Anglian Water Services Limited submission to the CMA

Dear Matthew,

I am writing in response to your email to Peter Simpson, 23 March 2015, requesting submissions from interested parties on matters relevant to the inquiry.

We note that two of the areas of focus highlighted by both Bristol Water and Ofwat are totex cost assessment and outcome delivery incentives (ODIs). We made submissions to Ofwat on both of these topics as part of the price review process and these submissions may be useful to your inquiry.

On totex cost assessment we attach the submissions we made to Ofwat in June 2014. These submissions set out what we consider are systematic errors in Ofwat's cost modelling and the changes that we considered were necessary to address them. There are separate submissions for water and waste water, and while there are considerable overlaps between the two documents we have attached both for completeness.

On ODIs we attach an extract from our representations on Ofwat's draft determination that we submitted in October 2014. We draw your attention to our comments on the interruptions to supply ODI and our view that the committed performance level had been set without reference to the inherent differences in companies' network which inevitably affect performance.

We trust that you may find these submissions helpful contributions to the work of the panel. They have all been published on Ofwat's website so are matters of public record. We note the deadline of 29 May for submission of representations to the panel and may make further submissions before that date.

If you have any queries or wish to discuss our submission, please do not hesitate to contact me.

Kind regards
Jean Spencer
Regulation Director

Revised submission

Water wholesale

Summary

- The cost assessment models result in radically different assessment of costs compared with previous approaches.
- We have a number of reservations with the cost assessment modelling approach taken by Ofwat:

1. Different quality models should be accorded different weights. Finding a quantitative basis for setting differential weights is hard but we have considered the impact of making what to us appears a conservative adjustment.
2. Within the Ofwat approach to modelling, RPE (real price effect) is taken into account through the time trend in the totex models. However, in four out of five of the models used by Ofwat which feed into the computation of the threshold, the time trend's coefficient is not significantly different from zero. Essentially this means that there is very limited recognition of price effects in the water totex modelling.
3. We are concerned that Ofwat's use of Jacobs' forecasts, based as they are on historical performance, ingrains into the modelling process the assumption that the future is a continuation of the past. In several important ways, this is not the case. The impact of swapping Jacobs' numbers for our own reinforces our concerns about model quality.
4. We are unconvinced that operational expenditure relating to enhancement capital expenditure being modelled in unit cost models and in the unmodelled category is recognised in the modelling. As we demonstrate, this has the effect of overlooking a significant amount of expenditure. The value of this omitted operational expenditure has been evaluated, as has the impact of its recognition on the calculated threshold.
5. There are shortcomings with the Supply / Demand enhancement model.

- We feel that these issues all comprise systematic errors. We set out why we consider this to be the case for each of the issues .
- The impact of making the proposed remedies to all issues is to add at least £53.8m to the water threshold. This would be increased by reviewing the use of Jacobs' data to over-write Anglian's actual variables. The impact of each remedy is set out in the table below.

Summary impact of remedies to all issues

Issue	Description		Evaluation (£m)
1	Quality agnostic triangulation in the econometric models		+8.1
1a	Reduce weight for full totex model	+3.8	
1b	Increase weight on Model D to 60% & reduce Model B to 40%	+1.7	
1c	Increase weight on Model E to 60% & reduce Model F to 40%	+2.6	
2	RPE underplayed		Not quantified

Issue	Description		Evaluation (£m)
3	Jacobs data used (memo item not added to total)		[20.6]
4	Unit cost model uplift to take account of totex instead of just capex		+7.7
5	Modifications to unit cost model W1 Supply Demand Balance (triangulated value)		+34.5
6	Unmodelled cost uplift to take account of totex instead of just capex		+3.5
	Total		**+53.8**

Purpose

In this section we:

- Consider the results of the cost assessment modelling in the context of historical experience in the sector
- Review the modelling approach followed by Ofwat
- Consider shortcomings with that approach (identified as Issues 1-6)
- Make suggestions as to how these issues could be addressed, and
- Quantify the impact of those changes on the water cost threshold.

Ofwat has made it clear[(1)] that any criticisms of its modelling approach will only be entertained if the company can provide:

1. "Compelling evidence that any new proposals would be superior to the existing approach ... [and]

2. Evidence that the existing approach creates systematic bias ..."

We take systematic bias in this context to mean approaches which lead to errors which affect the generality of companies as opposed to impacting only a single organisation.

The calculations produced by this analysis form part of our gap analysis. We have satisfied ourselves that there are no material overlaps between the adjustments made in this section and those we will be submitting as part of the gap analysis.

Context to the cost assessment modelling

As a starting point, we have sought to understand at a **high level** how the results of Ofwat's threshold assessment compares with Ofwat's PR09 assessment of efficiency and CIS ratios; performance in AMP5; companies' AMP6 plans compared with AMP5; Ofwat's thresholds compared with AMP5; and the resulting Ofwat thresholds compared with companies' plans. The analysis is illustrated in the chart below, but in summary:

1 *Source: Ofwat Wholesale cost assessment workshop 08/04/2014 slide 57*

- PR09: the most efficient companies included Anglian, Northumbrian, Wessex and Yorkshire. The less efficient included South West and Dwr Cymru.
- AMP5 capex compared with PR09 allowed expenditure: the companies that spent less include Anglian, Wessex and Yorkshire. The companies that spent considerably more include South West and Dwr Cymru.
- AMP6 plans compared with AMP5: for the water service, Anglian proposed a similar uplift in AMP6 (10%) compared with South West Water (9%)
- Ofwat threshold compared with AMP5: for the water service, the threshold for Anglian is 1% lower than AMP5 whereas for South West Water the threshold is 29% higher than AMP5.

An historical perspective on water cost assessment

	Anglian	Welsh	N'mbrian	Severn Trent	South West	Southern	Thames	United Utilities	Wessex	Yorkshire
PR09 Opex efficiency	A-	C-	B+	B+	B-	A+	B+	B+	B+	A+
PR09 Capex infra efficiency	17.6	-2.9	10.3	12.6	-9.2	8.6	-6.1	13.1	12.1	8.2
PR09 Capex non-infra efficiency	-3.9	-0.7	8.6	-15.4	0.5	-6.2	-3.7	4.4	5.4	7.4
PR09 CIS ratio	105	105	103	102	105	122	125	94	104	100
AMP5 capex vs PR09 allowed	-8%	36%	-9%	10%	-1%	30%	6%	-10%	-20%	-9%
PR14 company proposed totex vs AMP5 actual	10%	-6%	-2%	12%	9%	-4%	7%	-4%	13%	0%
PR14 Ofwat threshold vs AMP5 actual	-1%	-8%	-2%	2%	29%	-9%	28%	-7%	9%	12%
PR14 company proposed totex vs Ofwat threshold	11%	2%	0%	10%	-16%	6%	-16%	3%	4%	-10%

This analysis would indicate that the PR14 models result in radically different assessment of costs compared with previous approaches. It would also suggest that the differences are due to factors other than efficiency. If past efficiency assessments are given some credence in evaluating companies' general efficiency now (history in the water industry does not suggest that radical movement up or down efficiency rankings is achieved over the course of a single AMP period), for some companies, including Anglian, it suggests that the threshold assessments at PR14 also encompass factors other than efficiency. This can be seen by comparing the assessments in the last three rows of the table with the assessments in the first three rows, in particular for Anglian, Severn Trent, South West, Thames and United Utilities.

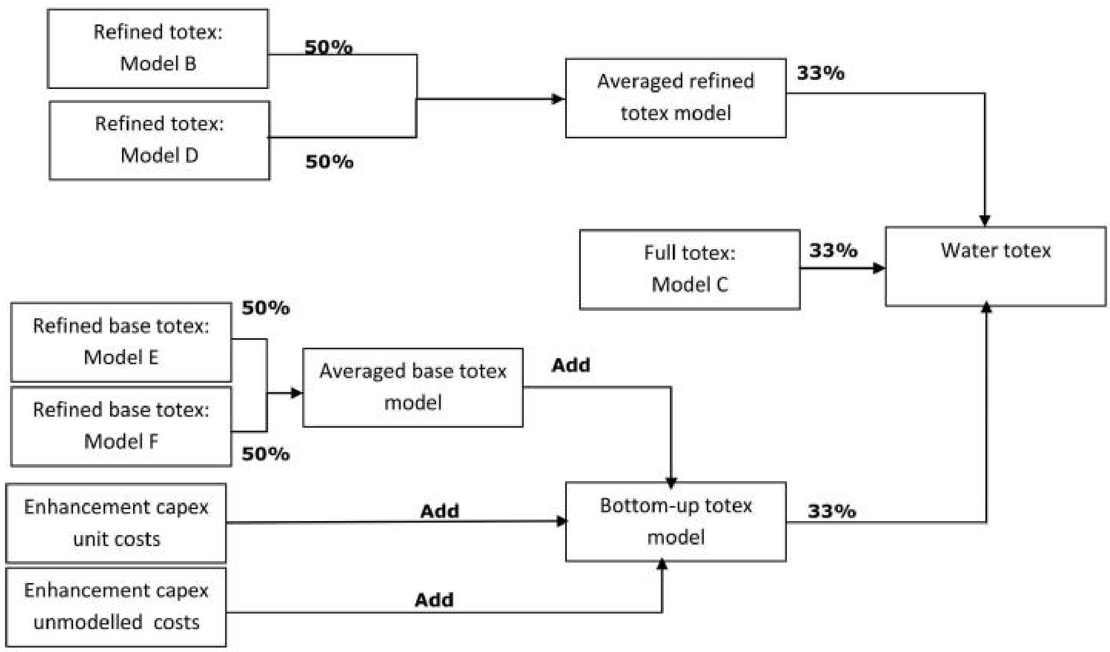
Overview of Ofwat's approach

Ofwat used CEPA to prepare econometric models for totex. CEPA was able to create models which it felt adequately described water. For the purpose of its overall modelling, Ofwat used five of these econometric models. In figure 1, these are referred to as Models B, C, D, E and F. Models B, C and D are full totex models; that is to say, they cover all opex as well as maintenance and enhancement capex. The other two models, models E and F, model only opex and maintenance capex. These are referred to as botex (i.e. base totex) models.

Ofwat's approach to modelling was to combine the results from multiple models through an approach referred to as "triangulation". In terms of the approach followed by Ofwat, triangulation can be described as a process of taking arithmetic averages of the outputs of the separate models. Where it relied on econometrics for deriving base opex and maintenance capex ('botex') in the bottom-up strand of water modelling, then enhancement capex was dealt with through unit cost models where robust relationships between volume drivers and costs could be found. Where robust relationships could not be found, an uplift to deal with this remaining enhancement capex was added in, where the uplift percentage was based on experience in AMP5.

The modelling approaches for water is shown in Figure 1 below.

Ofwat Water modelling approach



The use of arithmetic averages (i.e. equal weights for each of the models used) would appear to suggest that CEPA and Ofwat have equal confidence in each of the models. As can be seen from what follows in this section, this is not the case. ***Ofwat explained that it could not see an objective reason for not having equal weights. As CEPA explicitly rates its models qualitatively, and as the ratings given to the models Ofwat has used differ, this appears curious. We believe that different weights should be applied to models of differing quality.***

Ofwat commissioned Jacobs to produce a set of forecast figures for the variables used in the econometric and unit cost models across AMP6. These numbers, rather than the numbers used in companies' Business Plans, were used. These forecasts were based on the AMP5 figures for these variables. Where the figures across AMP5 were monotonic (i.e. all increasing or decreasing year on year), then Jacobs used Excel's trend function to generate the forecasts. If the AMP5 numbers were not monotonic, then Jacobs used the arithmetic average of the AMP5 figures, as reported in the August Submission, as the forecast for the annual change across AMP6. The implicit assumption in taking this approach is that AMP6 will be a continuation of AMP5. ***Discrepancies between Ofwat's model and our Business Plan are a result of the fact that in some respects AMP5 and AMP6 are not the same.*** The reasons for this vary but include, for example:

- Economic growth in AMP6 vs austerity and lack of growth in AMP5 means a very different pattern of household creation
- The impact of the 2011 census and the much faster population growth has now been recognised in our region
- A step reduction in leakage in AMP6

- Continuing increases in the level of metering
- Growing focus on resilience - heightened concern about the effects of climate change, with an increased frequency of both drought and flood conditions, and security of energy supply.

