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Dear Ofwat

Assessing base costs at PR24

This is Anglian Water's response to Ofwat's consultation on aspects of base cost assessment at PR24. We have prioritised our comments to focus on the most material areas of the consultation and would welcome the opportunity to continue the effective dialogue between Ofwat and companies ahead of draft methodology, to ensure all matters are given sufficient time for discussion.

With regard to base cost assessment, we consider that Ofwat has a good foundation upon which to build for PR24, although work remains to be done on some significant topics, such as the assessment of growth costs and an effective capture of the relationship between costs and service. Both of these are significant issues requiring careful consideration, which is heightened as the regulatory framework looks to place greater emphasis on companies improving environmental performance and standards of service both in PR24 and over the long term.

We welcome Ofwat's review of key issues such as approaches to future capital maintenance, growth, the cost-service relationship and the role of Average Pumping Head and economies of scale associated with large water recycling centres, all of which were flagged as areas to review following the CMA redetermination. Getting these parameters right is critical to ensuring the industry can deliver in the long-term for customers and the environment.

However, we do not support the current proposed options for assessing the costs of meeting future capital maintenance needs. Allowances should be made using a rounded assessment, which includes the outputs of models but also consideration of AMMA and broad equivalence. We believe further thought is needed to appropriately determine the levels of service funded by base expenditure. We also think that changes will be needed to enable the desired increase in nature-based solutions to come through for PR24 and beyond.

We are pleased that Ofwat has provided the opportunity for companies and Ofwat to explore the range of issues around base cost assessment over the course of the last few months through the Cost Assessment Working Group (CAWG). The outputs of the discussions in this forum are evident in the consultation document. We are also pleased that Ofwat has indicated that the CAWG will continue to meet where parties wish to bring forward issues for further discussion.

Furthermore, we welcome Ofwat's commitment for the CAWG's focus in 2022 to include the assessment of enhancement expenditure, an area where we anticipate significant sector expenditure in future periods to address a range of challenges. Given the difficulties faced during both PR14 and PR19 in the assessment of enhancement expenditure, we consider this a sensible step which we expect to result in a further consultation centred on both cost assessment and efficiency benchmarking for enhancement in due course.

Two topics which have, hitherto, not been discussed as a result of their exclusion from the terms of reference of the CAWG and the scope of this consultation document are frontier shift and real price effects. Given the attention which was given to these topics during the course of PR19 (including the CMA redeterminations) and the potential materiality

of their impact on cost allowances, we think it would be useful to consider how these will be treated at PR24 before the draft methodology is published. We would be happy to bring forward ideas on these topics at a CAWG meeting.

There has been much public debate in recent months about factors which could lead to significant changes in the expectations of water companies. These include the challenge of adapting to and mitigating the challenges of climate change and reducing the impact of water company activities on river water quality. Investment will doubtless be required in the PR24 price control period to address these needs. We have assumed that such investment would primarily be treated as enhancement rather than base and therefore beyond the scope of this document. Otherwise, in the face of such a step change in investment Ofwat's proposed approach to assessing base costs, which at heart assumes a continuation of the historical status quo, would be fundamentally unfit for purpose.

We note the overlap between issues in 'Assessing base costs' and those in Ofwat's 'Our proposed approach to funding bioresources activities at PR24' paper. Where we have comments that are specific to bioresources cost assessment we will include them in our response to the bioresources consultation.

In the following sections the questions posed in the consultation document are set out in italics and our responses follow.

We look forward to continuing the active discussion and contribution to the development of the PR24 cost assessment approach.

As always, we would be happy to discuss any of the points set out in this response.

Yours faithfully

A handwritten signature in black ink, appearing to read 'Darren Rice', with a large, sweeping flourish at the end.

Darren Rice
Head of Policy and Regulatory Strategy

Key points

- Applying the criteria set out in the consultation supports the case for strategic and standard growth costs to be excluded from base and modelled separately. The case is further underpinned by the work we have done to develop robust stand-alone growth models.
- We propose three new models for treated water distribution and two models for wastewater network plus.
- We oppose the use of forecast costs in base cost models on grounds of reliability and endogeneity.
- We propose a five-year sample period is used for modelling rather than using all years back to 2011/12.
- We are sceptical about the ability of companies reliably to fill historical data gaps with 'back-casting'.
- Were the PR19 base models to be used again at PR24 we would currently be minded to make seven cost adjustment claims in our business plan.
- We do not support any of the proposed options for assessing the costs of meeting future capital maintenance needs. Allowances should be made using a rounded assessment, which includes the outputs of models but also consideration of AMMA and broad equivalence.
- Consideration should be given to how the approach to cost assessment can enable the desired increase in nature-based solutions to come through for PR24 and beyond.
- Further work is needed to understand the relationship between service base cost allowances.

1. Principles of PR24 base cost assessment

1. Do you agree with our principles of base cost assessment?
2. Do you consider any important principles are missing?

We support the principles set out in the document and the accompanying discussion and make the following additional observations.

Recalling the PR19 discussion with reference to the exclusion of average pumping head (APH) from the water models, we suggest there might be an additional principle that *“models should only be populated with data which meet appropriate standards for quality and consistency”*. More generally, we urge Ofwat to provide more detailed guidance (and require data revision, where necessary) on any data item relevant to modelling where there are suspicions of inconsistency. We identify examples in this response where greater consistency should be achieved.

We also propose that the list of principles includes one that the approach to assessment *“should create desirable long-term incentives and drive valued behaviours”*. Below, we identify how the current approach to assessing capital maintenance costs could encourage companies to take a higher risk on maintenance expenditure, with an ongoing impact on future allowances and adverse consequences for asset health and customer services. Inclusion of this as a principle could act as a useful test of whether any proposed approach avoids creating such unintended incentives.

In general, we support the drive behind the premise of setting a *“stretching but achievable cost efficiency challenge”*. Clearly such a motive is a cornerstone of RPI-X regulation, but the calibration of this must be consistent with the delivery of companies' long-term delivery strategies and supported by an appropriate assessment of the balance of risk. Otherwise, in the event of such targets being over-stretching, as was the case for PR19, this could drive an asymmetric risk faced by companies. As highlighted in the recent Future Ideas lab discussion paper by Skylight

Consulting, there was arguably an incentive for a ‘race to the bottom’ to demonstrate low-cost plans due to cost and service thresholds being set independently of company needs which needs to be redressed for PR24.

We support the view that cost assessments should be based on the triangulated outputs of more than one model. This principle was not well adhered to at PR19. For example, there was only one model for treated water distribution (the biggest single area of industry expenditure) and there was no wholesale wastewater model against which to triangulate the outputs of the individual wastewater sub-service models. Furthermore, in a number of cases two ‘triangulated’ models differed only in the choice of one variable. There is therefore scope for the principle of triangulation to be more effectively applied which should increase the confidence associated with using these cost modelling outputs.

2. Approach to wholesale base cost modelling at PR24

Scope of wholesale modelled base costs

3. Do you consider the scope of wholesale modelled base costs should be amended at PR24? If so, please explain how the potential amendment/s to wholesale modelled base costs can be justified based on our proposed assessment framework.

4. Would you recommend collecting additional data in relation to growth expenditure (cost and/or cost driver data) to improve cost assessment at PR24? If so, what additional data would you recommend collecting?

We are pleased that Ofwat is minded not to pursue the development of total expenditure (totex) models. Previous experience shows that the likelihood of creating robust and useable totex models are very slim and we consider the sector’s collective efforts are better directed to developing other robust cost assessment approaches.

Treatment of growth

We support the idea that exclusions from and additions to the PR19 scope of base modelled costs should be justified against a set of criteria. Ofwat is aware from our presentation to the October CAWG that we think growth costs should be excluded from base cost models and assessed outside of wholesale base cost assessment.

