Southern Water
Ensuring water for life

IAP Technical Annex 6

Securing cost efficiency

1. SRN.CE.A1

Ofwat action	How we have responded
We provide our view of efficient costs for the company along with our reasoning. We expect it to address areas of inefficiency, or lack of evidence, in the revised business plan. Where appropriate, we expect it to withdraw investment proposals if either: - the need for investment is not compelling; or - there is no need for a cost adjustment claim beyond our existing cost baseline.	Partially accepted: plan updated

Our detailed response

Introduction to this document

This document responds to Ofwat's initial assessment of business plans for PR19, received in January 2019. It focuses on the [redacted] area of securing cost efficiency. Specifically, it responds to *SRN.CE.A1*.

This document is structured according to the cost area in question, discussing the extent to which we accept Ofwat's initial assessment of our totex. Where we do not fully accept Ofwat's initial assessment, we provide details of changes that we have made and further evidence to support the costs in our revised plan.

- **Section 1: Summary** – an overview of our response to Ofwat's IAP.
- **Section 2: Botex** – we discuss issues relating to base total expenditure ('Botex').
- **Section 3: Recognition of Enhancement costs** – we discuss Ofwat's categorisation of costs, and the recognition of costs associated with delivering enhanced service levels (primarily enhancement opex).
- **Section 4: Enhancement – modelling** – we set out our response to Ofwat's assessment of expenditure that delivers an enhancement in service quality (primarily enhancement capex).
- **Section 5: Cost Adjustment Claims (CACs)** – we provide an update on our CACs.
- **Appendices** – we provide detailed and technical information regarding Ofwat's model inputs, studies and investigations costs, and our cost adjustment claims.

In each case, we clearly set out the changes we expect Ofwat to make, recognising the constraints of the PR19 timetable and overall approach to cost assessment.

We do not cover retail costs in this document, which Ofwat has judged to be efficient at the IAP.