The rest of this report looks at the outputs of the econometric models, the unit cost models and the unmodelled approach in more detail, highlighting issues with the approach which make the outputs an unreliable basis for assessing our expected requirements for AMP6. Suggestions are made as to how the approach could be improved.

Econometric models

Overview and evaluation

CEPA started off by developing 10 water models. These were all evaluated on three bases:

- Theoretical correctness
- Statistical performance
- Robustness.

In each case, the criteria were rated as Good, Acceptable or Rejected.

The table below summarises the results of CEPA's own evaluation of its water models. The emboldened lines are the models taken forward for use by Ofwat. These are then reviewed below.

Water models

Model	Theoretical correctness	Statistical performance	Robustness
W1: Totex all variables	Good	Rejected	Acceptable
W2: Totex all variables	Good	Rejected	Acceptable
W3: Totex all variables. Model C	**Good**	**Acceptable**	**Acceptable**
W4: Totex refined.	Acceptable	Acceptable	Rejected
W5: Totex refined. Model D	**Good**	**Good**	**Good**
W6: Totex refined. Model B	**Good**	**Good**	**Good**
W7: Totex refined.	Good	Rejected	Good
W8: Botex refined.	Good	Rejected	Good
W9: Botex refined. Model F	**Good**	**Acceptable**	**Good**

Model	Theoretical correctness	Statistical performance	Robustness
W10: Botex refined. Model E	Good	Good	Good

(2)

Full totex – Model C

By full totex, CEPA means that they have considered 27 variables (or, more precisely, 26 variables and a constant) from the August Submission. These include, length of mains, density, usage, length^2, density^2, usage^2, length x density, length x usage & density x usage. ***The use of such derivative variables makes it hard to see how CEPA can maintain that these represent 27 independent variables. The results from the model will be affected by the consequent multicollinearity, leading to the apparent flattering of the quality of the model.***

Of the 27 variables, only seven have coefficients which are statistically significant. These are shown with a cross in the statistically significant columns of Tables 2 - 6. In other words, more than three quarters of the variables in this model had coefficients which were not statistically significant from zero. At the risk of stating the obvious, this means that, statistically speaking, the impact of all of those variables cannot be distinguished from zero.

CEPA also set out *a priori* the sign and magnitude of the coefficients. Only nine of the coefficients matched their *a priori* expectations; these are shown with a cross in the 'sign/magnitude matches a priori' columns of the following five tables.

In the table below, and in the subsequent four tables, the parameters where the coefficient is significant and matches the *a priori* expectations are shown emboldened. For Model C only two in 27 of the variables had statistically significant coefficients which matched prior expectations.

This is not a very satisfactory model.

However, if this model were not used, then Ofwat could not suggest that usage, metering, pumping head, leakage, % customers served by meters and interruptions were incorporated into its analysis. To restate the point a different way, these key variables are only represented in Ofwat's cost modelling in this one place. If Model C were not used, then Ofwat would be in the same position for water as it is for wastewater - without a totex model. It would have to rely on being able to develop credible botex models (opex plus maintenance capex) plus an enhanced range of unit cost models and, quite probably, a wider range of unmodelled items. In the case of unmodelled, at the moment, the unmodelled allowance is already 8.4% for water. Having that move up into double figures would not improve perceptions of overall model quality.

Unfortunately, the suggestion that usage, metering, pumping head, leakage, % customers served by meters and interruptions were incorporated adequately into Model C is undermined by none of these variables having statistically significant coefficients. Moreover, usage has a negative coefficient (albeit with a statistically insignificant coefficient): all other things being equal, the model expects lower costs as volume increase. This is counter-intuitive.

2 *Source: Ofwat cost assessment - advanced econometric models. CEPA 20/03/2014*

Model C variables

Variable	Coefficient	Statistically significant	Sign / magnitude matches a priori
Constant	-0.961		
Length of main	**0.905**	**x**	**x**
Density	-0.276		
Usage	-0.032		
$Length^2$	-0.031		
$Density^2$	1.154	x	
$Usage^2$	-0.247		
Length x density	0.647	x	
Length x usage	-0.006		
Density x usage	0.063		
Time trend	0.012		x
Average regional wage	1.492	x	
Population density	-0.561		
% metered properties	-0.776		x
Sources	-0.293	x	
Pumping Head	0.122		x
% water input from river abstractions	0.002		x
% water inputs from reservoirs	-0.015		
% new meters	0.028		x
% new mains	-0.031	x	
% mains restored / renewed	**0.290**	**x**	**x**
Properties below pressure level	0.003		
Leakage volume	-0.200		x
Properties affected by unplanned interruptions >3 hours	0.008		
Properties affected by planned interruptions >3 hours	0.027		

Variable	Coefficient	Statistically significant	Sign / magnitude matches a priori
% usage by metered HH	0.501		x
% usage by metered NHH	-0.171		

Refined totex Models B & D

The stated rationale by CEPA behind the refined models was to seek a better quality model with better explanatory power. On that basis they concentrated on the most significant variables from the full totex model. Comparing the following table with the previous table demonstrates that the outcome of the selection process was not very successful: some variables with statistically significant coefficients were excluded (e.g. sources, % new mains) while some variables with coefficients which are insignificant (e.g. length^2, % of water input from reservoirs) were included – and proved insignificant again. This casts further doubt on the reliance on the modelling to determine thresholds.

In the case of Model B, five variables plus the constant have statistically significant coefficients, of which three have signs and magnitudes which match *a priori* expectations.

Model B variables

Variable	Coefficient	Statistically significant	Sign / magnitude matches a priori
Constant	2.512	x	
Length of main	**1.078**	**x**	**x**
Density	0.281		x
Length^2	-0.019		
Density^2	0.942	x	
Length x density	0.557	x	
Time trend	-0.003		x
Average regional wage	**0.958**	**x**	**x**
Population density	0.495		x
% mains restored / renewed	**0.056**	**x**	**x**
% water inputs from reservoirs	-0.012		
% water input from river abstractions	0.012		x

Model D has the same 11 variables as Model B. Compared to Model B, the results are similar, except that for Model D, regional wages are not significant while % of water from river abstractions is significant (for Model B it is the other way around).

As is the case for Model B, Model D has five variables plus the constant with statistically significant coefficients, of which three have signs and magnitudes which match *a priori* expectations.

The difference between Models B and D focuses on the form of the models. Model B has time invariant efficiency whereas Model D has a time varying efficiency form which CEPA considers less robust.

Model D variables

Variable	Coefficient	Statistically significant	Sign / magnitude matches a priori
Constant	2.888	x	
Length of main	**1.072**	**x**	**x**
Density	0.210		x
Length^2	-0.022		
Density^2	1.067	x	
Length x density	0.512	x	
Time trend	-0.007		x
Average regional wage	0.720		x
Population density	0.989		x
% mains restored / renewed	**0.065**	**x**	**x**
% water inputs from reservoirs	-0.014		
% water input from river abstractions	**0.020**	**x**	**x**

Refined botex Models F & E

The two botex models, Models E and F, have the same 11 variables as do the two refined totex models, Models B and D.

For Model F, only four variables have statistically significant coefficients, of which only two have signs and magnitudes which match *a priori* expectations.

Model F variables

Variable	Coefficient	Statistically significant	Sign / magnitude matches a priori
Constant	2.917		
Length of main	**1.037**	**x**	**x**
Density	0.275		x
Length^2	0.014		
Density^2	0.240		
Length x density	0.359	x	
Time trend	-0.001		x
Average regional wage	0.280		x
Population density	2.032	x	
% mains restored / renewed	**0.060**	**x**	**x**
% water inputs from reservoirs	-0.007		
% water input from river abstractions	0.005		x

Model E appears to be the best specified of the water models. It has seven variables with statistically significant coefficients, six of which have signs and magnitudes which match *a priori* expectations. It is the only water model where the time trend is statistically significant, with a value of 0.9% p.a.

Model E variables

Variable	Coefficient	Statistically significant	Sign / magnitude matches a priori
Constant	1.713		
Length of main	**1.032**	**x**	**x**
Density	**0.405**	**x**	**x**
Length^2	0.019		
Density^2	0.354		

Variable	Coefficient	Statistically significant	Sign / magnitude matches a priori
Length x density	0.449	x	
Time trend	**0.009**	**x**	**x**
Average regional wage	**0.901**	**x**	**x**
Population density	**1.053**	**x**	**x**
% mains restored / renewed	**0.038**	**x**	**x**
% water inputs from reservoirs	0.002		x
% water input from river abstractions	0.004		x

Issues and remedies

Issue 1 - Weighting of models in the triangulation process

The totex all variables water model (Model C) is clearly rated less well than the refined models. However, as can be seen from Figure 1, it is given 33% weight in the overall water totex model. ***This lack of recognition of the model quality in the triangulation process appears to be a curious form of agnosticism which we consider to be a systematic error. We feel that a lower weight should be accorded to the poorer quality model. One might well feel that a lack of preference for the refined models over the all variables model calls into question Ofwat's confidence in any of the modelling outputs.***

Naturally, one can agree to the proposition that differing quality models should be accorded different weights without necessarily agreeing the magnitude of the changes to the weights. In this critique, we have proposed modest changes in weights for the triangulation of the econometric models. These changes acknowledge the differences and skew the triangulation towards the higher quality models. One can argue whether 60:40 is an adequate reflection of differential quality - should it be 67:33, for example? - but the fundamental point that quality differences should be recognised is, we believe, uncontentious.

As can be seen from Figure 1, Model C is given equal weight to Models B and D which are, on CEPA's evidence, of better quality. As mentioned above, we believe that this model quality agnosticism represents a systematic error. The option of ignoring the full totex model entirely would result in an increase of £9.8m to our threshold. To illustrate the range of possibilities, if the weights were shifted conservatively from 33%, 33%, 33% to 30%, 35%, 35%, then this would increase our threshold value by £1.0m. If the weights were shifted to an intermediate level of 20%, 40%, 40%, then this would only raise the threshold by £3.8m. ***In other words, our argument in logic to shift the weights, giving Model C a lower weight, would in practice make a marginal difference to the end result for Anglian, but would improve the logical coherence of the approach.***

The problem of quality agnosticism crops up again in the context of Models B and D. Once again, despite CEPA's view that Model D is less robust than Model B,[3] Figure 1 shows that both are accorded the same weight. ***As explained earlier, Anglian views a quality agnostic approach to weighting as being a systematic error. Were Model D given a 60% weight (and Model B 40%) instead of the 50:50 weights used, then this would add £1.7m to our threshold.***

Similarly, Model E, which is time invariant in terms of efficiency, is deemed more robust than Model F by CEPA although they are both assigned equal weights. As is the case for models B and D, ***once again, Ofwat has assigned the same weights to Models E and F, despite CEPA's view that Model F is less robust. As explained above, Anglian views this quality agnosticism as being a systematic error. If Model E were accorded a 60% weight and Model F 40%, instead of the 50:50 weights used, then this would add £2.6m to Anglian's threshold.***

Summary - impact on the cost threshold of Issue 1

Issue	Description	Evaluation (£m)
1	Quality agnostic triangulation	
1a	Reduce weight for full totex model	+3.8
1b	Increase weight on Model D to 60% & reduce Model B to 40%	+1.7
1c	Increase weight on Model E to 60% & reduce Model F to 40%	+2.6
	Total	**+8.1**

Issue 2 - Time trend

In our December business plan we made a detailed assessment of the value of Real Price Effects (RPE), taking particular note of future likely changes in the cost of power. There is no explicit allowance for RPEs in Ofwat's cost assessment but we have been told that they are provided for via the time trend component of the econometric modelling. Other commentators have claimed that the time trend provides an allowance for future changes in quality, revealing uncertainty about its function within the modelling.

