Responding to Ofwat’s draft determination of Yorkshire Water’s cost allowance

Prepared for Yorkshire Water Services Ltd

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1 Introduction

In the draft determinations (DD), Ofwat has made a number of changes to its modelling approach relative to its initial assessment of plans (IAP) in January 2019.[1]

However, it has not changed its approach to addressing the worsening in raw water complexity that Yorkshire Water (YKY) anticipates over AMP7. Ofwat has reiterated that additional costs to operate worsening in raw water complexity are included in its base modelling. As shown in our response to the IAP on behalf of YKY on this issue,[2] Ofwat’s claim is incorrect in the case of YKY as neither the treatment complexity variables included the base cost models nor the approach to forecasting these over AMP7 reflect the type of worsening that YKY anticipates. Hence, the concerns raised in our previous note remain valid.

Furthermore, Ofwat’s decision to model enhancement on a TOTEX basis and remove the enhancement OPEX currently allowed for in the BOTEX+[3] models creates new challenges.

YKY has commissioned Oxera to:

- re-evaluate the evidence that Ofwat underestimates the impact of raw water deterioration on the estimated efficient expenditure for it, in light of Ofwat’s DD framework (section 2);

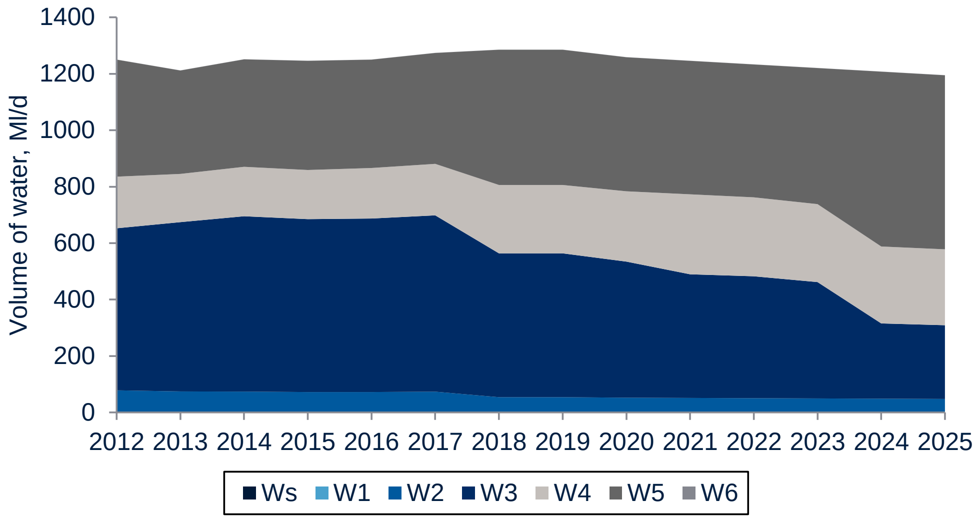
[1] Ofwat (2019), ‘PR19 draft determinations: Securing cost efficiency technical appendix’, July.
[2] Oxera (2019), ‘Ofwat’s enhancement modelling approaches at the IAP: a review’, March, pp. 31–38.
[3] Base expenditure plus growth enhancement expenditure.

- assess the appropriateness of Ofwat's approach to remove the enhancement OPEX allowed for in the BOTEX+ models (section 3).

2 Ofwat's approach to treating raw water deterioration

As noted, YKY is anticipating a significant deterioration in raw water quality in AMP7, as shown in Figure 2.1**Error! Reference source not found.** below. In its business plan resubmission, YKY associated £30m of base CAPEX with schemes to address raw water deterioration[4] and a further £2m with schemes specifically to address taste, odour and colour[5] complaints that are associated with raw water deterioration. The total base CAPEX associated with the schemes, as per Ofwat's cost reporting guidelines, is therefore £32m.

Figure 2.1 Evolution of YKY's treatment complexity



Source: Oxera analysis based on Ofwat data.

Ofwat has not changed its approach to forecasting treatment complexity, and nor has it changed the variables it uses to capture treatment complexity in its econometric models. The arguments raised in our IAP response therefore remain valid.

In its assessment of YKY's raw water deterioration expenditure in the DD, assessed through a deep dive enhancement model, Ofwat claims that:[6]

> Additional costs to operate the enhanced treatment processes are included in our base modelling and we make no allowance for these.

However, as noted previously, Ofwat's approach does *not* capture the costs associated with increased treatment complexity, because of the following.

- **Ofwat's forecasting approach.** Ofwat's approach to forecasting the industry's cost drivers (a combination of extrapolating trends and using historical averages) does not adequately capture the step changes in activity or operational environments that YKY is expecting.