We have assessed the case for including growth costs within the scope of base against the Ofwat criteria proposed in the consultation. Consistent with our October presentation, we have conducted separate assessments for standard and strategic growth set out in full in Appendix 1. To summarise:

- Using Ofwat’s consultation criteria, there is a clear case that ‘strategic growth’ strongly meets the evidential criteria for exclusion from base and being assessed separately; and
- The case for excluding ‘standard growth’ is also convincing. The progress in the development of stand-alone econometric models strengthens the case for exclusion. The need for alignment and consistency by a few companies in costs attributed to ‘standard growth’ should not be used as a reason for costs to remain in base. This is an area where we would urge Ofwat to use its powers to achieve greater consistency.

In addition to considering the merits of different modelling approaches, the decision on how to treat growth at PR24 should be mindful of the regulatory context within which the assessment is made. One of the consequences of including growth in its entirety within the base cost models at PR19 meant that both Ofwat and companies are unable to robustly determine the growth allowances set out in the Final Determinations. We believe that Ofwat share this concern of being unable to demonstrate the quantum of forward-looking growth costs allowed. This has several implications, particularly for investment budgeting and charge setting. It also reduces the transparency of expected

contributions to growth, which is important given developers fund some elements of growth and bill-paying customers others. As such, the decision made must be mindful of potential consequences beyond cost assessment and the possible impacts on an increasingly competitive market.

Consistent with our stance during the latter part of PR19 and during the CMA redetermination process, we consider that modelling growth expenditure within base cost assessment leads to several issues. As evidenced previously, it leads to the material underfunding of substantial elements of growth for fast growing companies.

We are encouraged that Ofwat is actively considering its approach to growth for PR24. We strongly support an improved approach at PR24, as we set out in our presentation to Ofwat's CAWG in October. To summarise the presentation:

- Growth is a large 'catch-all' term. There are different types of growth-driven expenditure that could be considered differently in cost assessment.
- The approach to assessing growth costs is intrinsically linked to the regulatory model, the treatment of contributions, forecasting approaches and reconciliations.
- We advocated that a sensible delineation of growth activities between that are **standard and repeatable** and the more **complex, lumpy and strategic** growth investments which generally facilitate long-term growth over multiple AMPs.
- "Standard" growth could be modelled relatively simply. "Strategic" growth is more complex, lumpy and should be looked at separately from standard growth.
- Strategic growth costs are influenced by the location of growth and available headroom in nearby assets. There may be an opportunity to agree common PR24 planning assumptions/ scenarios. Risk sharing and true-up mechanisms can de-risk forecasting challenges for companies and customers.
- Improved data capture is required to support the evolution of growth cost assessment.

We followed up our Growth presentation at October CAWG by developing stand-alone growth cost models. These models build on the disaggregation we proposed at meeting. **Dividing growth costs into standard and strategic, in a similar manner to the split of wholesale costs into base and enhancement, enables the creation of credible looking models for each key area of growth costs**, based upon exogenous data which are already available from the APR and the tables of developer services data which companies submitted to Ofwat in October 2021.

In January 2022 we shared with Ofwat the growth cost models we have developed. The analysis is at an early stage given that only one year's data are currently available. We have agreed to continue our analysis along the lines agreed during the meeting, mindful that until subsequent years' data become available (next being APR22 in the summer), the indicative results are albeit strongly positive and promising. We propose to publish our results later in the year.

All parties recognise that a pre-requisite to robust cost modelling is consistent approaches to data reporting. In our October presentation we proposed some additional data that would assist in assessing growth costs. We are pleased that new APR reporting requirements have been introduced and that scheme-specific data were collected through the developer services data submission in October. We believe this should continue.

As described above, we have already started testing how the data from those submissions may be useful in further developing our growth models, with initial indications appearing positive. We suggest that the developer services data submission should become an annual requirement and that these submissions should be shared across the industry, subject to any necessary redactions with regard to commercial confidentiality and GDPR. The modelling

output would be enhanced by multi-year information, however, companies' ability to back date the information to prior years may be challenging. We therefore encourage greater granularity and data requirements for future years.

We reiterate our view that there remains a case for additional data capture on strategic growth expenditure. For Anglian and some other companies this remains a significant proportion of total growth expenditure (>75% at PR19). The table below lists the additional data capture we suggested in our October presentation to the CAWG and, in response to the consultation, proposes some initial definitions for each. As previously stated, we also encourage a consistency review of reporting guidance for allocation of expenditure between growth and maintenance.

Table 1: Proposed initial definitions for growth expenditure

Proposed measure	Draft definition
Network reinforcement	
Property capacity created by investment in pumping stations and pipes	Head room capacity created in line with design assumptions.
Length of water main laid	Length of water main laid in whole or in part for growth. <i>Even if an element of capital maintenance is involved, this would impact diameter rather than length.</i>
Length of sewer laid	Length of sewer (rising main and gravity) laid in whole or in part for growth. <i>Even if an element of capital maintenance is involved, this would impact diameter rather than length.</i>
Pumping stations	Number and capacity of pumping stations built or upgraded
More granular reporting of expenditure	This could include new build, mitigation/incremental upgrade, conveyance.
Review of interpretation of 'local distribution network', and if necessary expand	<i>Consistency review</i>
Clarify boundary between expenditure directly linked to new development sites as opposed to generic investment to maintain existing levels of service in the face of population growth	<i>Consistency review</i>
Water recycling treatment	
PE capacity created by investments (retain for PR24).	The increase in treatment capacity, from company action, measured in population equivalent. The increase must be measured from the previous year's capacity of existing sewage treatment works and the previous capacity at each works must be the higher of the then current design capacity or the company's revised understanding of actual capacity before the company's action. <i>Retain definition from PR19 data tables</i>
Disaggregated expenditure by works band	Further disaggregation of band 6 as discussed elsewhere in this response.
Number or scale of WRCs where permit compliance is 'beyond available technology'.	Beyond available techniques as defined by the Environment Agency.

Enhancement opex

The PR19 approach was sub-optimal but justifiable given the absence of required data on historical enhancement opex. The requirement for companies to report enhancement opex separately from 20-21 warrants a re-consideration of the treatment of enhancement opex in cost models and we support this review. In this regard, the proposed presentation by Yorkshire and Anglian to one of the March CAWGs on how enhancement costs from one AMP can be carried over into base cost assessment for subsequent AMPs will address issues germane to any such review. It remains particularly important to get this issue right in the context of long-term investment as one AMP's enhancement opex becomes base opex in all future AMPs.

Implications of improvements in cost allocation reporting guidance

We comment on our ability to back-cast sludge liquor treatment costs and energy generation revenues to 11-12 in our response to the bioresources consultation. In general, we are sceptical about the industry's ability to produce data from up to ten years ago that comply with today's reporting requirements and meet the standards required for reliable cost modelling. This is one of our reasons for proposing shorter sample periods for modelling purposes later in this response.

On a related note, we suspect from our recent analysis that companies may have been taking different approaches in accounting for assets of principal use. This has important implications for Ofwat's cost assessment approach and its ability to be confident that its allowances are stretching but achievable, as what is thought to be cost variances due to (in)efficiency could in fact be due to cost allocation. We shared our concerns on this with Ofwat and the outcome of those discussions was that Ofwat issued a revision to the guidance in October. Having seen the revised guidance, we intend to re-state our APR tables for all years which were completed in accordance with our previous approach. Given that accounting for principal use assets materially affects tables 4J and 4K, which form the data sources for cost models, we suggest that all companies should be required to either confirm that they have completed all relevant historical tables in accordance with the revised guidance or submit revised tables. There is a risk to the quality of models and the accuracy of their outputs should cost modelling proceed with data which are not compliant with the October revised guidance.

Wholesale base cost modelling suite

7. Do you agree with our proposed target wholesale base cost modelling suite at PR24?

8. Do you consider it would be worthwhile attempting to develop wholesale wastewater network plus models for PR24?

If so, do you propose any potential wastewater network plus cost model specifications to consider?