In any event, we note that the coefficient for the time trend in both the full model (Model C) and the refined Model B is insignificant. In fact only one of the five chosen water models has a significant time trend coefficient. Furthermore, the sign for Model C's time trend coefficient is positive whereas those for Models B, D and F are negative.

Overall we have no confidence that the time trend provides an adequate estimate of future RPEs or that the contribution it makes to our threshold is in way comparable with the RPE included in our business plan. A remedy would be to explicitly allow for a quantified RPE in line with accepted regulatory practice.

3 Section 2.3.1 p 10 of CEPA's report Ofwat cost assessment - advanced econometric models dated 23 March 2014

Summary - impact on the cost threshold of Issue 2

Issue	Description	Evaluation (£m)
2	Uncertainty about allowance for RPEs	Not quantified

Issue 3 Use of Jacobs data (implicit assumption that AMP6 will be a continuation of AMP5)

We consider that there are real problems in applying CEPA's capex smoothing approach when it comes to enhancement capex, notwithstanding the benefits from capital smoothing to deal with the inherent lumpiness of spending. Insofar as there have been substantial changes in not just priorities for enhancement capex but also in the very process of determining those priorities, it would be surprising if the relative weights of (enhancement) capital programmes over AMP6 were to match those of AMP4 and AMP5. We believe that the priorities agreed between the companies and the CCGs should have been incorporated into the process of model development. In terms of new programmes, these could be handled via an increase in the unmodelled capex uplift.

We have reviewed the inputs used by Ofwat and have found several to be particularly problematic. Below we discuss the use of draft rather than final WRMP figures in dealing with future supply demand costs. For another example, we would highlight the effect of averaging recent years' population data which overlooks both the effect of significantly higher economic growth on household creation and the step change consequent on the release of 2011 census data which became available during 2013.

If one were to replace all of the Jacobs / Ofwat assumptions by Anglian's assumptions, then the effect on the threshold would be an increase of £20.6m. Within this, there are variables where the Anglian numbers lead to an overall reduction in the threshold and others where they lead to an increase. Some of these changes are substantial and many are contrary to engineering or economic logic - consistent with CEPA's own admission that the signs of many of the model coefficients are not consistent with *a priori* expectations.

We do not claim that the value produced by this exercise should be added to the cost threshold in full. However, we note it as a 'memo item', to reinforce our concerns about the quality of the models and illustrate the significant impact on the cost thresholds of chosen input values.

Impact of incrementally replacing Jacobs / Ofwat inputs with Anglian Business Plan figures

Variable	ANH input values(5 year avg)	Jacobs input values (5 year avg)	Impact of using ANH inputs £m
Total length of mains on 31 March of report year (km)	38,679	38,796	-3.2
Total connected properties at year end (x000)	2,173	2,183	-1.4

Variable	ANH input values(5 year avg)	Jacobs input values (5 year avg)	Impact of using ANH inputs £m
Water delivered (potable) (Ml/d)	910	980	+10.0
Population - Total (x000)	4,755	4,617	+22.3
Households connected for water only and water and sewerage - metered (x000)	1,668	1,635	-7.1
Non-households billed measured water (x000)	108	105	-0.6
Source types and pumping - total number of sources	229	226	-1.7
Distribution input (Ml/d)	1,074	1,149	-18.9
Source types and pumping - average pumping head - total	156	161	-1.6
Metering programme - household selective meters - water service	17,424	536	+5.2
Metering programme - household optional meters - water service	15,172	29,096	-8.4
New mains (km)	128	136	+1.3
DG2: Properties receiving pressure or flow below reference level at end of year	335	633	-0.9
Water delivered: total leakage (Ml/d)	182	200	+9.1
DG3 properties affected by planned and warned interruptions of more than 3 hours	16,727	21,900	-3.3
DG3 properties affected by unplanned interruptions of more than 3 hours	82,092	69,134	+0.6
Water delivered (billed measured households) (Ml/d)	470	455	+7.7
Water delivered (billed measured non-households) (Ml/d)	271	243	-8.6
Proportion of distribution input derived from river abstractions	6.8%	7.0%	-0.2
Proportion of distribution input derived from impounding reservoirs	40.2%	39.9%	-0.1
Total enhancements to the supply demand balance (Ml/d)	13.4	7.1	+37.3
Total number of new connections (x000)	19.3	18.0	+0.5

Variable	ANH input values(5 year avg)	Jacobs input values (5 year avg)	Impact of using ANH inputs £m
Number of lead communication pipes replaced for water quality	1,870	767	+1.9
Total length of mains relined (km)	80	110	-19.4
Total			**+20.6**

Unit cost models

Overview

For enhancement capex, Ofwat has developed a number of unit cost models based on companies' activities and expenditure in AMP5. Where Ofwat could not find a robust relationship between a particular driver and a category of enhancement capex, then Ofwat relied on the unmodelled approach explained below. Ofwat asked CEPA to give assurance that its approach to enhancement capex modelling, including the formulation of the unit cost models, was robust and satisfactory. [4]While Ofwat relates that CEPA gave advice on the advisability of using a log-linear form for the unit cost model, there is no mention about the results of CEPA's tests for robustness, nor any explicit statement that CEPA considered Ofwat's unit cost model formulations to be robust.

For each category of enhancement capex where it could find a robust relationship, Ofwat calculated four separate unit cost figures:

- Unweighted, where each company's cost is given an equal weight
- Weighted, where companies with a higher value for the driver are given a higher weight
- Linear regression, where all companies have constant marginal costs
- Log-linear regression where marginal costs can vary depending on input variable size.

To produce a single unit cost figure per company, Ofwat again used arithmetic averages of the four values, once again referring to this as triangulation.

In generating the unit costs models, Ofwat adjusted all figures to 2012-13 prices then made further adjustments for regional wages.

The table below sets out the unit cost models for water.

Water unit cost models

Reference	Cost	Volume driver
W1	Supply Demand Balance (SDB) enhancements	Total Ml/d enhancements to SDB (dry year peak, unless zero, then dry year average)

4 Para 2.17, PL14W/S003 Appendix C Enhancement modelling

Reference	Cost	Volume driver
W2	Lead reduction	No. lead communication pipes replaced for water quality
W3	New developments	No. new connections

Issue 4 - allowance for opex in capex unit cost models

This approach by Ofwat is designed to compute the totex (i.e. opex plus capex) allowances for different categories of enhancement capex. However, the driver used in developing the unit cost models was the AMP5 enhancement capex alone for these categories. In other words, ***no allowance for opex was made in the unit cost models which were developed by reference to the AMP5 enhancement capex. We consider that this represents a systematic error*** as it omits significant (operating) costs for all operators, thus understating the calculated totex cost threshold.

This problem is exacerbated by the move from UK GAAP to IFRS, where reactive capex is expensed rather than capitalised. For this reason, the supply demand balance model, with significant leakage expenditure, is very much a case in point. The table below highlights the impact of the shift to the leakage element of our proposed SDB expenditure.

Impact of IFRS on Leakage opex: capex split within totex

Component	UK GAAP			IFRS		
£000	Capex	Opex	Totex	Capex	Opex	Totex
Maintain @ 211Ml/d	61,969	0	61,969	5,099	56,870	61,969
Reduce to ELL	25,430	1,961	27,391	4,799	22,592	27,391
Total	**87,399**	**1,961**	**89,360**	**9,898**	**79,462**	**89,360**

The following table gives our AMP6 totex and capex amounts taken from the business cases covering each of the enhancement categories included in the water unit cost models. It can be seen that the totex is 14.7% higher than the capex. The absolute difference, £22.6m, is the opex which has been omitted from the modelling.

Unit cost totex vs capex

Model	Opex (£000)	Capex (£000)	Totex (£000)	Totex uplift
W1	21,248	51,876	73,124	41.0%
W2	0	89,420	89,420	0.0%
W3	1,370	12,606	13,976	10.9%
Total	**22,618**	**153,902**	**176,520**	**14.7%**

Our proposed remedy would be to recalculate all industry unit costs on a totex, rather than a capex basis, but we do not have the data available to us to perform this calculation. ***We have therefore corrected for this systematic error increasing the value of the unit cost outputs by the value of the omitted opex. This correction adds £22.6m to the Ofwat computed unit costs and £7.7m to the threshold.***

Summary - impact on the cost threshold of Issue 4

Modelling element	Ofwat £m	Modified £m	Delta £m
Model C	1,481.1	1,481.1	-
Model B & D	1,565.6	1,565.6	-
Model E & F	1,219.8	1,219.8	-
Unit costs	124.6	147.2	22.6
Unmodelled	112.9	114.8	1.9
Bottom up	1,457.3	1,481.8	24.5
Upper Quartile adjustment	-90.1	-90.6	-0.5
Policy Additions	251.6	251.6	-
Water threshold	**1,662.8**	**1,670.5**	**7.7**

Issue 5 - specification of the supply demand balance unit cost model

We are concerned about the specification of model W1, enhancements to the Supply / Demand balance, on two counts:

- Use of out-dated cost driver estimates
- No account taken of additional costs incurred by companies in water stressed areas.

Outdated cost drivers

For the purpose of evaluating the PR14 Business Plans submitted in December 2013, Ofwat commissioned Jacobs to provide it with estimates of the key drivers to its models during AMP6 for each company. These are all set out in PR14 Forecast of exogenous variables, published by Ofwat dated 24th March 2014. Generally speaking, for the purpose of the RBR and the computation of the cost threshold, Ofwat used the Jacobs forecasts. However, in the case of the supply demand enhancements for Anglian, Ofwat chose to over-write Jacobs' numbers because they were seen as being simplistic[5].

In their place, Ofwat chose to use the forecast figures from our Draft Water Resource Management Plan (WRMP) on the grounds that they had been subject to external review.

5 PR14 Forecast of exogenous variables Page xxi

Anglian agrees with Ofwat's approach. When we were preparing our Business Plan, we used Final WRMP figures for the enhancement to the supply demand balance. These reflect that the WRMP has been subject to further development since the Draft WRMP was published. The figures in our December Business Plan match those updated final figures, which were submitted to the Environment Agency on 27 November 2013.

To be consistent in the application of its methodology Ofwat should now use the inputs from the Final WRMP showing enhancement volumes for dry years in place of the Draft WRMP numbers.

Consequence of change

The figures used by Ofwat in its unit cost modelling for enhancements to the supply demand balance, taken from our Draft WRMP are set out below in the following table

Ofwat's figures for W4006 & W4007 across AMP6, based on our Draft WRMP

Driver in Ml/d	2016	2017	2018	2019	2020
Total enhancements to the supply demand balance (dry year critical / peak conditions)	7.36	7.36	7.36	7.36	7.36
Total enhancements to the supply demand balance (dry year annual average conditions)	6.93	6.93	6.93	6.93	6.93
Dry year critical unless is zero, when use dry year annual average	7.36	7.36	7.36	7.36	7.36

These figures were used in place of the forecasts supplied by Jacobs. In computing its estimates for AMP6, Jacobs took the arithmetic average of our forecasts across AMP5. These figures are shown in the next table.