[4] Ofwat (2019), 'Wholesale Water Enhancement feeder model: Raw water deterioration', July, https://www.ofwat.gov.uk/wp-content/uploads/2019/07/FM_E_WW_raw-water-deterioration_ST_DD.xlsx.
[5] Ofwat (2019), 'Wholesale Water Enhancement feeder model: Taste, odour, colour', July, https://www.ofwat.gov.uk/wp-content/uploads/2019/07/FM_E_WW_taste-odour-colour_ST_DD.xlsx.
[6] Ofwat (2019), 'Wholesale Water Enhancement feeder model: Raw water deterioration', July, https://www.ofwat.gov.uk/wp-content/uploads/2019/07/FM_E_WW_raw-water-deterioration_ST_DD.xlsx.

- **Ofwat's model specifications.** The cost drivers used to capture treatment complexity (the proportion of water treated in complexity bands W3–6 and the weighted average complexity measure (log)) are inadequate to capture the type of treatment complexity that YKY is expecting.

Ofwat does not explicitly comment on the inability of the models to account for the increase in base expenditure associated with enhanced works for YKY. While Ofwat's base models and forecasting approach on this issue may be appropriate for others, its approach simply disallows the base expenditure associated with the YKY's enhancement schemes. This is despite Ofwat agreeing with the need and evidence (e.g. supporting letters from DWI) that YKY has presented on the issue.

In this section, we update the results of our IAP response, accounting for the changes to the modelling framework made in the DD.[7]

As in our response to the IAP, we estimate the extent to which a method implicitly allows for the base expenditure associated with a deterioration in raw water quality as follows:

- estimate YKY's efficient cost allowance under the approach;
- compare this with an estimate of what YKY's efficient cost allowance would have been if there had been no change in treatment complexity between the outturn period and AMP7.[8]

The difference between these two estimates is the extent to which the model/approach captures the increase in base expenditure associated with an increase in treatment complexity.

2.1 Ofwat's approach

Table 2.1 below shows the extent to which Ofwat's approach at the DD allows for the increase in efficient base costs associated with a deterioration in raw water quality. Note that there is no implicit allowance in the TWD model as it does not include water treatment costs; also there is no implicit allowance in the WRP2 and WW2 models as Ofwat is forecasting no increase in weighted average treatment complexity. The overall implicit allowance of £5.4m is significantly below the base expenditure that YKY has submitted with the scheme.

Table 2.1 Implicit allowance—Ofwat's approach

	WRP1	WRP2	TWD1	WW1	WW2	Overall
Ofwat forecast of treatment complexity, £m	589	563	687	1397	1350	1318
No change in complexity, £m	580	563	687	1384	1350	1313
Implicit allowance, £m	**8.8**	**0.0**	**0.0**	**12.9**	**0.0**	**5.4**

Note: The efficient cost allowances presented in this table are estimated by applying the triangulated upper quartile efficiency challenge (4.2%) and overlaying Ofwat's net frontier shift assumption.

Source: Oxera analysis based on Ofwat data.

[7] For example, the inclusion of growth enhancement expenditure in the modelled cost base and the allowance for real price effects (RPEs) in labour costs.
[8] That is, the AMP7 level of treatment complexity is constant and equal to the average in the period 2012–18.

2.2 Ofwat's econometric models with updated forecast data

As noted, Ofwat has already accepted the need for YKY to upgrade its treatment plants,[9] yet has forecast no increase in the weighted average treatment complexity measure.

When the analysis presented in section 2.1 is replicated using YKY's forecast of the base cost drivers, the amount allowed for by Ofwat's models increases to £21m, as shown in Table 2.2 below. Under this approach to forecasting, models controlling for the weighted average complexity measure (i.e. WRP2 and WW2) result in a higher implicit allowance than models controlling for the percentage of water treated in complexity bands W3–6 (i.e. WRP1 and WW1). This is due to the latter variable's inability to capture the type of treatment complexity that YKY is anticipating.[10]

Table 2.2 Implicit allowance—Ofwat's models, YKY's forecasts

	WRP1	WRP2	TWD1	WW1	WW2	Overall
YKY forecast treatment complexity, £m	587	580	687	1395	1399	1334
No change in complexity, £m	580	563	687	1384	1350	1313
Implicit allowance, £m	7.4	16.8	0.0	10.9	48.1	20.8

Note: The efficient cost allowances presented in this table are estimated by applying the triangulated upper quartile efficiency challenge (4.2%) and overlaying Ofwat's net frontier shift assumption.

Source: Oxera analysis based on Ofwat data.

2.3 Alternative econometric models

Half of Ofwat's WRP and WW models control for the proportion of water treated in complexity bands W3–6, which is not able to capture an increase in treatment complexity within bands W3–6. In this section we propose the same modelling amendments discussed in our IAP response.[11] Specifically, we consider amending the treatment complexity variable as described below.