Treated Water distribution

The consultation invites proposals for alternative treated water distribution (TWD) and water resources plus model specifications. We propose three additional models for TWD. We set out these models in Appendix 2 below. In the first, *re3b*, the existing driver of pumping stations per km of main is replaced by APH for TWD. In the second, *re3c*, as well as using average pumping head (APH) instead of pumping stations per km, we also replace properties as the scale driver with water delivered. In the final additional model, *re3d*, both APH and water delivered are used in place of the existing drivers. The attraction of the approach we propose is that triangulation would be on the basis of separate economic models, rather than two versions of the same model.

Both of the new variables we propose were used at PR14 and in the Bristol 2015 redetermination. They were also used as part of the suite of opex models used for cost assessment prior to PR14. The expectation is that the current exercise being managed by Ofwat to improve the data quality of APH data will provide sufficient evidence of data robustness, such that Ofwat reinstates APH as a measure of topography. We remain confident that APH can be used for modelling

TWD costs, given that APH of the distribution network is the component of APH with the lowest level of uncertainty. Water delivered is an excellent driver to use as a scale variable as it measures the key deliverable of a water company. By excluding leakage, it ensures that no reward is granted to companies with high leakage levels, and thus avoids the problem which would arise from the use of distribution input.

We fully welcome Ofwat's commissioning of the current APH exercise being carried by WRc and Turner and Townsend and support their preliminary observation that total APH as opposed to disaggregated data appears more reliable. We strongly urge Ofwat to replace the existing measure of pumping stations per km of main in the two integrated models with total APH.

Effective triangulation of a modelling suite requires at least one model at the highest level of aggregation. The lack of any PR19 wholesale wastewater models was an obvious gap. Should Ofwat proceed with its consultation proposal to regulate bioresources on a different basis from the rest of wastewater wholesale, and to assess wastewater network plus without bioresources, we support Ofwat's view that wastewater network plus models are required. However, we are also concerned that there may be cost substitution effects between bioresources and wastewater network plus. If this were the case there is a risk that benchmarks are identified in each price control which, taken together, form an unrealistic efficiency challenge. To check against these, triangulation should also be done at the overall wastewater wholesale level and models at this level are also required.

Wastewater network plus

The consultation invites proposals of potential wastewater network plus cost model specifications. In response, we propose two water recycling network plus models. These models are also set out in Appendix 2. Each is uncomplicated and represents a separate economic model of sewage collection and treatment. Both have coefficients which are statistically significant and which make logical sense from both an economic and engineering perspective. Both have R-squared values which are at least as good, if not better, than the existing suite of models.

The first model, *re9*, is based on the observation that companies do not run a single sewage network. Instead they run many individual networks (in our case, 1,138). The model has as its dependent variable the base cost per network (i.e. base cost divided by the number of wastewater networks). The scale driver is taken as the length of main per network. For this model, there are also two control variables. The first is the proportion of load where the ammonia consent is tighter than 3%: this acts as a proxy for treatment complexity. The second is pumping capacity per length to take account of topography. We call this the average system model.

The second model, *re10*, takes as its starting point the fact that there are significant economies of scale in treatment while there are none in collection. There are here two scale variables – the load treated in Band 6 works and the load treated in Bands 1 – 5 (the bands used here are as defined by Ofwat). It uses the same two control variables as the first model. As small works are generally to be found in rural areas and large works universally in urban areas, disaggregating load in this way captures demographics effectively. Consequently, this model encapsulates the key elements of both the collection and treatment models put forward by Ofwat at PR19. We call this the total network model.

We recognise that while sewage collection has sewer length as the key scale variable and sewage treatment has load as the key scale variable, the network plus models proposed do not contain both load and length together. One uses one variable, the other uses the other. This is because load and length are 96% correlated, so to include both would lead to coefficients being reported with much lower levels of significance.

Water resources plus

We urge Ofwat to use a second separate economic model for Water Resource Plus (rather than the two versions of the same model as at present).

Wholesale base cost drivers and explanatory variables

9. Do you think we should reconsider the inclusion of APH in the wholesale water base cost models at PR24? If so, should it be a substitute for, or additional to, booster pumping stations per length of mains?

10. Should we consider replacing the existing 'load treated in size band 6' variable with 'load treated in band 8 and above' in the relevant wholesale wastewater base cost models?

11. Please provide detailed proposals for any additional / alternative cost drivers and explanatory variables we should consider at PR24, including clearly defined data requirements that would need to be collected from companies.

We have proposed our candidates for additional cost drivers – namely average pumping head (APH) and further disaggregation of band 6 STWs – through the CAWG and believe the case for both to be strong. We note that both Ofwat and the CMA explained their rejection of APH in terms of the data quality for APH. With this in mind, we are pleased that Ofwat has established the project to improve the quality and consistency of APH reporting and look forward to a positive outcome. As mentioned above in our answer to the questions on the wholesale base cost modelling suite, we propose treated water distribution (TWD) models using APH. We also suggest that APH should be used within the integrated water models.

On band 6+ STWs, we recognise that there are missing data for the years 2014, 2015 and 2016. We have three comments to make about this missing data:

- First, the data could be interpolated from existing data with little loss of accuracy, given the relative stability of these numbers;
- Second, we could avoid the problem in its entirety by using a five-year sample period. This is consistent with our general view on sample periods (see following section); and
- Third, the operational data for large works is very stable: it would be surprising were it not to be. Our analysis of the available data set both at an aggregate and a unit cost level demonstrates this stability and has been shared with Ofwat through the CAWG process.

We are content with Ofwat's proposed approach to regional wages, capital stock and the use of time trends.

Sample period selection

5. Do you agree that we should utilise the full historical data series available to develop the wholesale base cost models at PR24 (from 2011-12 onwards) unless there is clear justification for using a reduced time series (e.g. structural break that cannot be addressed through other remedies)?

6. Should we consider including business plan forecasts in our wholesale base cost models at PR24?

Ofwat proposes to include all years back to 2011-12 in developing its models while recognising the risks to quality from structural breaks in the dataset. In principle, a larger dataset can improve the precision of model estimates but we have a number of concerns about Ofwat's proposal and whether it is optimal or necessary from a modelling perspective.

Fundamentally, we question whether it is right for a company's cost allowance in 2025-30 to be influenced by the expenditure it made over fifteen years previously. It is reasonable to ask how relevant those distant years are to what

a company might spend today. This would appear to be inconsistent with Ofwat’s long-term focus, the forward-looking role of innovation and Ofwat’s common reference scenarios which imply potential material changes to companies’ costs in given potential future states.

Secondly, we note that the longer the dataset the greater the likelihood of structural breaks, which may not always be easy to detect.

Thirdly, we note that the longer the sample period the smaller the influence of an individual year on the model outcome. Using a long sample period therefore seriously blunts the incentives on companies to achieve efficiencies in the remaining years of the current price control period.

Fourthly, the longer the sample period, the greater the requirement on companies to produce back-cast data. We have serious concerns about the ability of companies to produce all data which may be required to the required standard back to 2011-12.

Considering the normal distribution of expenditure we typically see across a price control period, we see value in selecting a sample period which aligns to a fixed number of price control periods – i.e. five or ten years. This approach avoids the risk that the sample period includes a disproportionate number of ‘high cost’ or ‘low cost’ years.

Weighing up these factors, **we suggest the sample period should be five years.** This creates strong incentives for efficiency improvements in the current period, avoids any issues arising from the price control cycle expenditure cycle, ensures that the future efficiency challenge is related to recent company performance and reduces the reliance on back-cost data that may be costly to produce and unreliable to use. Our analysis shows that Ofwat’s PR19 models remain stable with sample periods of this length. Should additional years be added to the sample period as the price review progresses, the oldest years should be discarded to preserve the total period length.