Jacobs' figures for W4006 & W4007 across AMP6

Driver in Ml/d	2016	2017	2018	2019	2020
Total enhancements to the supply demand balance (dry year critical / peak conditions)	12.08	12.08	12.08	12.08	12.08
Total enhancements to the supply demand balance (dry year annual average conditions)	11.42	11.42	11.42	11.42	11.42
Dry year critical unless is zero, when use dry year annual average	12.08	12.08	12.08	12.08	12.08

The figures from the Final WRMP for enhancements to the supply demand balance which were used in our December Business Plan are shown below.

Our Business Plan figures for W4006 & W4007 across AMP6 (based on our Final WRMP)

Driver in Ml/d	2016	2017	2018	2019	2020
Total enhancements to the supply demand balance (dry year critical / peak conditions)	0.00	0.00	0.00	29.00	29.00
Total enhancements to the supply demand balance (dry year annual average conditions)	15.68	4.59	5.24	25.73	25.00
Dry year critical unless is zero, when use dry year annual average	15.68	4.59	5.24	29.00	29.00

The result of replacing the Draft WRMP figures by the Final WRMP figures is set out below

The next table shows the following parameters which Ofwat reported for the four sub-models of unit cost model W1, for the enhancement of the supply demand balance in PL14W/S003.

Ofwat reported parameters

Industry (regionally neutral) unit costs	Ofwat computed
Weighted industry average	2.6935
Unweighted industry average	3.7268
Linear regression model: fixed cost	24.2883
Linear regression model: variable cost	1.7358
Log regression model: fixed cost	1.9102
Log regression model: variable cost	0.6590

The following table shows the values of the four sub-models for the supply demand enhancement unit cost model using both the Draft WRMP figures (as used by Ofwat) and the subsequent Final WRMP figures, along with the overall triangulated value for both variants.

Unit cost values

£m	Draft WRMP AMP6	Final WRMP AMP6	Delta
Weighted unit cost model	96.7	219.5	122.8
Unweighted unit cost model	133.9	303.7	169.8
Linear regression model	86.1	165.2	79.1
Log regression model	94.8	162.6	67.8
Triangulated overall model (simple average)	102.9	212.8	109.7

Changing the value of the supply demand enhancement unit cost model has knock-on impacts on the unmodelled allowance and on the upper quartile efficiency adjustment. These are shown below.

Changes to water threshold model as a result of using the Final WRMP inputs

Threshold model element	Using original W1	Using modified W1	Delta
Model C	1,481.1	1,481.1	-
Models B & D	1,565.6	1,565.6	-
Models E&F	1,219.8	1,219.8	-
Unit costs	124.6	234.5	109.9
Unmodelled costs	112.9	122.2	9.2
Bottom up model	1,457.3	1,576.4	119.1
Upper Quartile adjustment	-90.1	-92.5	-2.4
Policy adjustments	251.6	251.6	-
Threshold	**1,662.9**	**1,700.2**	**37.3**

Incorporating water stress into unit cost model W1

Overview

Anglian considers that the Supply Demand Balance unit cost model (W1) understates the costs for companies in water stressed areas and overstates the costs for companies in non-water stressed areas. We consider that conflating water stressed and non stressed companies together as Ofwat has done in W1 constitutes a systematic error.

We have recreated Ofwat's four unit cost models which created the drivers for W1 using the August Submission data. The recreation mirrors Ofwat's published drivers closely.

We then split the 18 WASCs and WOCs into water stressed and non water stressed companies and computed the drivers for these two sub-groups.

Using the water stressed drivers, we then recalculated the value of W1 for Anglian.

The next table shows the result of using the combined peak and average enhancement figure used by Ofwat shown in the table above in the water stressed disaggregated model. As can be seen, the result of the disaggregation is to increase the value of unit cost model W1 by £25.7m. This adds £8.7m to the threshold of the water model.

Changes to water threshold model as a result of using the water stressed model with the Draft WRMP inputs

Threshold model element	Using original W1	Using disaggregated W1 & Draft WRMP inputs	Delta
Model C	1,481.1	1,481.1	-
Models B & D	1,565.6	1,565.6	-
Models E&F	1,219.8	1,219.8	-
Unit costs	124.6	150.3	25.7
Unmodelled costs	112.9	115.1	2.2
Bottom up model	1,457.3	1,485.2	27.9
Upper Quartile adjustment	-90.1	-90.6	-0.6
Policy adjustments	251.6	251.6	-
Threshold	**1,662.9**	**1,671.6**	**8.7**

To continue the logic set out above, whereby we consider that the proper driver for W1 should be the Final WRMP inputs, we have computed the result of using the updated inputs within the water stressed disaggregated model. The results are shown below.

Changes to water threshold model as a result of using the water stressed model with the Final WRMP inputs

Threshold model element	Using original W1	Using disaggregated W1 & Final WRMP inputs	Delta
Model C	1,481.1	1,481.1	-
Models B & D	1,565.6	1,565.6	-
Models E&F	1,219.8	1,219.8	-
Unit costs	124.6	293.9	169.3
Unmodelled costs	112.9	127.1	14.2
Bottom up model	1,457.3	1,640.8	183.5

Threshold model element	Using original W1	Using disaggregated W1 & Final WRMP inputs	Delta
Upper Quartile adjustment	-90.1	-93.7	-3.7
Policy adjustments	251.6	251.6	-
Threshold	**1,662.9**	**1,720.3**	**57.5**

Rationale

We have been very successful in making the most of the resources available to us. The volume of water abstracted and put into our network is the same now as it was at the time of privatisation 25 years ago, despite an increase in population of 20% over the same period. This has occurred in the context of Anglian's region being the most water stressed part of the country.

There are additional costs faced by water stressed companies in terms of Supply Demand Balance. These include:

- Higher demand side costs such as:
  - Higher demand reduction costs relating to campaigns such as Love Every Drop, Drop 20 and The Potting Shed
  - Higher costs associated with metering, given we now have over 75% of domestic customers using meters
  - Additional leakage reduction costs as a robust response to uncertainty and in response to CCG challenge
- Higher supply side costs; for example the cost of
  - Moving water around the area in times of extreme shortage
  - Developing new sources of water

Approach taken

In PL14W/S003 Appendix C Enhancement cost modelling dated 24th March 2014, Ofwat set out both its unit cost approach for calculating enhancement capex and the parameters it computed.

Ofwat puts forward four individual sub-models for each of its enhancement capex unit cost models. These are:

1. A weighted unit cost model. The total costs incurred by all companies is divided by the total volume of enhancement across the AMP.
2. An unweighted unit cost model. The average unit cost for each company over the AMP is computed. The average of all those AMP averages is then taken.

3. Linear regression model. The OLS regression of the volume across the AMP for each company is regressed onto the cost across the AMP for each company
4. Log regression model. A log version of the linear regression.

For the enhancement to the supply demand balance model, W1, Ofwat explained that the volume driver for the model was the total enhancements to the supply demand balance in dry year, critical/ peak conditions, unless the figure in any one year should be zero, in which case the figure for that year should be taken from the total enhancements to the supply demand balance in dry year, annual average conditions. The relevant figures are set out above.

To begin with, we have used the Draft WRMP figures so as to allow direct comparison with the figures in the baseline model v3.2.

We have split the total market into water stressed and non water stressed companies using the Environment Agency's document from July 2013: Water stressed classification. (LIT 8538).

This document shows water stressed companies are shown as being:

- Affinity Water
- Anglian Water
- South East Water
- Southern Water
- Sutton & East Surrey Water
- Thames Water

All other companies were non water stressed.

The following table shows the result of our recreation of the four W1 sub-models, along with a comparison to Ofwat's computed parameters.

Anglian's computed total market parameters

Industry (regionally neutral) unit costs	Anglian computed	Difference to Ofwat parameters
Weighted industry average	2.6942	+0.03%
Unweighted industry average	3.7628	0.00%
Linear regression model: fixed cost	24.322	+0.14%
Linear regression model: variable cost	1.1753	-0.03%
Log regression model: fixed cost	1.9102	0.00%
Log regression model: variable cost	0.6590	0.00%

It can be seen that our recreation of the Ofwat results matches almost exactly.

In doing so, we see that Ofwat used the summed values across the AMP for each company. Consequently, there are only 18 data points for the calculation of the models. When it comes to the log regression model, because four companies reported zero volume (Wessex, Yorkshire, Dee Valley and Portsmouth), the number of data points fell to 14. This is at the lower limit in terms of numbers of data points for useful inferences to be drawn. At this point it is worth noting that this problem is exacerbated in the sewerage models given that there are only 10 WASCs.

We note that the R^2 for the linear model is 0.605. For the log model, the R^2 is 0.419.

Taking this recreation as the starting point, we then recomputed the parameters for the water stressed and non water stressed groups. In the tables below, we show the parameters computed for water stressed and non water stressed companies.

Water stressed parameters

Industry (regionally neutral) unit costs	Ofwat computed
Weighted industry average	2.8682
Unweighted industry average	4.7238
Linear regression model: fixed cost	44.6330
Linear regression model: variable cost	1.7870
Log regression model: fixed cost	1.3773
Log regression model: variable cost	0.9027

We note that the R^2 for the linear model is 0.532, a 12% lower figure compared to the full market version. For the log model, the R^2 is 0.620, 48% higher than for the full market version.

Non water stressed parameters

Industry (regionally neutral) unit costs	Ofwat computed
Weighted industry average	2.4879
Unweighted industry average	3.2360
Linear regression model: fixed cost	20.305
Linear regression model: variable cost	1.3213
Log regression model: fixed cost	1.6895
Log regression model: variable cost	0.6194

Next, we re-ran the four models with the water stressed parameters and the volume driver used by Ofwat. The results are shown below.

Uplift to W1 from using water stressed parameters

Model	Water stressed AMP6 £m	Original W1 AMP6 £m	Difference £m	Difference %
Forecast of cost from weighted unit cost model	103.01	96.74	6.28	6.5%
Forecast of cost from unweighted unit cost model	169.66	133.85	35.81	26.8%
Forecast of cost from linear regression model	107.74	86.05	21.69	25.2%
Forecast of cost from logged regression model	133.89	94.75	39.13	41.3%
Weighted average of the four sub-models	128.58	102.85	25.73	25.0%

So, if the systematic error of conflating water stressed and non water stressed companies were corrected, then for Anglian this would result in the SDB model increasing in value by £25.73m. This in turn would result in an increase in the threshold of £8.7m. The detail of this calculation is shown in the table above.

If we were to use the Final WRMP figures as drivers instead of the Ofwat figures taken from the Draft WRMP, then the value of the model rises to £272.13m. This would lead to an increase in the threshold of £57.5m. The detail of this calculation is shown above.

Triangulation

We have now computed three alternative values for the threshold uplift as a result of adjusting the supply demand balance unit cost model W1.

The result of equal weighting triangulation of these three alternatives are shown in the table below.

Summary - impact on the cost threshold of Issue 5

Issue	Adjustment	Input on Threshold £m
	Replacing Draft WRMP inputs in existing W1 with Final WRMP inputs	+37.3
	Replacing W1 with disaggregated water stressed model, Draft WRMP inputs	+8.7
	Replacing W1 with disaggregated water stressed model, Final WRMP inputs	+57.5
5	**Triangulated value**	**+34.5**

Unmodelled costs

To deal with the enhancement capex items where Ofwat could not come up with robust drivers, Ofwat took another backward looking approach.

The value of the unmodelled lines during AMP5 for the industry as a whole was computed separately for water and for wastewater and that was divided by the relevant AMP5 totex less the unmodelled amount. For water, this amount was 8.4% of the remaining totex.

The list of the unmodelled items for water is shown below in the following table.