- **W3–6 (I).** Ofwat's DD models WRP1 and WW1 control for the proportion of water treated in complexity bands W3–6.
- **WAC (log) (II).** Ofwat's DD models WRP2 and WW2 control for the weighted average complexity measure in logarithms.
- **WS–1**; **W5–6 (III).** Controlling for multiple treatment complexity thresholds may better capture the impact of different treatment complexity bands on base expenditure. Here we consider the proportion of water treated in complexity band 1 and below, and the proportion of water treated in complexity band 5 and above.
- **WS–2; W5–6 (IV).** As in (III), but controlling for the proportion of water treated in complexity band 2 and below and 5 and above.
- **WAC (linear) (V).** The weighted average complexity measure is similar to a proportion variable and may therefore be better modelled in levels than in

[9] For example, see Ofwat (2019), 'Wholesale Water Enhancement feeder model: Raw water deterioration',https://www.ofwat.gov.uk/wp-content/uploads/2019/07/FM_E_WW_raw-water-deterioration_ST_DD.xlsx.
[10] That is, an increase in treatment complexity *within* bands W3–6, as shown in Figure 2.1.
[11] Oxera (2019), 'Ofwat's enhancement modelling approaches at the IAP: a review', March, pp. 36–37.

logs.[12] If the variable is modelled in levels, the impact of moving 1% of total water treated from complexity band 'x' to complexity band 'y' on predicted costs is approximately the coefficient multiplied by the difference in the complexity bands (y–x). In logarithms, the interpretability of the coefficient is less clear.

- **WACS–4; WAC5–6 (linear) (VI).** In the same way that multiple complexity thresholds can be controlled for (see models III and IV), the weighted average complexity measure can also be split into several thresholds. This allows for a more flexible relationship between treatment complexity and expenditure.

The estimated model coefficients and statistical diagnostics can be found in the appendix.

Table 2.3 below shows the implicit allowance in each of the model variants. In general, the implicit allowance is higher in WW models than in WRP models. Similarly, models controlling for a form of weighted average treatment complexity typically have higher implicit allowances than models controlling for the proportion of water treated at different complexity thresholds.

Table 2.3 Implicit allowance—alternative models

	I	II	III	IV	V	VI
Water resources plus (WRP)						
YKY forecast treatment complexity, £m	587	580	581	588	587	585
No change in complexity, £m	580	563	577	578	560	563
Implicit allowance, £m	7.4	16.8	3.5	9.9	26.2	22.8
Wholesale water (WW)						
YKY forecast treatment complexity, £m	1395	1399	1402	1408	1414	1413
No change in complexity, £m	1384	1350	1369	1365	1347	1343
Implicit allowance, £m	10.9	48.1	32.9	43.2	67.1	70.0

Note: The efficient cost allowances presented in this table are estimated by applying the triangulated upper quartile efficiency challenge (4.2%) and overlaying Ofwat's net frontier shift assumption.

Source: Oxera analysis based on Ofwat data.

The results presented in this section demonstrate that Ofwat's claim that its approach captures the enhancement treatment processes over AMP7 is incorrect in the case of YKY. As at the IAP, a change in Ofwat's approach to forecasting treatment complexity can better allow for this raw water deterioration, but alternative models are required to capture the type of increase in treatment complexity that YKY is expecting.

3 Implicit OPEX enhancement allowance

One of the key changes to assessing enhancement expenditure between the IAP and the DD is that Ofwat now considers enhancement on a TOTEX basis. This is more consistent with the TOTEX framework (as it does not provide different incentives for enhancement OPEX and enhancement CAPEX).

[12] The CMA argued in the Bristol Price Appeal inquiry that it 'did not consider it sensible to take the logarithm of this proportion [proportion of DI from rivers and proportion of DI from reservoirs] for this specification of the explanatory variable'. Competition and Markets Authority (2015), 'Bristol Water plc: A reference under section 12(3)(a) of the Water Industry Act 1991', Appendices 1.1–4.3, para. 166.

As enhancement OPEX cannot be separated from base OPEX in the historical dataset, Ofwat argues that its base expenditure models implicitly allow for some level of enhancement OPEX (despite no explicit enhancement OPEX drivers being included in these). To avoid double-counting the efficient level of enhancement OPEX in AMP7, Ofwat strips out enhancement OPEX that it considers is allowed for in the BOTEX+ models. While we agree in principle that enhancement OPEX needs to be removed from the modelled BOTEX+ allowance if enhancement is to be assessed on a TOTEX basis, the approach followed by Ofwat is simplistic.

Ofwat estimates the share of enhancement OPEX in modelled BOTEX for a limited sample[13] of companies in 2018 (the only year for which outturn enhancement OPEX data is available), and multiplies this by the AMP7 modelled BOTEX allowance.

There are several concerns with the way in which the implicit allowance is calculated.