Use of forecast costs in models

We are sceptical about the use of forecast costs in cost models for the reasons set out in the consultation document. Furthermore, there is an unhealthy interaction between the need for accurate forecasts and the business plan assessment incentive. Experience shows that there is frequently a large gap between companies’ outturn costs and those they proposed in their business plans, revealing those forecasts to be unreliable components of a benchmarking tool. Furthermore, use of forecast costs would be a blatant breach of Ofwat’s third modelling principle, that cost drivers should be outside of company control, or exogenous.

Model estimation method

12. Do you agree that we should maintain the use of random effects to estimate our wholesale base cost models at PR24?

Ofwat’s proposal to continue using random effects is reasonable. Our only observation is that OLS and GLS estimation techniques encapsulate a residual covering both efficiency and an error term. The recognition of the imperfection of models and model data points to the need for robust evidence in setting the efficiency benchmark.

Model selection process

13. Do you agree with our proposed model selection process?

Overall, we are content with Ofwat’s proposals on the selection process for acceptable models. In terms of the principle set out as “sensibly simple and transparent”, while we accept and follow Occam’s razor and aim to avoid complexity for its own sake, we are also mindful of Einstein’s principle: “make it as simple as possible, but no simpler”. Applying this to cost modelling in the water sector, even with a five- year panel, we still have at least 50 data points and so do have some latitude in terms of degrees of freedom.

3. Cost adjustment claims

14. Do you agree that the cost adjustment claim process at PR24 should be separated between base (wholesale and residential retail) and enhancement claims?
15. What base cost adjustment claims (wholesale and residential retail) would you consider submitting if the PR19 base cost models were used to assess efficient costs at PR24?
16. What additional cross-sector data should be collected to support the submission of the claims indicated in response to the previous question? Please describe and explain the rationale behind the additional data that you consider should be collected and provide a draft definition.
17. How can the cost adjustment claim guidance be enhanced to improve the quality of cost adjustment claim submissions?
18. Would an early cost adjustment claim submission be welcome at PR24?

We support the idea of assessing base and enhancement Cost Adjustment Claims (CACs) separately at PR24. We hope that Ofwat will consult on enhancement cost assessment in general and how enhancement CACs are defined (and work alongside deep and shallow dives) in particular.

In the November CAWG, Ofwat set out its views regarding CACs at PR24:

“For claims which were either not submitted or rejected at PR19, we expect to receive evidence of a material change in circumstances since the PR19 business plan submissions. In the absence of new evidence / information, cost claims would likely fail the ‘need for’ adjustment’ gate.”

While we appreciate and accept the thrust of Ofwat’s stance, we would suggest that “material change of circumstances” should be replaced by “material change in evidence.” Companies which made potentially valid claims but substantiated them poorly should have the opportunity to re-make their cases. It should also be reflected that previous submission of cost adjustment claims will have been driven by a range of factors, including the overall base models which could change substantially so as to still be relevant for submission at PR24 even if the claim was not submitted or was rejected at PR19.

Symmetrical CACs

We agree with Ofwat that, where appropriate, CACs should be symmetrical. However, we disagree with the assumption that this implies that all, or nearly all, base cost CACs would be symmetrical.

The test of whether or not a CAC should be symmetrical is whether the historical data from which the models are derived include relevant costs for all companies. In many cases they will do: our CACs for leakage and diseconomies of scale for large wastewater treatment works at PR19 proposed the adjustments that would apply to all companies, not just ourselves, and these netted to zero.

However, South West’s CACs relating to the Scilly Isles could not have been symmetrical as there was no expenditure on providing water services in the Scilly Isles in the historical sample period. For the same reason, CACs relating to

higher future capital maintenance needs due to changes in the asset base should not be symmetrical. Most enhancement CACs can be expected not to be symmetrical.

Our potential PR24 CACs

Any company's final proposed CACs will be dependent on Ofwat's final PR24 costs assessment methodology. This includes Ofwat's approaches to assessing growth expenditure but also approaches to forward-looking capital maintenance requirements and assessing the relationship between cost and service which we explore later in this response.

However, in the spirit of the question, and assuming the PR19 suite of base cost models were to be used again at PR24, we would be minded to submit base Cost Adjustment Claims for the factors set out in the table below. We have set out alongside each one our assessment of whether additional data would be required to make and assess the claim.

Table 2: Potential PR24 Cost Adjustment Claims

	Candidate	Notes	Additional data
1	Average Pumping Head	Not submitted as a CAC during PR19 as we advocated for APH to be restored within the base cost models	No. Disaggregated APH data are already required by the RAGs. Project aimed at improved data quality for APH is currently underway, funded by Ofwat, supported by the industry
2	Costs of maintaining frontier leakage	Submitted at PR19. CMA provided a company specific adjustment to take account of our leakage performance and its accompanying costs	TBC. The CMA's approach to our base leakage claim used total base costs for leakage for the AMP and data on current and future leakage performance. If the approach that the CMA took were applied, the additional data requirement would be a consistent view of what all companies spent on base leakage over the most recent AMP. A project is in train to improve the consistency of reporting.
3	Large Wastewater works	Not submitted to Ofwat at PR19	No new lines of data are required. Data have been collected in the APR since 2017, which is sufficient for modelling. By PR24 FD, there will be a continuous panel of 8 years of data.
4	Growth	Not submitted as a CAC during PR19 as we argued for Growth to be modelled separately.	Yes. We have proposed potential cost models to enable separate modelling of growth with cost drivers which are already available within collected data. However, we have also suggested some additional data requirements (see above).
5	Climate vulnerable water mains replacement	Improved techniques for forecasting the impact of climate change on asset behaviour are enhancing our view of risk to service and thus to maintenance requirements. Anglian have proposed a presentation on this subject for the forthcoming AMMA workshop.	No.
6	WTW unplanned outage risk	The growing supply-demand pressure faced by Anglian significantly	No.

	Candidate	Notes	Additional data
		increases the potential risk to supply of unplanned outages at WTWs.	
7	Handling enhancement opex from one AMP in subsequent AMPs	While this was recognised as being a potential issue at PR19 within the CAWG, it has only crystalized as a real issue now, given that the AMP7 enhancement opex programme is significantly larger than at PR14 – a measure of the success of implanting totex thinking. Yorkshire and Anglian will be raising this at a CAWG planned for March 2022, along with proposed remedies.	No. The additional opex associated with enhancement investment is now captured in companies' APRs.

We agree that a problematic element of the CAC process is assessing the level of Implicit Allowance (IA) for a particular CAC within the existing models. As has been noted, there are some claims where the IA is zero. However, these are relatively rare. For the bulk of claims, where there is a positive IA, we welcome Ofwat's intention to provide guidance regarding the computation of IAs.

We support the early submission of CACs in mid-2023. This is on two grounds:

- We expect to have much greater clarity over the nature of base cost models at PR24 compared to the same stage during PR19, given Ofwat's intention to publish the PR24 models earlier; and
- The proposal spreads the workload (for both companies and Ofwat) during the Business Plan development phase and gives greatest time for assessment, feedback and revision.

4. Capital maintenance and asset health

19. Do you agree with the different elements / approaches to introducing more of a 'forward-look' into our approach to assessing capital maintenance expenditure? Are there other elements / approaches we could consider?

20. Do you have any comments on the proposed long list of asset health measures in Table 5, particularly in relation to their suitability and how feasible they are to collect? Please include any reporting or definition changes you would like us to consider and provide suggestions for other measures not included in this list.

We are pleased that Ofwat has responded to the CMA's recommendation that it considers whether its assessment of future capital maintenance expenditure needs should incorporate an element of 'forward look' in addition to examining what has happened in the past. As highlighted in the Future Ideas Lab paper from Skylight Consulting, spending on capital maintenance has in the past been unsustainably low¹. To us, it is clear that a system within which:

- Future allowances are assessed with reference only to past expenditure;
- Companies have strong disincentives to exceed those allowances;
- Outperformance (or underspending) does not necessarily lead to adverse outcomes in the observable period; and

¹ How should Ofwat's approach to price control regulation focus on the long-term? Skylight Consulting, para 2.8

- The outturn expenditure resulting from the application of those incentives is again used to determine future allowances ...