Water unmodelled items

Enhancement capex category
Making ecological improvements at abstractions
Addressing low pressure
Improving taste/odour/colour
Investment to address raw water deterioration
Resilience
SEMD
NEP- Flow monitoring at WTW
NEP – Drinking water protected areas
Additional lines defined by ourselves

Issue 6 - allowance for opex in the unmodelled uplift

There is a non-trivial problem embedded in Ofwat's approach. Ofwat has used the enhancement capex figures in the August Submission (relating to AMP5) and companies' business plans (for AMP6). This is added to the triangulated botex model and the unit cost models to create the bottom up totex model. But capex is not totex. The opex involved in these unmodelled items is ignored. The table below shows the value of opex associated with each of the unmodelled capex lines as taken from our associated business cases.

Unmodelled opex vs capex

Enhancement capex category	Capex (£000)	Opex (£000)
Making ecological improvements at abstractions	40,958	709
Addressing low pressure	5,724	1,063
Improving taste/odour/colour	0	0

Enhancement capex category	Capex (£000)	Opex (£000)
Investment to address raw water deterioration	32,070	11,111
Resilience	88,180	1,934
SEMD	20,246	923
NEP- Flow monitoring at WTW	3,155	18
NEP – Drinking water protected areas	0	1,196
Additional lines defined by ourselves	8,718	2,618
Total	**199,050**	**19,571**

Ignoring the £19.6m opex represents a systematic error . We suggest that this can be dealt with by using totex instead of capex and by increasing the unmodelled uplift by the ratio of totex to capex for the unmodelled lines. For us, this figure is 9.8%, which would result in a modified uplift of 9.23% instead of the 8.40% used. This would translate into an increased uplift allowance of £11.1m and an increase in the threshold of £3.5m.

Summary - impact on the cost threshold of Issue 6

Issue	Adjustment	Input on Threshold £m
6	Unmodelled cost uplift to take account of totex instead of just capex	+3.5

Revised submission

Wastewater wholesale

Summary

- The cost assessment models result in radically different assessment of costs compared with previous approaches.
- We have a number of reservations with the cost assessment modelling approach taken by Ofwat:

1. Different quality models should be accorded different weights. Finding a quantitative basis for setting differential weights is hard but we have considered the impact of making what to us appears a conservative adjustment.
2. Ofwat claims that real price effects (RPE) are taken into account through the time trend in the totex models. We have no confidence that this is the case.
3. We are concerned that Ofwat's use of Jacobs' forecasts, based as they are on historical performance, ingrains into the modelling process the assumption that the future is a continuation of the past. In several important ways, this is not the case. The impact of swapping Jacobs' numbers for our own reinforces our concerns about model quality.
4. We are unconvinced that operational expenditure relating to enhancement capital expenditure being modelled in unit cost models and in the unmodelled category is recognised in the modelling. As we demonstrate, this has the effect of overlooking a significant amount of expenditure. The value of this omitted operational expenditure has been evaluated, as has the impact of its recognition on the calculated threshold.

- We feel that these issues all comprise systematic errors. We set out why we consider this to be the case for each of the issues.
- The impact of making the proposed remedies to all issues is to add at least £79.7m to the wastewater threshold. This would be increased by reviewing the use of Jacobs' data to over-write Anglian's actual variables. The impact of each remedy is set out in the table below.

Summary impact of all remedies

Issue	Description		Evaluation (£m)
1	Quality agnostic triangulation		+5.3
1a	Increase weight on Model SW9 to 60% & reduce Model SW10 to 40%	+0.9	
1b	Increase weight on wholesale base: bottom up to 60% & reduce wholesale base: top down to 40%	4.4	
2	RPE overstatement		Not quantified
3	Jacobs data used (memo item not added to total)		[259.2]
4	Unit cost model uplift to take account of totex instead of just capex		+74.4

Issue	Description		Evaluation (£m)
5	Unmodelled cost uplift to take account of totex instead of just capex		0
	Total		**+79.7**

Purpose

In this section we:

- Consider the results of the cost assessment modelling in the context of historical experience in the sector
- Review the modelling approach followed by Ofwat
- Consider shortcomings with that approach (identified as Issues 1-5)
- Make suggestions as to how these issues could be addressed, and
- Quantify the impact of those changes on the water cost threshold.

Ofwat has made it clear[1] that any criticisms of its modelling approach will only be entertained if the company can provide:

1. "Compelling evidence that any new proposals would be superior to the existing approach ... [and]

2. Evidence that the existing approach creates systematic bias ..."

We take systematic bias in this context to mean approaches which lead to errors which affect the generality of companies as opposed to impacting only a single organisation.

The calculations produced by this analysis form part of our gap analysis. We have satisfied ourselves that there are no material overlaps between the adjustments made in this section and those we will be submitting as part of the gap analysis.

Context to the cost assessment modelling

As a starting point, we have sought to understand at a **high level** how the results of Ofwat's threshold assessment compares with Ofwat's PR09 assessment of efficiency and CIS ratios; performance in AMP5; companies' AMP6 plans compared with AMP5; Ofwat's thresholds compared with AMP5; and the resulting Ofwat thresholds compared with companies' plans. The analysis is illustrated in the chart below, but in summary:

- PR09: the most efficient companies included Anglian, Wessex and Yorkshire. The less efficient included South West and Dwr Cymru.
- AMP5 capex compared with PR09 allowed expenditure: the companies that spent less were Anglian, Wessex and Yorkshire. The companies that spent significantly more include South West and Dwr Cymru.

1 *Source: Ofwat Wholesale cost assessment workshop 08/04/2014 slide 57*

- AMP6 plans compared with AMP5: for the sewerage service, Anglian proposed a similar uplift in AMP6 (18%) compared with South West Water (13%)
- Ofwat threshold compared with AMP5: for the sewerage service, the uplift in the threshold for Anglian (15%) is similar to that for South West Water (11%).

An historical perspective on sewerage cost assessment

	Anglian	Welsh	N'mbrian	Severn Trent	South West	Southern	Thames	United Utilities	Wessex	Yorkshire
PR09 Opex efficiency	B+	C+	C+	A-	B-	B+	A+	C+	A+	A-
PR09 Capex infra efficiency	15.8	0	-3.5	1.1	-3.3	-10.2	-5.0	-8.0	7.3	12.2
PR09 Capex non-infra efficiency	9.5	-5.6	4.3	-6.2	-6.6	-11.1	-2.5	-7.9	8.4	13.2
PR09 CIS ratio	99	106	101	102	110	112	108	108	97	93
AMP5 capex vs PR09 allowed	-12%	28%	7%	0%	14%	6%	17%	18%	-6%	-34%
PR14 company proposed totex vs AMP5 actual	18%	9%	2%	7%	13%	5%	-20%	-1%	30%	12%
PR14 Ofwat threshold vs AMP5 actual	15%	9%	3%	10%	11%	-14%	-33%	-32%	19%	-4%
PR14 company proposed totex vs Ofwat threshold	2%	0%	-1%	-3%	1%	23%	20%	47%	10%	16%

This analysis would indicate that the models result in radically different assessment of costs compared with previous approaches. It would also suggest that the differences are due to factors other than efficiency. If past efficiency assessments are given some credence in evaluating companies' general efficiency now (history in the water industry does not suggest that radical movement up or down efficiency rankings is achieved over the course of a single

AMP period), for some companies it suggests that the threshold assessments at PR14 also encompass factors other than efficiency. This can be seen by comparing the assessments in the last three rows of the table with the assessments in the first three rows, in particular for Yorkshire and Wessex.

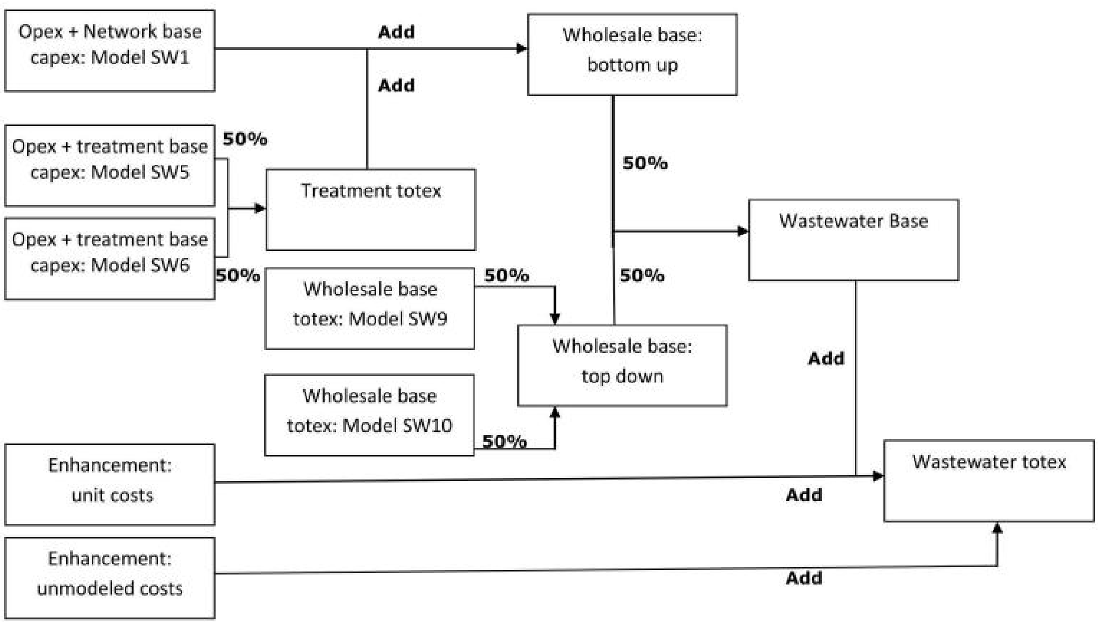
Overview of Ofwat's approach

Ofwat used CEPA to prepare econometric models for totex. CEPA was unable to create models which it felt adequately described wastewater in its entirety. However, CEPA felt comfortable with the quality of models developed to take account of opex and maintenance capex. These models were described as base totex - botex - models. As explained below, these were augmented by Ofwat with unit cost models and unmodelled allowances to take account of enhancement capex.

Ofwat's approach to modelling was to combine the results from multiple models through an approach referred to as "triangulation". In terms of the approach followed by Ofwat, triangulation can be described as a process of taking arithmetic averages of the outputs of the separate models. As all of the wastewater econometric models focused on botex, enhancement capex was dealt with through unit cost models where robust relationships between volume drivers and costs could be found. Where robust relationships could not be found, an uplift to deal with this remaining enhancement capex was added in, where the uplift percentage was based on experience in AMP5.

The modelling approaches for wastewater is shown in Figure 1 below.

Figure 1: Ofwat wastewater modelling approach



The use of arithmetic averages (i.e. equal weights for each of the econometric models used) would appear to suggest that CEPA/Ofwat have equal confidence in each of the models. As can be seen from what is set out below, this is not the case. ***Ofwat explained that they***

could not see an objective reason for not having equal weights. In the light of the facts, this appears curious. We believe that different weights should be applied to models of differing quality.

Ofwat commissioned Jacobs to produce a set of forecast figures for the variables used in the econometric and unit cost models across AMP6. These numbers, rather than the numbers used in companies' Business Plans, were used. These forecasts were based on the AMP5 figures for these variables. Where the figures across AMP5 were monotonic (i.e. all increasing or decreasing year on year), then Jacobs used Excel's trend function to generate the forecasts. If the AMP5 numbers were not monotonic, then Jacobs used the arithmetic average of the AMP5 figures, as reported in the August Submission, as the forecast for the annual change across AMP6. The implicit assumption in taking this approach is that AMP6 will be a continuation of AMP5. ***Discrepancies between Ofwat's model and our Business Plan are a result of the fact that, in some respects, AMP5 and AMP6 are not the same.*** The reasons for this vary but include, for example:

- Economic growth in AMP6 vs austerity and lack of growth in AMP5 means a very different pattern of household creation
- The impact of the 2011 census and the much faster population growth has now been recognised in our region
- Growing focus on resilience - heightened concern about the effects of climate change, with an increased frequency of both drought and flood conditions, and security of energy supply.

