP regarding customer uptake, cost certainty and the potential for hot spots to become “less hot” with ongoing plumbosolvency treatment.

The Company’s strategy submitted to DWI features overlap with optional and selective metering during AMP5. However, following changes to the WRMP and a revised approach to metering this element of opportunistic lead pipe replacement has been eliminated.

Under the VMR programme all lead communication pipes are due to be replaced where VMR overlaps with Category 2 lead hotspots. Thames proposes to work with customers to replace the lead supply pipes at the Company’s cost, an uptake of 80% is assumed. We note that this could be more achievable due to the VMR contractor’s presence.

The resulting collaborative programme seeks to replace the following number of lead communication and supply pipes during the AMP5 period:

ITEM	COMMS PIPES	SUPPLY PIPES
Reactive replacement of lead pipes following failures	630	570
Pipe replacement in Category 1 hotspots	30600	24500
Social housing	1000	0
VMR overlap with Category 2 hotspots (supply pipes)	0	4550
Additional pipe replacement resulting from communications strategy	2700	0
TOTAL	34,930	29,620

At the time of the DBP, the Company did not have a contingency plan in place in the event that the uptake of lead pipe replacement falls short of the levels assumed. For the FBP, Thames explained that if levels assumed for the category one hot spots were not being achieved then it would reprioritise category two hot spots and would also look to target social housing. A last resort would be to log down the expenditure for AMP6.

We consider the Company has responded to our challenge to develop a contingency plan. We consider the arrangements are appropriate considering the challenges faced by the Company and the plan is robust.

Nitrates

The two nitrate schemes at Westerham and Wantage, which were rejected by the DWI at the DBP stage, have been resubmitted providing more information including evidence of a continued rise in nitrate levels at the two locations. We note that these are now supported by the DWI. Our audit confirmed the rising trend in nitrate concentrations at both locations; however we challenged the data presented for both locations.

In the case of Wantage there was a rising trend and during 2008 concentrations had exceeded the 50mg/l standard, however data was missing for the period January 1990 – January 2000. Thames explained that nitrate had been monitored in the raw water during this period but routine monitoring of the treated water leaving the works had only started when the concentration of nitrate had started to approach the nitrate standard threshold. In the case of Westerham the data was below the 50mg/l level although did appear to be rising. Linear regression analysis conducted by Thames showed that the average nitrate concentrations were unlikely to reach 50mg/l until after 2018, however the upper trend line predicted that nitrate concentrations could reach 50mg/l in 2010, with a 95% confidence level.

We challenged the Company about the assumption of a linear increase in the nitrate concentration. Plotting of the data “by eye” it could be that the trend could be asymptotic. Thames accepted that it was possible to fit a number of different curves to the dataset including an asymptote. However if the increase was asymptotic there would need to be a catchment or hydrogeological factor acting to reduce the rate of increase. Thames is not aware of any such change and believes that linear regression is the most appropriate way of extrapolating future trends.

Furthermore, Thames explained that if the upward trend in nitrate occurrences was to continue this would be a regular occurrence by the end of the AMP5 period. The Company aims to have treatment in place before the threshold is breached.

Wantage

The source of nitrate concentrations is unknown but it is thought to be from agricultural activities in the area. Currently nitrate levels are being monitored and the works has been taken out of supply in the short term. Ion exchange has been identified as the solution and we challenged whether the Company had considered alternatives such as catchment management, blending or permanent closure.

Thames explained that catchment management was not a feasible solution to this problem due to the length of time (estimated up to 15 years) needed to produce improvements to the water quality, despite the designation of Wantage as a Nitrate Vulnerable Zone (NVZ). Thames had considered blending but we found this had not been fully costed with generic costs applied. Thames explained that blending with the Gatehampton/ Oxford trunk main was not feasible due to the large volumes of water involved and the impact that this would have on the supply demand balance in the SWOX supply area. Permanent closure was also not considered a possibility as output from this site is needed to maintain the supply/demand balance in the SWOX supply zone. We are satisfied that the Company has explored these options and agree with Thames that ion exchange is the best option.