... risks leading to a downward spiral of allowances (after normalisation for scale). The danger arising from the incentives in this system is that companies are tempted to take more risk on asset maintenance, nursing ageing assets through a variety of compensating strategies. If risk-taking is mistaken for efficiency, the whole industry is benchmarked against an inappropriate comparator, with adverse consequence for customers and the environment.

Ofwat states that improving trends in key asset health measures over time do not support the case that capital maintenance levels have been inadequate. However, this position fails to recognise the steps companies have taken to evolve their asset management processes, adopting totex approaches to improving service. Observing an improvement in certain measures in the short term also fails to acknowledge underlying asset health and changing conditions assets face in the future. We discuss this more in the section below on asset health measures.

We do not support any of the four modelling options which Ofwat sets out in the consultation paper for incorporating a forward-looking element into capital maintenance cost assessment.

Like Ofwat, we agree that there are challenges to assessing capital maintenance separately and that variables that capture levels of capital maintenance activity should not be included in cost models.

However, unlike Ofwat, we do not support the inclusion of forecast costs in models. We set out our general objections to the use of forward costs in our response to section 2 above. Neither do we support the option of incorporating a forward-looking component into the efficiency challenge. This is for the same reason: this option is also dependent on the forecasts in companies' plans, which we regard as unreliable and subject to the influence of wider regulatory incentives present in the price review process. Our objection to any options that relied on companies' forecasts might be lessened if the business planning incentive were removed from the regulatory framework.

An alternative way forward

As an alternative to Ofwat's four proposals we advocate the approach set out by South West Water at the September CAWG meeting. The approach advocated was that while cost models may form the starting point of an assessment, their outputs should be supplemented by additional evidence and cross-checks to form a rounded view.

We agree that companies should have the opportunity to submit evidence on the basis of aggregated measures such as base asset health or monetised risk, which can then be assessed to compare with the modelled allowance. The results of the Asset Management Maturity Assessment (AMMA) could also be used for this purpose. This evidence would effectively be a cost adjustment claim.

As part of this more rounded assessment, we also propose the approach of comparing the investment which companies propose to make to maintain their assets against the loss of value suffered by companies as those assets deteriorate. In the long run, the first should match the second if the asset base is to be maintained in a stable state. In previous price controls Ofwat used this approach, which it defined as the principle of 'broad equivalence', to assess companies' proposals of current cost depreciation (CCD) in business plans. Today, we could use RCV run-off rate as the financial measure of asset deterioration to compare with capital maintenance proposals.

The approach outlined above enables future capital maintenance needs to reflect growth in the asset base and changes in the nature of new assets in terms of their asset lives. It could also support and accommodate the desired

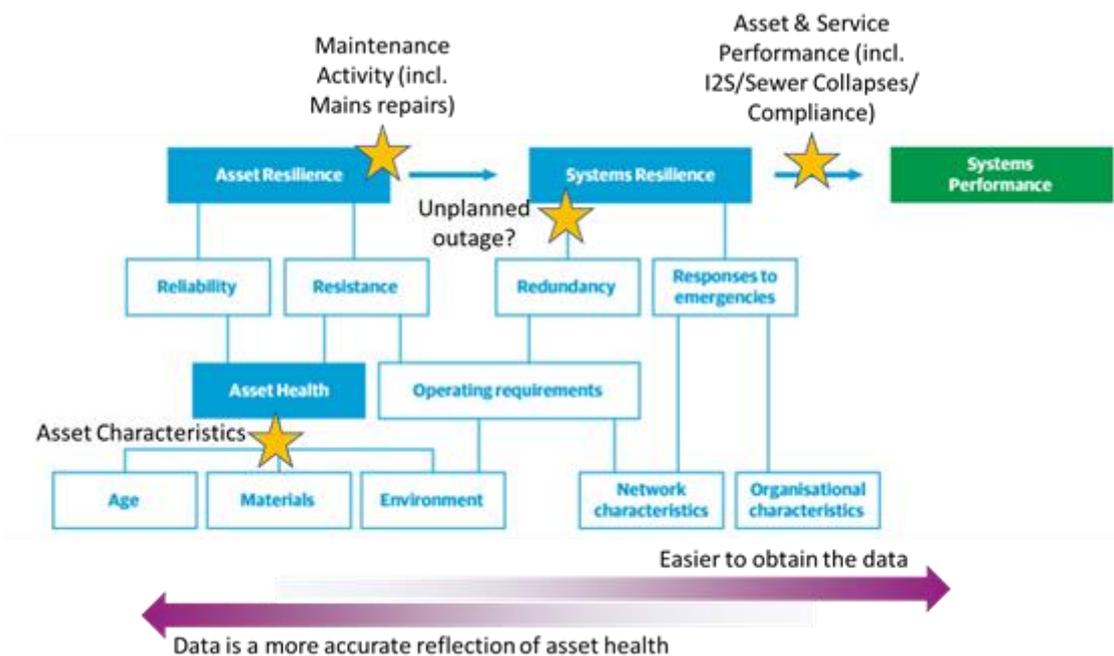
increase in nature-based solutions to environmental challenges. It has the advantage of making use of quantified, bottom-up accounting evidence relating to the cost of assets and serviceable lives which companies already hold.

Asset health measures

We are supportive of the intention to gather more asset health data at an industry level to inform decisions in this area. We agree that a range of indicators is required.

We also agree with Ofwat’s criteria for selecting asset health measures. The test of the relevance of asset health measures should be that they are set at the right point in the diagram which Ofwat published as part of its own Targeted Review of Asset Health (2017), reproduced below.

Figure 1: A conceptual relationship between asset health and the ‘four R’s’ of resilience



On this framework, interruptions to supply is not an ‘asset health’ measure as it is heavily influenced by the quality of emergency response. Likewise, the current definition of sewer collapses, which requires them to be reported only if a customer is affected, again means the measure is set at the wrong point since a high quality emergency response can mask an inherent asset weakness. A better asset health measure for water supply systems would be the number of supply interruption incidents rather than their duration, while for collapses the total number of collapses and partial collapses would be better than the reportable number experienced by customers.

Most of the suite of current PCs labelled as asset health are better thought of as measures of system resilience. This may explain why we are seeing them reduce over time where improvements are being made in responses to emergencies and network characteristics, when assets themselves are not improving.

In their Future Ideas Lab paper, United Utilities define Asset Health as “defined by a condition of wellness, fitness and life expectancy. The ability of an asset to deliver its function under and outside of normal conditions, over an extended period of time.” This is very similar to our own definition of Manufactured Capital: “the ability of our infrastructure to provide resilient services to meet the current and future expectations of our customers”. Without Asset Health measures which adequately capture the underlying ability of an asset to deliver its function, the industry risks allowing its asset systems to deteriorate to a point where improved operational responses can no longer keep pace with poor

asset condition, placing customers at risk of reduced service. This was highlighted by Ofwat in MD161, reinforced by the National Audit Office in 2004², and has been the subject of much research in the sector since then, in particular by UKWIR³. As Ofwat acknowledge in the consultation, most recently the CMA have also supported this view.