The rest of this report looks at the outputs of the econometric models, the unit cost models and the unmodelled approach in more detail, highlighting issues with the approach which make the outputs an unreliable basis for assessing our expected requirements for AMP6. Suggestions are made as to how the approach could be improved.

Econometric models

Overview and evaluation

CEPA started off by developing 10 wastewater models. These were all evaluated on three bases:

- Theoretical correctness
- Statistical performance
- Robustness.

In each case, the criteria were rated as Good, Acceptable or Rejected.

The table below summarises the results of CEPA's own evaluation of these wastewater models. The emboldened lines are the models taken forward for use by Ofwat. These are then reviewed below.

Wastewater models

Model	Theoretical correctness	Statistical performance	Robustness
SW1: Network opex, base capex	**Good**	**Good**	**Good**
SW2: Network opex, base capex	Good	Rejected	Rejected
SW3: Treatment & sludge opex, base capex	Acceptable	Rejected	Rejected
SW4: Treatment & sludge opex, base capex	Acceptable	Good	Rejected
SW5: Treatment & sludge opex, base capex	**Good**	**Good**	**Good**
SW6: Treatment & sludge opex, base capex	**Good**	**Good**	**Good**
SW7: Wholesale opex, base capex	Good	Acceptable	Acceptable
SW8: Wholesale opex, base capex	Good	Acceptable	Acceptable
SW9: Wholesale opex, base capex	**Good**	**Good**	**Acceptable**
SW10: Wholesale opex, base capex	**Good**	**Good**	**Acceptable**

Source: Ofwat cost assessment - advanced econometric models. CEPA 20/03/2014

Network opex & Base Capex: Model SW1

Like all of the wastewater models, SW1 is a refined model. As can be seen from comparing the following tables, all the wastewater models have similar variables. Models SW9 and SW10 have one additional variable over and above the seven used by the first three models.

Several of the variables are closely linked: length, length^2, density, density^2 and length x density. The use of non-independent variables introduces multicollinearity to the models, artificially inflating the apparent quality of the relationship between dependent and independent variables.

SW1 has only three variables with statistically significant coefficients. These are shown with a cross in the statistically significant column of the following table.

CEPA also set out its *a priori* expectation for the sign and the magnitude of the coefficients. These are shown with a cross in the right hand column of the table below.

In the next table, and in the subsequent four tables, the parameters where the coefficient is significant and matches the *a priori* expectations are shown emboldened. For SW1, of the three variables with significant coefficients, only two have signs and magnitudes which match *a priori* expectations.

SW1 variables

Variable	Coefficient	Statistically significant	Sign / magnitude matches a priori
Constant	2.386		
Length of sewers	**0.815**	**x**	**x**
Density	0.578		x
$Length^2$	0.058		
$Density^2$	-2.417		
Length x density	-2.802	x	
Time trend	**0.019**	**x**	**x**
Average regional wage	0.652		x

Treatment & sludge opex & base capex: Models SW5 & SW6

SW5 has five variables with statistically significant coefficients. Of these, four have signs and magnitudes which match *a priori* expectations.

SW5 variables

Variable	Coefficient	Statistically significant	Sign / magnitude matches a priori
Constant	1.271		
Load	**0.828**	**x**	**x**
Density	**-0.589**	**x**	**x**
$Load^2$	0.085		
$Density^2$	-2.879		
Load x density	-3.594	x	
Time trend	**0.023**	**x**	**x**
Average regional wage	**1.280**	**x**	**x**

SW6 has six variables with statistically significant coefficients. As can be seen in the next table, of these, four have signs and magnitudes which match *a priori* expectations.

SW6 variables

Variable	Coefficient	Statistically significant	Sign / magnitude matches a priori
Constant	1.709		
Load	**0.881**	**x**	**x**
Density	**-0.609**	**x**	**x**
Load^2	0.127	x	
Density^2	-2.472		
Load x density	-4.513	x	
Time trend	**0.021**	**x**	**x**
Average regional wage	**1.127**	**x**	**x**

Wholesale opex & base capex: Models SW9 & SW10

SW9 also has six variables with statistically significant coefficients. Of these, three have signs and magnitudes which match *a priori* expectations.

SW9 variables

Variable	Coefficient	Statistically significant	Sign / magnitude matches a priori
Constant	2.489	x	
Load	0.043		x
Density	0.883	x	
Load^2	-2.647		
Density^2	-0.008		
Load x density	-2.068	x	
Time trend	**0.024**	**x**	**x**
Average regional wage	**1.199**	**x**	**x**
Proportions treated in Bands 1 - 3	**0.156**	**x**	**x**

SW10 has six variables with statistically significant coefficients. Of these, four have signs and magnitudes which match *a priori* expectations.

SW10 variables

Variable	Coefficient	Statistically significant	Sign / magnitude matches a priori
Constant	3.392	x	
Load	0.050		
Density	**0.977**	**x**	**x**
Load^2	-1.211		
Density^2	-0.102		
Load x density	-3.790	x	
Time trend	**0.020**	**x**	**x**
Average regional wage	**0.847**	**x**	**x**
Proportions treated in Bands 1 - 3	**0.127**	**x**	**x**

Issues and remedies

Issue 1 - Weighting of models in the triangulation process

Despite CEPA's view that SW5 is less robust than SW6 [(2)], Figure 1 shows that both are accorded the same weight. ***This lack of recognition of the model quality in the triangulation process appears to be a curious form of agnosticism which we consider to be a systematic error.*** We feel that a lower weight should be accorded to the poorer quality model. ***Were SW6 given a 60% weight (and SW5 40%) instead of the 50:50 weights used, then this would add £4.4m to our threshold.***

From the triangulation process set out in Figure 1 and the quality of the models set out above, it can be seen that SW9 and SW10, both of which are rated Good / Good / Acceptable, are given the same weight as SW1, SW5 and SW6 combined (each of which was rated Good / Good / Good). ***If the triangulation were changed from the quality agnostic 50:50 between the two sets of models to 60:40 (in favour of the better quality top down models) then the threshold value would rise by £0.9m***.If the ratio shifted to 67:33, then the uplift would be £1.5m.

2 Section 2.3.1 p 10 of CEPA's report Ofwat cost assessment - advanced econometric models dated 23 March 2014

Summary - impact on the cost threshold of Issue 1

Issue	Description	Evaluation (£m)
1	Quality agnostic triangulation	
1a	Increase weight on wholesale base: bottom up to 60% & reduce wholesale base: top down to 40%	+4.4
1b	Increase weight on Model SW9 to 60% & reduce Model SW10 to 40%	+0.9
	Total	**+5.3**

Issue 2 - Allowance for Real Price Effects

In our December business plan we made a detailed assessment of the value of Real Price Effects (RPE), taking particular note of future likely changes in the cost of power. There is no explicit allowance for RPEs in Ofwat's cost assessment but we have been told that they are provided for via the time trend component of the econometric modelling. Other commentators have claimed that the time trend provides an allowance for future changes in quality, revealing uncertainty about its function within the modelling.

Overall we have no confidence that the time trend provides an adequate estimate of future RPEs or that the contribution it makes to our threshold is in way comparable with the RPE included in our business plan. A remedy would be to explicitly allow for a quantified RPE in line with accepted regulatory practice.

Summary - impact on the cost threshold of Issue 2

Issue	Description	Evaluation (£m)
2	Uncertainty about allowance for RPEs	Not quantified

Issue 3 - Use of Jacobs' data (implicit assumption that AMP6 will be a continuation of AMP5)

We consider that there are real problems in applying CEPA's capex smoothing approach when it comes to enhancement capex, notwithstanding the benefits from capital smoothing to deal with the inherent lumpiness of spending. Insofar as there have been substantial changes in not just priorities for enhancement capex but also in the very process of determining those priorities, it would be surprising if the relative weights of (enhancement) capital programmes over AMP6 were to match those of AMP4 and AMP5. We believe that the priorities agreed between the companies and the CCGs should have been incorporated into the process of model development. In terms of new programmes, these could be handled via an increase in the unmodelled capex uplift.

We have reviewed the inputs used by Ofwat and have found several to be particularly problematic. For example, we would highlight the effect of averaging recent years' population data which overlooks both the effect of significantly higher economic growth on household creation and the step change consequent on the release of 2011 census data which became available during 2013.

If one were to replace all of the Jacobs / Ofwat assumptions by Anglian's assumptions, then the effect on the threshold would be an increase of £259.2m. Within this, there are variables where the Anglian numbers lead to an overall reduction in the threshold and others where they lead to an increase. Some of these changes are substantial and many are contrary to engineering or economic logic - consistent with CEPA's own admission that the signs of many of the model coefficients are not consistent with *a priori* expectations.

We do not claim that the value produced by this exercise should be added to the cost threshold in full. However, we note it as a 'memo item', to reinforce our concerns about the quality of the models and illustrate the significant impact on the cost thresholds of chosen input values.

Impact of incrementally replacing Jacobs / Ofwat inputs with Anglian Business Plan figures

Variable	ANH driver (5 year average)	Jacobs driver (5 year average)	Impact of using Anglian inputs £m
Total length of sewers on 31 March of Report Year (km)	45,919	45,878	-0.3
Number of properties (household and non-household) connected for water and sewerage services.	1,896,263	1,872,066	+6.7
Number of properties (household and non-household) connected for sewerage services only.	892,842	898,356	-1.6
Load received by STWs in size band 1 (kg BOD5/day)	2,241	2,127	+1.1
Load received by STWs in size band 2 (kg BOD5/day)	3,022	3,059	-0.4
Load received by STWs in size band 3 (kg BOD5/day)	16,258	17,202	-9.5
Load received by STWs in size band 4 (kg BOD5/day)	59,138	57,353	+8.9
Load received by STWs in size band 5 (kg BOD5/day)	65,709	62,503	+15.9

Revised submission
Wastewater wholesale

Variable	ANH driver (5 year average)	Jacobs driver (5 year average)	Impact of using Anglian inputs £m
Load received by STWs in size band 6 (kg BOD5/day)	279,411	261,224	+91.7
Connectable properties potentially served by s101A schemes (allowance for arisals)	102	0	+11.1
Connectable properties potentially served by s101A schemes (known)	206	988	-85.6
Number of intermittent discharge sites with event duration monitoring	183	93	+3.1
Current population equivalent served by groundwater protection schemes	55%	47%	+0.6
Current population equivalent served by filter bed STWs with tightened/new P consents (p.e eqvt x000)	50.5	3.4	+19.0
Current population equivalent served by STWs with tightened/new sanitary parameter consents (p.e eqvt x000)	166.7	124.8	+57.0
Current population equivalent served by STWs with tightened/new UV consents	0	12	-3.4
Number of odour related complaints	880	970	-0.3
Volume of storage provided at CSOs, storm tanks, etc to meet spill frequency requirements	1,049	78	+7.5
Number of blockages cleared	21,605	13,622	+8.7
Number of collapses fixed	522	144	+52.3
Total number of non-households billed for sewage. (x000)	110	104	+0.2
Calculated additional sludge volumes (ttds)	208	194	+0.8
Total population connected to the sewerage system (x000)	6,442	6,145	+23.8
Total			**+259.2**

Summary - impact on the cost threshold of Issue 3

Issue	Description	Evaluation (£m)
5	Replacing Jacobs' inputs for Anglian's	[+259.2]

Unit cost models

Overview

For enhancement capex (and, for private sewerage totex, where there is no historical data available), Ofwat has developed a number of unit cost models based on companies' activities and expenditure in AMP5. Where Ofwat could not find a robust relationship between a particular driver and a category of enhancement capex, then Ofwat relied on the unmodelled approach explained below. Ofwat asked CEPA to give assurance that its approach to enhancement capex modelling, including the formulation of the unit cost models, was robust and satisfactory. (3)While Ofwat relates that CEPA gave advice on the advisability of using a log-linear form for the unit cost model, there is no mention about the results of CEPA's tests for robustness, nor any explicit statement that CEPA considered Ofwat's unit cost model formulations to be robust.