- The range of OPEX enhancement to modelled BOTEX ratios is large across the companies considered in the analysis (0.03–3.63% in water, with an average of 1.03%; 0.06–0.62% in waste, with an average of 0.29%). The significant variation across companies within the sample suggests that the results will be highly sensitive to the inclusion of other companies' data, particularly in the water service.
- Enhancement activity is idiosyncratic (i.e. 'lumpy'), and it is not obvious that enhancement in 2018 will be representative of the entire historical period. If enhancement OPEX is higher (lower) in 2018 than in the average year, Ofwat will overestimate (underestimate) the implicit allowance.
- Companies that had no enhancement OPEX in the chosen year were excluded from the analysis. If some of these companies had enhancement OPEX in the historical period (either in previous years or 2018 but were unable to disentangle base OPEX from enhancement OPEX) then this will necessarily bias Ofwat's estimated implicit allowance.
- Ofwat's approach to deriving the implicit enhancement OPEX by multiplying the average proportion of enhancement OPEX with the modelled expenditure has challenges as well. For example, this assumes that the proportion of enhancement OPEX is the same over outturn and AMP7, which for the reasons highlighted may not be correct for some companies. This can result in disallowance of base expenditure for these.

An additional year of outturn data may be able to refine Ofwat's approach in the final determinations. For example, by examining the relationship between enhancement OPEX and enhancement CAPEX in 2018 and 2019, it may be possible to infer how enhancement OPEX may have evolved in the historical period for each company, compare these with the trend over AMP7, and apply appropriate adjustments.

[13] Anglian Water, Southern Water, Dŵr Cymru, Wessex Water and Seven Trent Water in the wholesale water service. Affinity Water is added to the sample for the wholesale water service.

A1 Econometric models

This section presents the estimated coefficients and key statistical diagnostics that we used to assess the implicit allowance for YKY's increase in base expenditure associated with raw water deterioration.

Table A1.1 shows the model coefficients and statistical diagnostics in the WRP models.

Table A1.1 WRP model coefficients

	WRP(I)	WRP(II)	WRP(III)	WRP(IV)	WRP(V)	WRP(VI)
Connected properties (log)	1.013***	1.013***	0.995***	1.010***	1.010***	1.018***
% water treated in complexity bands W3–6	0.00777***					
Weighted average density measure (log)	-1.389**	-0.729	-0.882*	-1.334**	-0.717	-0.820
Weighted average density measure (log) sq	0.0851**	0.0380	0.0500	0.0811*	0.0364	0.0440
Weighted average complexity (log)		0.440***				
% water treated in complexity bands Ws–1			-0.737***			
% water treated in complexity bands W5–6			0.0523	0.0405		
% water treated in complexity bands Ws–2				-0.748***		
Weighted average complexity					0.139***	
Weighted average complexity Ws–4						0.169***
Weighted average complexity W5–6						0.879***
Constant	-5.215***	-7.505***	-6.074***	-4.597**	-7.455***	-7.307***
R-Squared	0.934	0.921	0.928	0.934	0.926	0.927
Breusch–Pagan Test	0	0	0	0	0	0
RESET	0.0108	0.0401	0.0172	0.0103	0.0256	0.0304

Note: ***, ** and * refer to statistical significance at the 1%, 5% and 10% significance levels, respectively.

Source: Oxera analysis based on Ofwat data.

Table A1.2 shows the model coefficients and statistical diagnostics in the WW models.

Table A1.2 WRP model coefficients

	WW(I)	WW(II)	WW(III)	WW(IV)	WW(V)	WW(VI)
Connected properties (log)	1.034***	1.021***	1.003***	1.017***	1.021***	1.018***
Booster pumping stations per length of mains (log)	0.236*	0.256**	0.249***	0.222**	0.261***	0.252***
% water treated in complexity bands W3–6	0.00482***					
Weighted average density measure (log)	-2.026***	-1.635***	-1.608***	-1.834***	-1.611***	-1.565***
Weighted average density measure (log) sq	0.142***	0.114***	0.113***	0.128***	0.112***	0.109***
Weighted average complexity (log)		0.524***				
% water treated in complexity bands Ws–1			-0.534***			
% water treated in complexity bands W5–6			0.202	0.206*		
% water treated in complexity bands Ws–2				-0.425***		
Weighted average complexity					0.148***	
Weighted average complexity Ws–4						0.132***
Weighted average complexity W5–6						0.855***
Constant	-1.732	-3.230***	-2.336**	-1.783	-3.151**	-3.240***
R-Squared	0.975	0.977	0.977	0.978	0.978	0.978
Breusch–Pagan Test	3.83e-10	3.63e-05	2.21e-06	1.68e-06	1.51e-05	2.31e-05
RESET	0.366	0.0506	0.141	0.190	0.0211	0.0235

Note: ***, ** and * refer to statistical significance at the 1%, 5% and 10% significance levels, respectively.

Source: Oxera analysis based on Ofwat data.