5. Cost-service relationship

21. *Do you agree with the high-level approach to determine 'what base buys'? Can you define any additional analysis or information that could support this process?*
22. *Do you consider it would be feasible to assess the 'efficient' baseline performance level for each company for individual PCs such as leakage and PCC through econometric modelling? Are there any other PCs where you consider this could feasibly be attempted?*
23. *The need to collect further granular data to elucidate the cost-service relationship was highlighted by companies in response to our PR24 May consultation. Can you propose any data it would be proportionate to collect to support the high-level approach outlined in this chapter?*
24. *What are your views on attempting to use of a composite variable to investigate the cost-service relationship, in the context of the methodological issues and complexities we outlined?*
25. *Do you have any proposals for how to make adjustments where a performance commitment level differs from that expected to be delivered from base costs?*

The cost-service relationship is critical to the calibration of any price review. Increasing customer expectations and the acute need to deliver greater environmental outcomes than companies have done in the past make the need avoid any risk that the price review disincentivises the delivery of better services even more important at PR24. It is also important to respect the views of customers, particularly where there is appetite to invest to deliver future improvements. The importance of the cost-service relationship is epitomised by the example of leakage. The CMA redetermination highlighted a clear cost-service relationship for leakage where a) the cost of reducing leakage by one MI/d increases as performance improves and b) better leakage performance requires greater base cost allowances to maintain that level of performance. This matters most to companies like Anglian who are strong leakage performers and need to reduce leakage further to maintain the supply-demand balance. Without a reflection of the cost-service relationship we risk either having insufficient allowances to maintain a supply-demand balance, or unsustainably investing beyond our allowance in order to achieve this balance.

The effective calibration of the price control relies on performance commitment levels (PCLs) being set at the level of performance which should be achievable for the base expenditure level set for an efficient company. This should be based on empirical evidence of what base costs buy, over judgment of the level of performance that ought to be achieved using base allowances (such as the assumption that base costs would fund forward-looking, upper quartile performance at PR19). This calibration also needs to reflect that there is an important difference between the one-off costs of achieving an improved service level, and where that improved service level needs to be delivered through ongoing costs. This has important implications for understanding different investment approaches between companies, but the consultation document is currently silent on this.

At a fundamental level, the cost-service relationship, and particularly the cost allowances required for each company depends on a) the current level of service and the regional factors that influence the level of service (both of these mean there are different marginal cost curves between companies for a single unit of improvement), and b) the level

² [Out of Sight - Not Out of Mind: Ofwat and the Public Sewer Network in England and Wales - National Audit Office \(NAO\) Report](#)

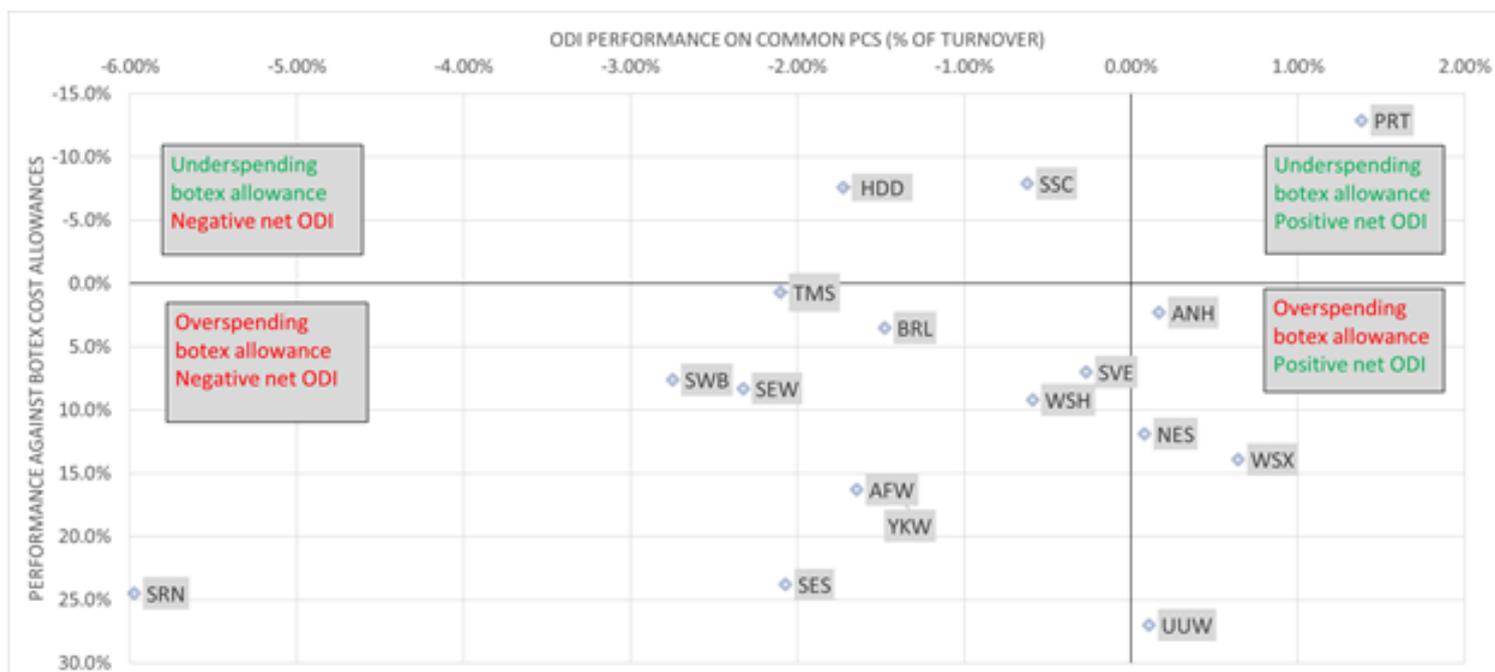
³ [Capital Maintenance Planning: A Common Framework Volume 1: Overview \(ukwir.org\)](#)

of service supported by customers, who may not support endless improvement across all areas of companies' plans. Currently, the consultation document has no details on how calibration of the cost-service relationship will work, particularly in relation to the points raised above. If appropriate allowances to reflect these are included, then we would be supportive of the approach.

However, we do not agree with Ofwat's proposal for how 'what base buys' should be determined as we challenge two of the assumptions on which it rests.

The first assumption is that efficient companies will achieve their PR19 performance commitments. This very uniform assumption does not address the economic point that different companies face different costs of achieving their PCLs due to different starting points and regional factors. This was explored extensively during the CMA redetermination which recognised that the top performers have a greater base and enhancement unit cost need than other companies. We also challenge this assumption on the evidence of the results in year one of the current price control period. The level of stretch on common performance commitments and base cost allowances in PR19 is demonstrated in the figure below, where only one company is both outperforming its base cost allowances and earning net positive ODI rewards.