For each category of enhancement capex where it could find a robust relationship, Ofwat calculated four separate unit cost figures:

- Unweighted, where each company’s cost is given an equal weight
- Weighted, where companies with a higher value for the driver are given a higher weight
- Linear regression, where all companies have constant marginal costs
- Log-linear regression where marginal costs can vary depending on input variable size.

To produce a single unit cost figure per company, Ofwat again used arithmetic averages of the four values, once again referring to this as triangulation.

In generating the unit costs models, Ofwat adjusted all figures to 2012-13 prices then made further adjustments for regional wages.

The table below sets out the unit cost models for wastewater.

Wastewater unit cost models

Reference	Cost	Volume driver
S1	First time sewerage	Connectable properties potentially served by s101A schemes (allowance for arisals) + Connectable properties potentially served by s101A schemes (known)
S2	Sludge enhancements	Calculated additional sludge (ttds)
S3	Event duration monitoring	Number of intermittent discharge schemes with event duration monitoring

3 Para 2.17, PL14W/S003 Appendix C Enhancement modelling

Reference	Cost	Volume driver
S4	Storage at intermittent discharge sites	Volume of storage provided at CSOs, storm tanks etc. to meet spill frequency requirements (m^3)
S5	Groundwater schemes	Current p.e. served by groundwater schemes
S6	P removal at filter works	Current p.e. served by filter works with tightened / new P consents
S7	Reduction in sanitary determinands	Current p.e. served by STWs with tightened/new sanitary parameter consents (BOD & ammonia)
S8	UV disinfection	Current p.e. served by STWs with tightened/new UV consents
S9	Odour	Number of odour related complaints
S10	Sewage treatment growth	Change in population
S11	Sewer flooding	Number of connected properties
S12	Private sewers - pipes	CSV of blockages & collapses

Issue 4 - Allowance for opex in capex unit cost models

This approach by Ofwat is designed to compute the totex allowances for different categories of enhancement capex. However, the driver used in developing the unit cost models was the AMP5 enhancement capex for these categories. In other words, ***no allowance for opex was made in the unit cost models which were developed by reference to the AMP5 enhancement capex. Given that the opex used in the econometric model appear to exclude the enhancement opex, Anglian considers that this represents a systematic error.***

The following table gives the AMP6 totex and capex amounts forecast by Anglian for each of the water unit cost models. The absolute difference, £81.36m, is the opex which has been omitted from the modelling.

Unit cost totex vs capex

Model	Capex (£000)	Opex (£000)	Totex (£000)
S1	69,730	946	70,676
S2	13,748	4,458	18,206
S3	7,084	987	8,071
S4	0	0	0

Model	Capex (£000)	Opex (£000)	Totex (£000)
S5	2,515	32	2,547
S6	31,590	1,405	32,994
S7	33,917	1,311	35,228
S8	0	0	0
S9	11,414	574	11,988
S10	106,242	5,181	111,423
S11	44,409	90	44,499
S12	14,310	66,375	80,685
Total	**334,959**	**81,359**	**416,318**

Our proposed remedy would be to recalculate all industry unit costs on a totex, rather than a capex basis, but we do not have the data available to us to perform this calculation. ***We have therefore corrected for this systematic error increasing the value of the unit cost outputs by the value of the omitted opex. This correction adds £81.4m to the Ofwat computed unit costs and £74.4m to the threshold.***

Summary - impact on the cost threshold of Issue 4

Issue	Description	Evaluation (£m)
2	Unit cost model uplift to take account of totex instead of just capex	+74.4

Unmodelled costs

To deal with the enhancement capex items where Ofwat could not come up with robust drivers, Ofwat took another backward looking approach.

The value of the unmodelled lines during AMP5 for the industry as a whole was computed separately for water and for wastewater and that was divided by the relevant AMP5 totex less the unmodelled amount. For wastewater, this amount was 3.95% of the remaining totex.

The list of the unmodelled items for wastewater is shown below.

Wastewater unmodelled items

Enhancement capex category
NEP -Conservation drivers
NEP - Monitoring of pass forward at CSOs
NEP - Investigations

Enhancement capex category
NEP - Nutrient (N Removal)
NEP - Nutrients (P Removal at AS plants)
Resilience
SEMD
Additional lines defined by ourselves

Issue 5 - Allowance for opex in the unmodelled uplift

There is a non-trivial problem embedded in this approach. Ofwat has used the enhancement capex figures in the August Submission (relating to AMP5) and companies' business plans (for AMP6). This is added to the triangulated botex model and the unit cost models to create the bottom up totex model. But capex is not totex. Given that the opex included in the econometric models appear to exclude enhancement opex, the opex involved in these unmodelled items is ignored. The table below shows the value of opex associated with each of the unmodelled capex lines on the basis of the forecast amounts within Anglian's business plan for the unmodelled elements agreed with Ofwat following the deep dive process.

Unmodelled opex vs capex

Enhancement capex category	Capex (£000)	Opex (£000)	Totex (£000)	Opex uplift to totex (£000)
NEP -Conservation drivers	0	0	0	0%
NEP - Monitoring of pass forward at CSOs	0	0	0	0%
NEP - Investigations	15,909	0	15,909	0%
NEP - Nutrient (N Removal)	0	0	0	0%
NEP - Nutrients (P Removal at AS plants)	11,769	1,365	13,134	11.6%
Resilience	2,025	398	2,423	19.6%
SEMD	2,971	77	3,048	2.6%
Additional lines defined by ourselves	30,054	3,427	33,481	11.4%
Total	**62,728**	**5,267**	**67,955**	**8.4%**

Ignoring the £5.3m opex represents a systematic error . We suggest that this can be dealt with by using totex instead of capex and by increasing the unmodelled uplift by the ratio of totex to capex for the unmodelled lines. For us, this figure is 8.4%, which

would result in a modified uplift of 4.28% instead of the 3.95% used. This would translate into an increased uplift allowance of £7.7m pre-efficiency, £6.8m post efficiency.

However, in reviewing business plans, Ofwat has taken a conservative approach. If a business plan had a figure for unmodelled lower than the calculated amount, then Ofwat would allow only the amount claimed for. If a company had an unmodelled total higher than computed, then generally Ofwat would limit the company to its allowance. Ofwat has listed three possible criteria that need to be met for it to increase a company's unmodelled allowance above the amount it sets. The additional amounts must:

- Be related to totally new requirements (or ones that were not relevant in AMP5 and thus were not included in the industry's historical modelled costs; or
- Be materially different to those of the rest of the industry; or
- Reflect a significant change from the past that has not been captured in the AMP6 explanatory variables forecasts.

In the light of the RBR and, in particular, the reclassification of the No deterioration unmodelled item during the deep dive, the aggregate value of our unmodelled lines comes to a lower figure than the existing allowance computed on the basis of 3.95% of other costs. Consequently, this increase in the allowance as a result of incorporating the opex element of totex will not result in any increase in our threshold.

Summary - impact on the cost threshold of Issue 5

Issue	Description	Evaluation (£m)
5	Allowance for opex in the unmodelled uplift	0.0

7 Risk and reward

7.1 ODIs

Ofwat's Draft Determination

Ofwat has made a number of additions to and removals from Anglian Water's suite of ODI measures.

Company specific appendix, pages 78-81

Summary of our Representations

We are not making representations on most of Ofwat's interventions on our package of ODIs in the Draft Determination.

We are proposing a change to Ofwat's Determination with respect to supply interruptions, on the basis that the Draft Determination over-simplifies what should be considered upper quartile performance, and the resulting incentive is not consistent with the variability inherent in the measure. We have included our revised proposal for this ODI.

We have provided additional information where requested in the Draft Determination, including proposals for new ODIs.

We are not making representations on most of the interventions made by Ofwat to our package of ODIs, and we are providing additional information or designed new ODI penalties and rewards where requested.

In principle, we understand Ofwat's desire to use ODIs as a disruptive force to stimulate improvement over a range of measures. However, no single company is upper quartile across all of the measures where this approach has been taken. This means that most companies will find the Draft Determination extremely challenging in one or more respects with their package of ODIs.

In making the representations below, we have been careful to consider the Draft Determination in the round. This has led us to make only one significant representation with respect to the ODI for supply interruptions.

CEF views on the ODIs in the Draft Determination

“We do not wish to see changes to the ODI make the company more risk adverse or stifle innovation. We support the principle behind upper quartile performance for ODIs before a company can earn a reward. However, in some instances the threshold chosen may be overly simplistic and may lead to perverse implications. An example would be supply interruptions where we support the company’s recommendation to set targets that reflect an upper quartile position adjusted to take account of the nature of the company’s networks.”
CEF Representation p3

Representations on Outcome Delivery Incentives

Supply interruptions

We agree that supply interruptions should be a focus for the ODIs and that rewards should only be earned for upper quartile performance. However, we do not consider that the proposed performance commitment and design of the incentive is appropriate.

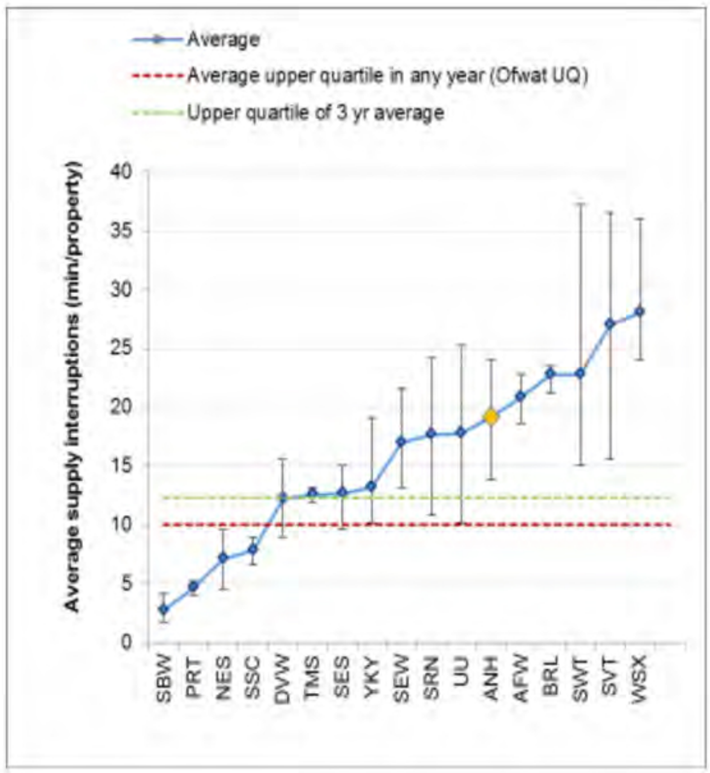
Upper quartile calculation

In calculating upper quartile performance for this measure, we note that Ofwat has calculated the upper quartile level in each of three years and then taken an average. This approach is inconsistent with that taken for other measures, such as water quality complaints, where instead an average company performance across three years is first calculated and then the upper quartile of these averages is used. This makes a significant difference to the assessment of upper quartile as shown below (12.3 minutes against 10.4 minutes).