Westerham

The source of nitrate concentrations is unknown but it is thought to be from agricultural activities in the area. Ion exchange has been identified as the solution and we challenged whether the Company had considered alternatives such as catchment management and blending.

Thames explained that catchment management was not an option due to the length of time that it would take to have an impact, furthermore Westerham has not been designated a NVZ area and without this regulatory backdrop additional voluntary measures could not be effective. Blending was also not an option as costs were significantly higher than ion exchange.

We are satisfied that the Company has explored alternatives and the proposed solution is appropriate.

Catchment Management Scheme - Metaldehyde

Monitoring for metaldehyde began in June 2008 and Thames is detecting metaldehyde in all surface waters with exceedances of the pesticide standard in a number of locations. We challenged why this catchment wide problem was not previously identified at the time of the DBP. Thames explained that Metaldehyde emerged as a national problem during 2008 as more companies started their own monitoring data. Thames' own monitoring starting in May 2008 and subsequent analysis has established the pesticide is regularly found in surface water and rarely groundwater. (TEXT REDACTED)

The Company outlined that existing treatments for pesticides are not effective for Metaldehyde. Treatment by reverse osmosis is highly expensive and we agree that it is not a viable option. Catchment management has been identified as the solution with one full time employee taking part in national working groups and providing local education/awareness with land users across the Thames Region. We challenged why the cost for the FTE appears

as CAPEX and not OPEX. Thames explained that this is a substitute for a capital solution.

We note that the burden of a national problem appears to be falling on the Water Industry. We note that manufacturers of metaldehyde have formed the “Metaldehyde Steering Group” (MSG). The MSG is working to understand the problem and find ways to reduce water contamination. The MSG, DWI, EA, Pesticide Safety Directive and Natural England are in discussion to understand what action is appropriate. Moreover the situation is not that different to any other pesticides found in surface water which is treated to maintain compliance. A complete ban on use of these chemicals would eliminate the problem for the water industry very quickly however this would ignore the economic and political impact of reduced crop yields and reduced farmers’ incomes.

The Company’s approach has been supported by the DWI and we acknowledge that Thames is addressing the problem with an appropriate solution.

Sustainability Reduction Implementations

The Company is proposing to implement two sustainability reduction requirements, one under the Habitats Directive (Speen) and one with a SSSI driver (Axford). Both of these schemes were included in the DBP. In accordance with Ofwat’s instructions, these are included in part B5 (Maintaining the Supply Demand Balance) and are discussed in our B5 commentary. (TEXT REDACTED) The Company responded that whilst the solution is the same as that proposed in DBP, a number of errors have been corrected.

A third sustainability scheme under the Habitats Directive, the West Berkshire Groundwater Scheme (WBGWS), has been added since the DBP. A scheme for the WBGWS under the Habitats Directive had been considered in the preparation of the DBP but it had been rejected on the grounds that the proposed solution was expensive and would have a disproportionate and adverse impact on London’s deployable output. In the light of further discussions with the Environment Agency the Company is proposing to implement an augmentation scheme at the Thatcham Reedbeds.

Low Flow Investigations

The Company has included six investigations into sustainability reductions as set out in the EA’s National Environment Programme (NEP) document. The DBP had also included an investigation on the Lower Rib. This has been removed from the FBP because Three Valleys has undertaken separate, and

more geographically relevant, investigations. We note that two investigations are flagged as “uncertain” in the NEP:

- Roundmoor Ditch is dependent on the outcome of an AMP4 investigation (Cress Brook).
- Royal Brook has two entries on the NEP because of different drivers.

The Company has included these in the FBP.

In addition the NEP includes one “uncertain” implementation scheme under the Habitats Directive

- River Lambourn depends on the EA deliberations on the operating agreement for the West Berkshire Groundwater Scheme

The Company has not included this scheme in the FBP.