Figure 2: Common ODI and Base Cost⁴ Performance 2020-21



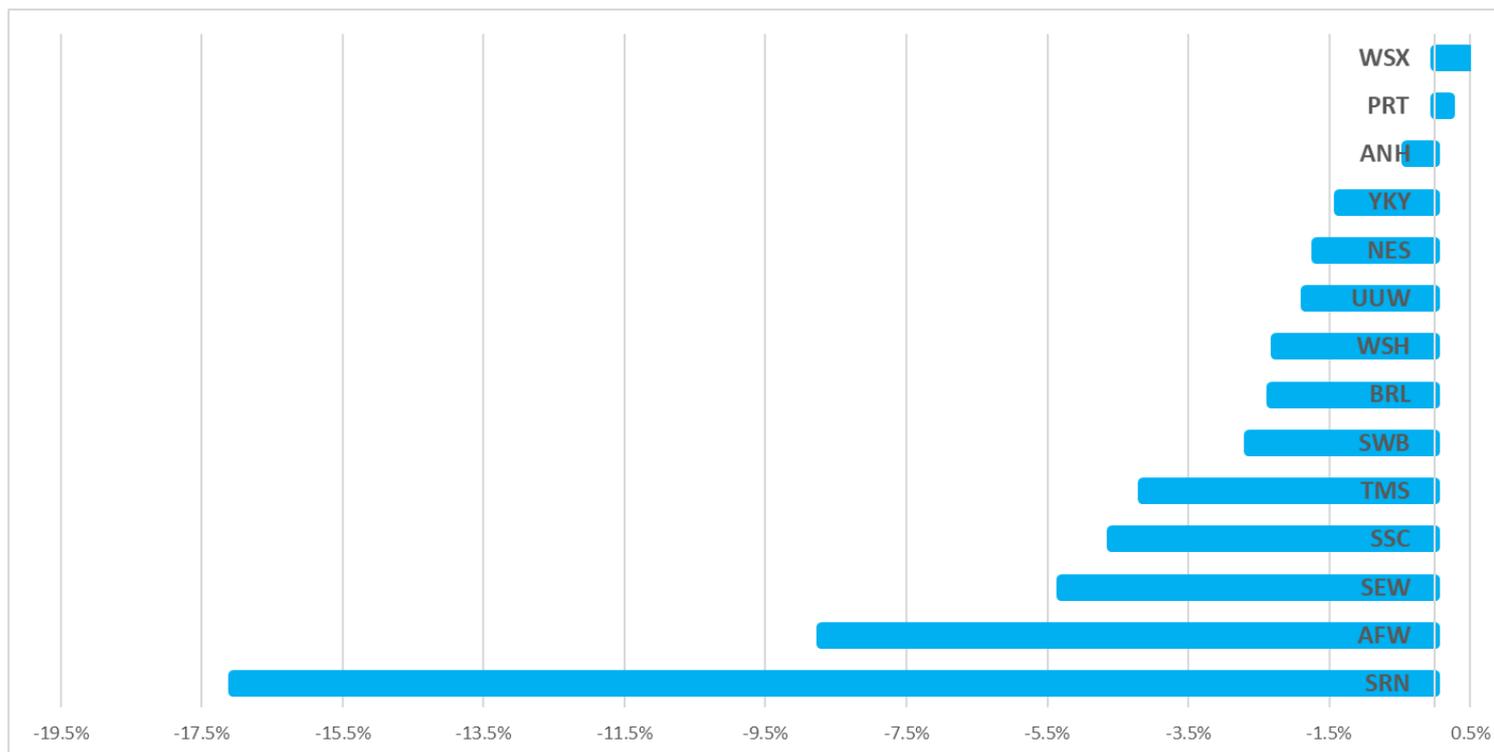
Source: Industry APR data and Ofwat Service Delivery Report underlying data (2021)

The general trend in AMP7 is for PCLs to become more stretching across the period so it is highly unlikely for PCLs to be met in year 5 when so many less challenging PCLs were missed in year one. Year one was the best year of AMP6 for reaching PCLs; the proportion of PCLs met fell steadily in subsequently years.

Looking at the reward and penalty forecasts for the whole of the current price control period that companies made in their 20-21 APRs (Figure 3), it seems clear that companies have very low expectations of meeting their PCLs. This leaves companies in a position where they must either spend more to avoid penalties, divert spending to areas that matter less to customers and/or be subject to underperformance penalties.

⁴ This figure includes low pressure and sewer flooding expenditure but excludes growth expenditure.

Figure 3: Industry forecast financial performance for common PCs, as a % of 2020-21 revenue



Source: Industry APR data

In summary, this early evidence on the current price control suggests that PR19 PCLs cannot be used as reliable indicators of industry performance in 2024/25.

The second assumption in Ofwat’s proposed approach which we challenge is that performance can be extrapolated to 2029/30 on the basis of historical performance trends. The assumption might be justified if there were a good understanding of the mechanisms which drove past improvement and there were guarantees that the factors which drove those improvements were going to continue to apply in the future. But to do this would require detailed understanding of those factors for each individual performance commitment and this is work that still needs to be done at industry level.

The assumption that 2029/30 performance can be extrapolated from past trends also pre-supposes that the costs of delivering performance improvements were ‘one-off’. It assumes that because a certain level of historical expenditure has taken a company’s performance from x to y, the same allowance in the next period will automatically enable improvement from y to z. It fails to recognise that the expenditure which enabled the initial performance improvement will need to be continued to maintain performance at the new level and that additional investment will be required to achieve further performance improvements.

We could only extrapolate ‘what base buys’ if it were base, and base alone, that paid for it. When we consider the improvements in industry performance we can see that there is a significant contribution to improvements from companies’ enhancement programmes. For example, CRI performance has been assisted by the enhancement totex spent on achieving compliance for lead, nitrates and metaldehyde. To extrapolate past trends to forecast a 2030 position must also assume a continuation of a similar level of further enhancement expenditure, which a base cost assessment alone cannot do. This contribution from one-off investment, either funded by base or enhancement, could also result in sustained, recurring costs to maintain a given level of service (e.g. staff to man water tankers). Cost allowances derived from models informed by historical costs reflect the cost of delivering those service levels in

those years, taking into account conditions (such as extreme weather events) at the time. They do not give an indication of the split of these costs between on-off and ongoing costs to achieve and maintain that level of service.

Projecting significant service improvements without the funds to achieve them imposes a return penalty on companies because they will either have to spend money to achieve those improvements or bear the cost of failing to meet them. In practice this creates an asymmetric risk and an additional, unquantified, productivity challenge.

Taking this forward for PR24

While we have reservations about the approach to extrapolating performance, we see potential in the framework if it can be calibrated correctly. A key consideration will be developing a shared understanding of the relationship between cost and service for individual performance commitments. This will enable companies and Ofwat to satisfy themselves that strong, sector-leading performance is appropriately funded, which in turn leads to benefits for customers and the environment by setting a new standard for the industry.

In our view, any approach should focus on the following principles:

- The industry is incentivised to behave in the interests of customers' and the environment in the long-term;
- Companies can exercise choices to reflect their customers' preferences;
- Generally, improvements in service or output will entail cost increases, as outlined in the Yorkshire Water / Baringa Future Ideas Lab paper.⁵ Some further improvements to frontier service may be possible without increased spending (e.g. through switching to alternative practices, elimination of inefficiencies) but (because of point 1) the scale of these improvements is unknowable on current knowledge; and
- Companies at the frontier for any dimension of performance should be rewarded for having achieved that and for sharing good practice. This will encourage companies to explore innovative options which may fail.

The consultation raises the idea of including performance variables, or composite variables, in cost models. While there are some challenges to this approach we would not discourage fresh exploration of this approach.

We look forward to continuing the dialogue with Ofwat and the industry on this important topic.

⁵ Baringa, Assessing the relationship between cost and performance for PR24, page 20.

6. Residential retail cost assessment

26. Do you have any comments regarding our proposal to ask companies to separate out the part of their provision of bad debt costs to do with Covid-19 that was made outside of their standard methodology in the PR24 business plan tables?

27. What guidance would aid companies to provide appropriate data related to the provision of bad debt costs to do with Covid-19?

We agree that the impact of Covid on reported bad debt costs is likely to cause a material distortion of underlying costs in the short-term but Ofwat needs to be clear about the distinction between the bad debt charge and bad debt provision, as it is the former that will impact reported costs to serve.

The atypical impact of Covid on the reported bad debt charge in table 2C will likely be present over several reporting years, with some companies starting to make additional provisions in 2019/20, and with further Covid-related bad debt adjustments in the following years (both additional bad debt charges and the write-back of unused provisions).

We therefore support Ofwat's intention to ask companies to provide additional data as part of their PR24 business plan tables with the separation of the part of their provision of bad debt costs to do with Covid-19 that was made outside of their standard methodology. We suggest that, as part of this return, companies provide a reconciliation, by year, of the total additional bad debt charge taken to what was held in the closing bad debt provision.

Appendix 1 – Assessment of whether growth costs should be included in the scope of base cost models

Standard growth

We define this as developer services activities directly relating to site-specific activities. For water these comprise new connections to new and existing mains (onsite / infill) and new water mains onsite. For wastewater these comprise the adoption of new sewers and approval of sewer connections.