Company	2011-12	2012-13	2013-14	3 year average
ANH	24.00	13.8	19.8	19.20
WSH	24.00	51	50.4	41.80
NES	9.60	7.2	4.56	7.12
SVT	36.60	28.8	15.6	27.00
SWT	37.20	16.2	15	22.80
SRN	24.18	18	10.8	17.66
TMS	12.60	13.2	12	12.60
UU	25.20	18	10.2	17.80
WSX	36.00	24	24	28.00
YKY	19.20	10.2	10.2	13.20
AFW (VCE in 2011-12 and 2012-13)	18.60	21	22.8	20.80
BRL	21.18	23.58	23.46	22.74
DVW	12.00	15.6	9	12.20
PRT	4.80	4.02	5.16	4.66
SBW	2.28	4.2	1.8	2.76
SEW	21.60	13.2	16.2	17.00
SSC (SST in 2011-12 and 2012-13)	6.60	7.8	9	7.80
SES	9.60	15	13.44	12.68
Upper quartile	**10.2**	**11.7**	**9.3**	**12.3**
Average of upper quartile (Ofwat calculation)	**10.4**			

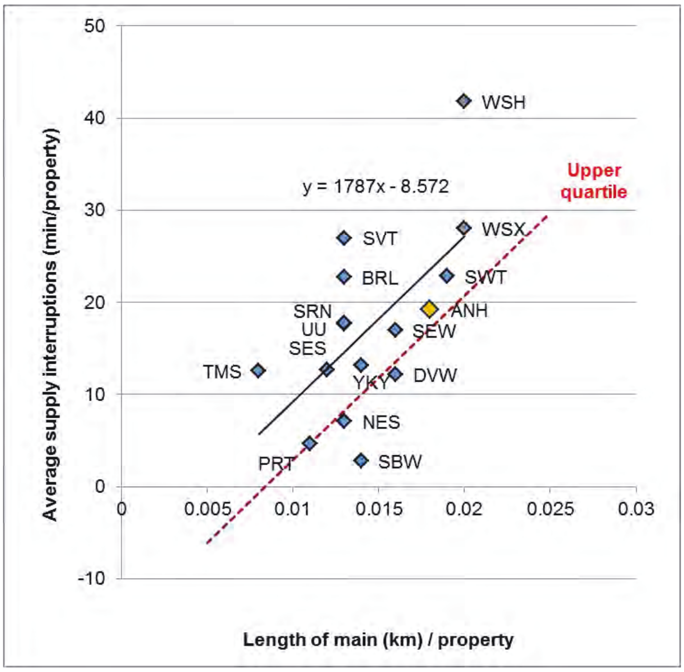
This is an inappropriate use of the upper quartile, and does not represent a real company's sustained performance. For example, Dee Valley Water would be considered upper quartile against a 10 minute commitment in 2013-14, but be 2 minutes above this in 2011-12 and 5.6 minutes above this in 2012-13. In both cases this is a greater variance than the penalty collar proposed by Ofwat in the Draft Determination. In other words, an 'upper quartile' performer would have incurred the maximum penalty two out of three years. We suggest that this indicates that not only should the upper quartile calculation be based on average company performance, but also that inherent variability in this measure needs to be addressed through either averaging or deadbands (in all years, not just the glidepath to 'upper quartile').

Variability in supply interruptions relative to the upper quartile



The assessment of upper quartile performance level also needs to be calibrated to reflect the nature of a company's network. There is a clear correlation between supply interruptions (minutes) per property and length of main per property:

Supply interruptions correlation to length of main per property



This should not be a surprise - it is well established, in the way that Ofwat has previously assessed service associated with burst mains, that there is a correlation between bursts and length of main[(1)]. Companies that have longer lengths of main per property would be expected to have more bursts per property and consequently more interruptions per customer. In the Draft Determinations Ofwat has applied an overly simplistic performance level. As illustrated in the chart above, the ten minutes performance achieved by the "upper quartile" companies is largely a factor of their networks. We propose that the performance level should be based on the upper quartile performance adjusted for length of main per property. Such an approach would be consistent with Ofwat's approach for pollution incidents, which is normalised by length of sewer.

To assess a normalised upper quartile level, we shifted the trend line down until four companies were below the trend. This approximates upper quartile performance, given the length of main per property served. This implies a committed performance level for Anglian Water of 17 minutes. This performance level remains challenging, especially given the normal level of variability seen in this measure year on year. Nevertheless, if this adjusted performance level is reflected in the Final Determination then the challenge could be set of using it as a basis for rewards and penalties from 2015-16 (i.e. no glidepath) if using annual targets, or as we propose below, through an interim target based on a three year average, which implies performance at 17 minutes from 2015-16 onwards.

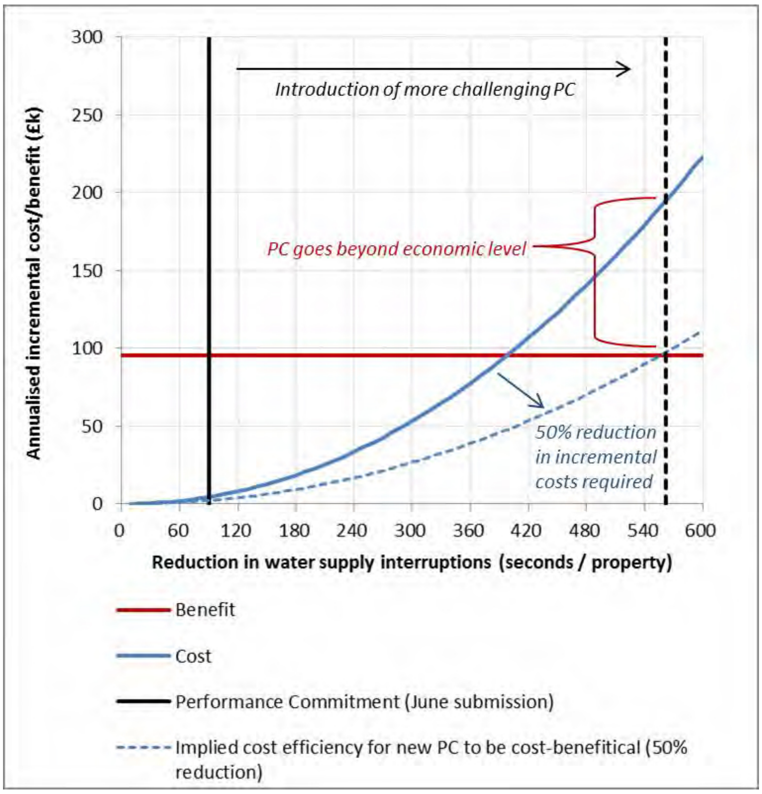
Economic assessment

In our original business plan submission, we included evidence of the economic level for supply interruptions, according to customer Willingness to Pay. We accept that this analysis takes a static view of efficiency and that in setting targets at upper quartile performance,

1 Ofwat's measure of service performance in June Returns (JR11, Table 11, line 12) was bursts per 1000km of main

Ofwat seeks to stimulate dynamic efficiency improvements which might justify the improvement. However, by our analysis, incremental costs would need to be halved in order to justify an economic level of supply interruptions of 10 minutes. We do not consider this to be a realistic expectation to be achieved by 2017-18.

Supply interruptions: Economic analysis



Variability and annual assessments

The Draft Determination provides a very **narrow range over which the rewards and penalties apply** within a single year assessment. We believe that this will result in perverse incentives and be to the detriment of customers.

As shown above, almost all companies experience a wide range of performance which exceeds the range of penalties and rewards in the incentive. This measure is susceptible to weather effects, but can also be affected by one-off incidents. As with leakage, basing a target on a single year's performance means that we would need to aim significantly below the target in order not to miss the target if such an event or extreme weather were to occur. This would require significant investment in what would in effect be redundancy in our operations, 'just in case'.

Assuming the run-rate for supply interruptions can be reduced to meet the performance commitment, then a single one-off event can result in the performance level being missed and the question then is whether the penalty is proportionate? To put this into context a single interruption of 12 hours, affecting 3,700 customers could result in the full penalty of over £8m being incurred. If such an event occurs at the beginning of a year, then there could also be a temptation for companies that are less focused on doing the right thing for customers to reduce the response to interruptions to save cost in the rest of the year. We propose the use of a three year average to better maintain the incentives to perform.

Proposed incentive

We propose the following:

- Performance should be based on a three year average, not a single year.
- Performance can be assessed in 2017-18 and again in 2019-20, with no glidepath, which implies the commitment should be met (on average) in each year from 2015-16.
- The assessment in 2017-18 to be worth one fifth of the incentive, and that in 2019-20 to be four fifths (in the same way as proposed in the Draft Determination for low pressure).
- Upper quartile should be determined relative to km main per property. We assess this to equate to a target of 17 minutes, given our network.
- Whilst we have retained a relatively narrow range of rewards and penalties, by taking a three year average, our proposal reduces fluctuation in penalties or rewards due to isolated events.

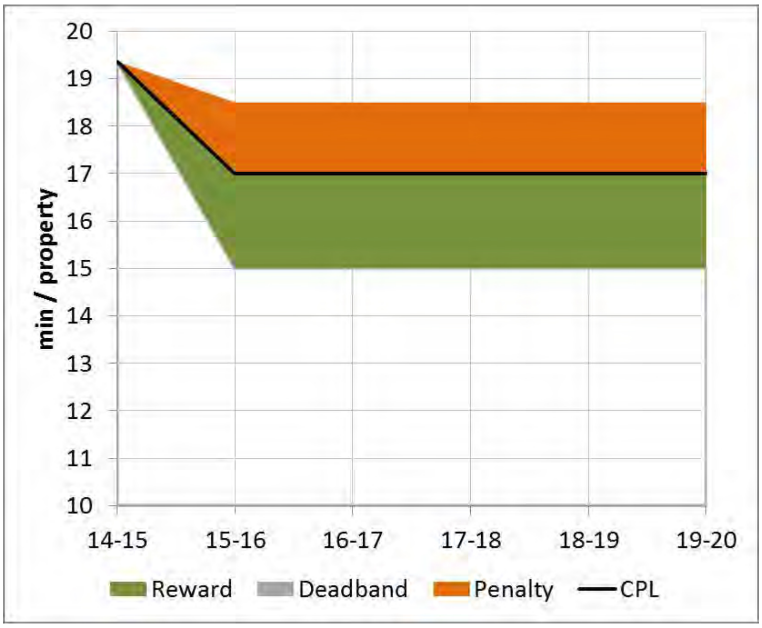
Supply interruptions: Performance commitments

	Unit	Starting level	Committed performance levels				
		2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
PC	Mins/prop/year	19.36			17		17
Penalty collar	Mins/prop/year				18.5		18.5
Penalty deadband	Mins/prop/year				17		17
Reward deadband	Mins/prop/year				17		17
Reward cap	Mins/prop/year				15		15

Supply interruptions: Incentive rates

Incentive type	Performance levels (obligations delivered)		Incentive rate (£m/incident/year)
	Lower	Upper	
Penalty	17	18.5	5.700
Reward	17	15	2.900

Supply Interruptions ODI



Interventions where no change to the Draft Determination is sought

Mean Zonal Compliance

At the request of Ofwat, we included an incentive relating to Mean Zonal Compliance in our June submission. We are not seeking to make representations on the interventions made on this incentive in the Draft Determination, as we understand that Ofwat seeks a consistent measure of water quality across companies.

We also understand the DWI view that any **target** on Mean Zonal Compliance should be 100%. This does not necessarily need to translate into a **commitment** of 100% for the purposes of an economic incentive. We are concerned that a commitment of 100% is unlikely to be delivered (given that some failures are attributable to customer fittings, for example), and that not meeting the commitment may prove a difficult message for customers to understand. The power of a commitment is undermined if there is no realistic means of achieving it.

Low Pressure

We are not making any representation on the change to the reward rate in the Draft Determination, the introduction of an interim commitment of 361 by 2017-18, and the associated penalty collar and deadband which accounts for one-fifth of the overall incentive.

We also note the change of the reward deadband to 230 properties.

All of the assessment of rewards in our incentive is made in 2019-20 and applies to five years of revenue in AMP7.

Value for money

We are not making any representation on the condition that rewards for the water and sewerage versions of this incentive rely on our absolute score improving, as well as relative score.