We suggest there is merit in the EA clarifying requirements and we note that the Company is seeking the EA’s clarification with regard to the Royal Brook drivers. Subsequent to the audit the EA has confirmed that the Royal Brook appears in the NEP as a “certain” investigation under a Water Framework Directive driver and as an “uncertain” investigation under a Biodiversity Action Plan driver due to possible impact on native Crayfish.

Thames has included Drought Permit Baseline Monitoring which is required by the EA.

At the DBP we challenged the Company to gain better certainty on costs of the investigations. We found that the Lower Thames investigations are based on costs compiled by an external consultant and these have not changed since the DBP. We challenged these at the time of DBP and were satisfied the estimates are based on robust information.

The Company has refined its costs for all other investigations by dividing up the scope into discreet elements with an estimate for each based on past costs of similar studies. We consider this to be a sensible approach.

For the drought permit baseline monitoring costs, we found the Company has prioritised each site based on the likelihood of use and environmental impact. This has been undertaken in conjunction with the EA. The Company has assessed data that is currently available and where deficiencies were identified Thames has used quotations from recognised consultants. We consider this to be an acceptable approach.

NEP Environmental Permitting of water treatment sludge plant

We note that the Company, in agreement with the EA, is addressing DEFRA's requirement under the Environmental Permitting Regulations 2007 in AMP5 via the NEP. Our audit found that this was previously included in the DBP under the wastewater quality programme. Thames Water has correctly reallocated it to the water quality programme for the FBP. The Company's approach to investigation work and obtaining any necessary permits under a single programme is sensible.

NEP Environmental Impact of metaldehyde

The Company has responded to the environmental investigation requirement in the EA's NEP to include a project to understand the use of metaldehyde in the Company's surface water catchment area. This is a monitoring project to obtain better information on the source of metaldehyde and its impact on upstream tributaries. Our audit confirmed that the outputs had been included in the table, but the associated costs had not been included in the financial model. The investigation is supportable in response to the NEP whilst addressing an emerging problem.

Installation of Fish Screens

The Company's DBP included installation of fish screens at the inlet to seven works. This proposal has been removed following advice from EA. The Company is awaiting the outcome of Defra's public consultation that is scheduled to close on 10 April 2009. The indicative timetable for implementation suggests that this may be a driver for investment in AMP6.

TEXT REDACTED

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

Summary of Audit & Review

Thames Water has disclosed all available information to us and demonstrated through interview with its staff that detailed investigations and studies have been carried out to inform the quality enhancement programme. The Company was fully co-operative and provided subsequent information in a timely manner to enable completion of our work.

Thames Water has used the latest guidance and has translated legislation into its obligations in an appropriate manner.

We consider the plans are appropriate to deliver the expected outcomes because the solutions are clearly established and the Company has experience of implementing most of them elsewhere.

With the exception of the lead pipe replacement programme's assumed rate of uptake (80%) for the replacement of customer's lead supply pipes we found no material areas of uncertainty.

The Company has received support from the DWI for all proposed drinking water quality schemes.

The Company is proposing appropriate environmental schemes which respond to the EA's requirements as listed in the NEP.

The plans are supported by customers' willingness to pay as well as compliance drivers. The Company fully understands the business risks of compliance failure and has developed its programme accordingly based on trends in performance and new information that has identified new risks.

The Company has undertaken a rigorous analysis in all areas. Studies undertaken to identify the lead pipe hot spots exceed our expectations and the Company has established sub-zonal data as a result of this detailed work. We welcome the Company's further detailed assessments to gain greater confidence in costs of lead pipe replacement.

The plans are generally not new to Thames, however we consider the lead pipe replacement programme including customer side supply pipes is a step change for the Company which could be a challenge to achieve the outputs. However, the Company is aware of the challenge and is gearing up to meet it.

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

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Prepared By: HMS
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