Criterion	Factor	Costs should be excluded from base	Costs should be included in base	Comments
1	Costs have / have not been incurred in the past?			<ul style="list-style-type: none"> This is a unit cost driven activity, therefore costs have been incurred in the past in a similar way to those in the next price review period. Overall, variation in costs from previous periods will be the strength of the housing market. This can be mitigated with a full true up / down mechanism. The past is not always a clear indicator of the future because of variations in the housing market. Fluctuations in demand, supply and availability of credit (credit crunch) or interest rates all have an impact on the level of expenditure.
2	Variations in costs between companies and over time can / cannot be explained by the cost drivers in the base models			<ul style="list-style-type: none"> Whilst the costs can be compared between companies, the inconsistent nature of accounting for Developer Services activity makes it more difficult to gain a 'true' picture of costs. The key driver of cost is the number of new connections, which is captured by the current base models. However, supplementary drivers of costs are work mix (onsite / infill connections); traffic management requirement, distance of water main to property boundary and competition percentage. None of these are in the base cost models. Ofwat have implemented a new cost assessment for developer services activities to address this issue. There is limited variation in the cost drivers for standard growth.
3	Costs can be clearly identified, and data reporting inconsistencies and/or interactions / complementarities			<ul style="list-style-type: none"> The information provided by companies in PR19 showed a significant variation in costs for similar activities that suggest the ability of companies to separate costs for Developer Services activities and other (potentially capital maintenance) is weak.

	with wholesale base costs are minimal (necessary but not sufficient condition for separate assessment).			
4	Robust standalone econometric / unit cost models can be developed (necessary but not sufficient condition for separate assessment).			<ul style="list-style-type: none"> We have developed promising economic models for standard growth. These have been shared with Ofwat.
5	Costs are largely outside of company control.			<ul style="list-style-type: none"> While the value of each unit-driven cost is controlled by the company to some extent, variation in work mix and volume is not. As set out above, the key driver of costs is the number of customer requests,

Strategic growth

We define this as infrastructure required to enable development, from the development site to the boundary of the treatment works. For both services it comprises tanks, pumps or mains required to enable 'site specific' infrastructure to be fed without detriment to the existing customer base.

Criterion	Factor	Costs should be excluded from base	Costs should be included in base	Comments
1	Costs have / have not been incurred in the past			<ul style="list-style-type: none"> • The costs for strategic infrastructure are a function of existing headroom in the network, development size and location. • Existing headroom – A network will usually have an in-built headroom for growth through investment in the past. This is eroded over time to the point where demand is greater than the remaining capacity. At this point investment is required to increase capacity within the network. • This 'cliff' edge may not have been reached for many years, dependent on the available capacity. Therefore, expenditure in previous price control periods may not be an indicator of required future investment. • Development size – larger developments will use the available headroom in one instance rather than the gradual erosion caused by standard growth. The need for investment will be triggered during the development life cycle. • Development location – As can be demonstrated by a number of large developments located near existing towns (e.g. Alconbury near Huntingdon), the scale of development is often out of balance with the surrounding area (Alconbury is 75% the size of the neighbouring town). Location of development determines the level of expenditure required. • The likelihood of this occurring in one price control period in the same way as it did in previous periods is small so the relationship between past and future costs is likely to be weak. Each large development area therefore needs to be considered on its own merit.
2	Variations in costs between companies and over time can / cannot be explained by the cost drivers in the base models			<ul style="list-style-type: none"> • None of the drivers listed above are included in the base cost models. • The existing headroom, growth rate, development size differs from company to company. For example, a company with headroom inherited from a post-industrial change in demand will differ from a company without this legacy.

				<ul style="list-style-type: none"> • The exact requirements for each development will be different, and therefore will be different between companies.
3	Costs can be clearly identified, and data reporting inconsistencies and/or interactions / complementarities with wholesale base costs are minimal (necessary but not sufficient condition for separate assessment).			<ul style="list-style-type: none"> • The costs for strategic infrastructure can easily be identified at a scheme level. The design and construction of the solution can be identified at an early stage in the planning process. Therefore, a suite of options can be prepared in advance of need, allowing a menu-driven selection process within an AMP to best enable development. • There is a need for greater cost assessment and data gathering to allow the companies to be compared.
4	Robust standalone econometric / unit cost models can be developed (necessary but not sufficient condition for separate assessment).			<ul style="list-style-type: none"> • We have developed promising economic models for strategic growth. These have been shared with Ofwat.
5	Costs are largely outside of company control.			<ul style="list-style-type: none"> • The requirement for new strategic infrastructure - and therefore the cost of it - is a function of the existing headroom, development size and location. • Companies that have benefited from previous generational investment in the network, with favourable changes in demographics will have a lower cost requirement due to growth. • The location and timing of development is not within the companies' control, therefore neither are the costs.

Appendix 2: Proposed models

All models have been prepared using the CMA's versions of PR19 data in WW1 and WWW1 as used for the redeterminations. Those data sets included 2020 data. Anglian has extended the data set to include 2021, taking the necessary additional data from the 2021 APR and updating the CPIH index for the average 2021 figure. For the avoidance of doubt, no changes have been made to take account of the Principal Use of Assets issue raised within this consultation response, The CMA's Stata files have been modified to take account of the additional cost drivers and generate the models. Modifications to the Stata files have been kept to a bare minimum.

The pre-existing TWD model from PR19 is referred to as re3a in the following table, alongside the other water base cost models used by both Ofwat and the CMA (these are numbered as per the Ofwat and CMA nomenclature). The proposed new models are re3b, re3c and re3d. For the Water Recycling table on the following page, the two proposed Network Plus models are included as re9 and re10. Models re1 – re8 are the wastewater base cost models from the PR19 modelling suite.

TWD

	re1	re2	re3a	re3b	re3c	re3d	re4	re5
	b/p	b/p	b/p	b/p	b/p	b/p	b/p	b/p
Inproperties	1.020***	1.031***					1.035***	1.024***
	{0.000}	{0.000}					{0.000}	{0.000}
pctwatertreated36	0.007***						0.005***	
	{0.000}						{0.000}	
Inwensitywater	-1.773***	-1.473**	-3.118***	-3.789***	-1.810***	-2.794***	-2.262***	-1.848***
	{0.000}	{0.017}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
Inwensitywater2	0.113***	0.093**	0.248***	0.286***	0.133***	0.190***	0.161***	0.131***
	{0.000}	{0.029}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}	{0.000}
InAPH_WRP		0.027						
		{0.852}						
Inlengthsofmain			1.068***	1.088***				
			{0.000}	{0.000}				
Inboosterperlength			0.409***		0.618***		0.337***	0.355***
			{0.000}		{0.000}		{0.000}	{0.000}
InAPH_TWD				0.104**		0.128**		
				{0.028}		{0.030}		
Inwater_delivered					1.091***	1.114***		
					{0.000}	{0.000}		
Inwac								0.510***
								{0.000}
_cons	-3.957**	-4.658*	5.330***	5.759***	6.264***	7.093***	-0.601	-2.137*
	{0.015}	{0.054}	{0.000}	{0.000}	{0.000}	{0.002}	{0.689}	{0.072}
Econometric_model	Random Effects	Random Effects	Random Effects					
devar	Inrealbote xwrp	Inrealbote xwrp	Inrealbote xtwd	Inrealbote xtwd	Inrealbote xtwd	Inrealbote xtwd	Inrealbote xww	Inrealbote xww
N	175	175	175	175	175	175	175	175
Vce	cluster	cluster	cluster	cluster	cluster	cluster	cluster	cluster
R_squared	0.927	0.898	0.963	0.959	0.965	0.957	0.974	0.975
RESET_P_value	0.59	0.369	0.199	0.445	0.03	0.078	0.238	0.08

R_squared	0.934	0.906	0.875	0.869	0.768	0.731	0.917	0.923	0.939	0.932
RESET_P_value	0.161	0.117	0.18	0.167	0.596	0.308	0.11	0.218	0.374	0.361