Section 1. Overview of our response to the IAP

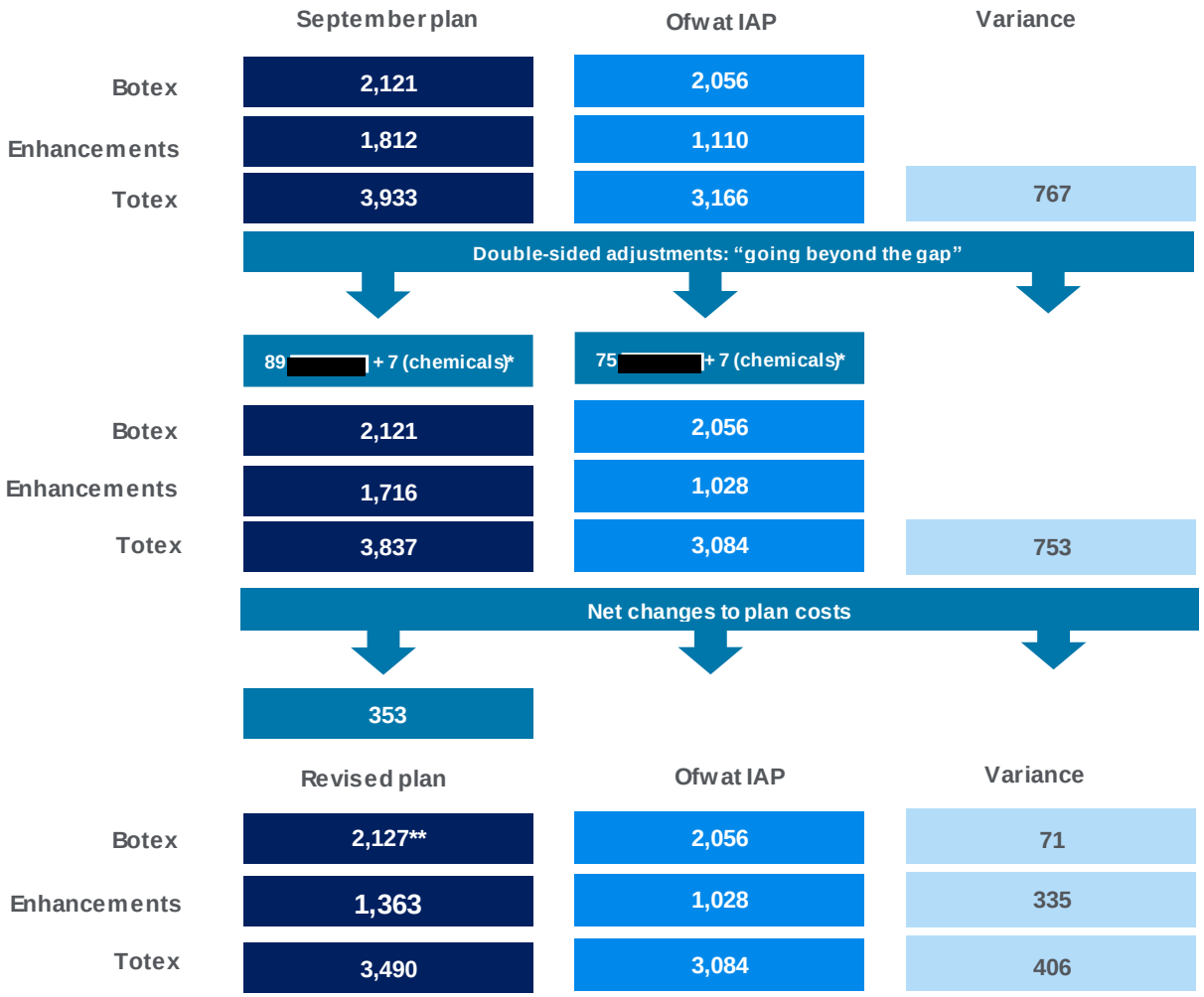
Introduction to this section

Our September 2018 business plan included a wholesale totex forecast of £3,933m (gross, excluding third party services, grants and contributions), which was our best view of efficient costs at the time of submitting the plan. Ofwat's initial view of our efficient costs is £3,166m – which is £767m lower than our initial forecast.

Following a robust challenge process, we have a revised totex forecast of £3,490m on the same basis. We have reduced totex (gross) by £443m. This is a result of identifying £353m of net efficiency gains, plus an additional £90m of net reductions – this is comprised of -£89m from the removal of the [redacted] scheme (£75m in Ofwat's IAP assessment), -£7m where we have "gone beyond Ofwat's" gap on chemical removal schemes, and +£6m of botex. Adjusting Ofwat's IAP view for this £75m, results in a remaining difference of £406m between Ofwat's initial view of efficient costs and our revised plan.

This document sets out the rationale for our revised forecast and provides additional evidence to support our view of efficient costs. *CE.A1.Figure 1 – Summary of changes to our September plan* and *CE.A1.Table 1 – Summary of revised plan and remaining gap* below summarise the changes to our plan since September 2018. We include opex enhancements within enhancements, as per our view of the nature of these costs.

CE.A1.Figure 1 – Summary of changes to our September plan (£m)



[redacted]

**Refers to the removal of the [redacted] scheme from our business plan (£89m), which Ofwat assessed to be £75m in the IAP assessment, as well as £7m where we have "gone beyond the gap" and reduced enhancements costs relating to chemical removal schemes to £3, beyond the £10m Ofwat included at the IAP. Therefore, we adjust both sides by £7m.*
*** Botex has increased in our revised plan by £6m (see Section 2).*

CE.A1.Table 1 – Summary of revised plan and remaining gap

Gross	Revised plan (March) (£m)	Ofwat IAP (£m)	Remaining Variance (£m)
Botex			
Water	713	673	40
Waste	1,414	1,383	30
Total	**2,127**	**2,056**	**71**
Enhancements			
Water	467	318	149
Waste	896	710	186
Total	**1,363**	**1,028**	**335**
Grand total	**3,490**	**3,084**	**406**

Note: CE.A1.Table 1 shows the position after the removal of costs equating to £82m.

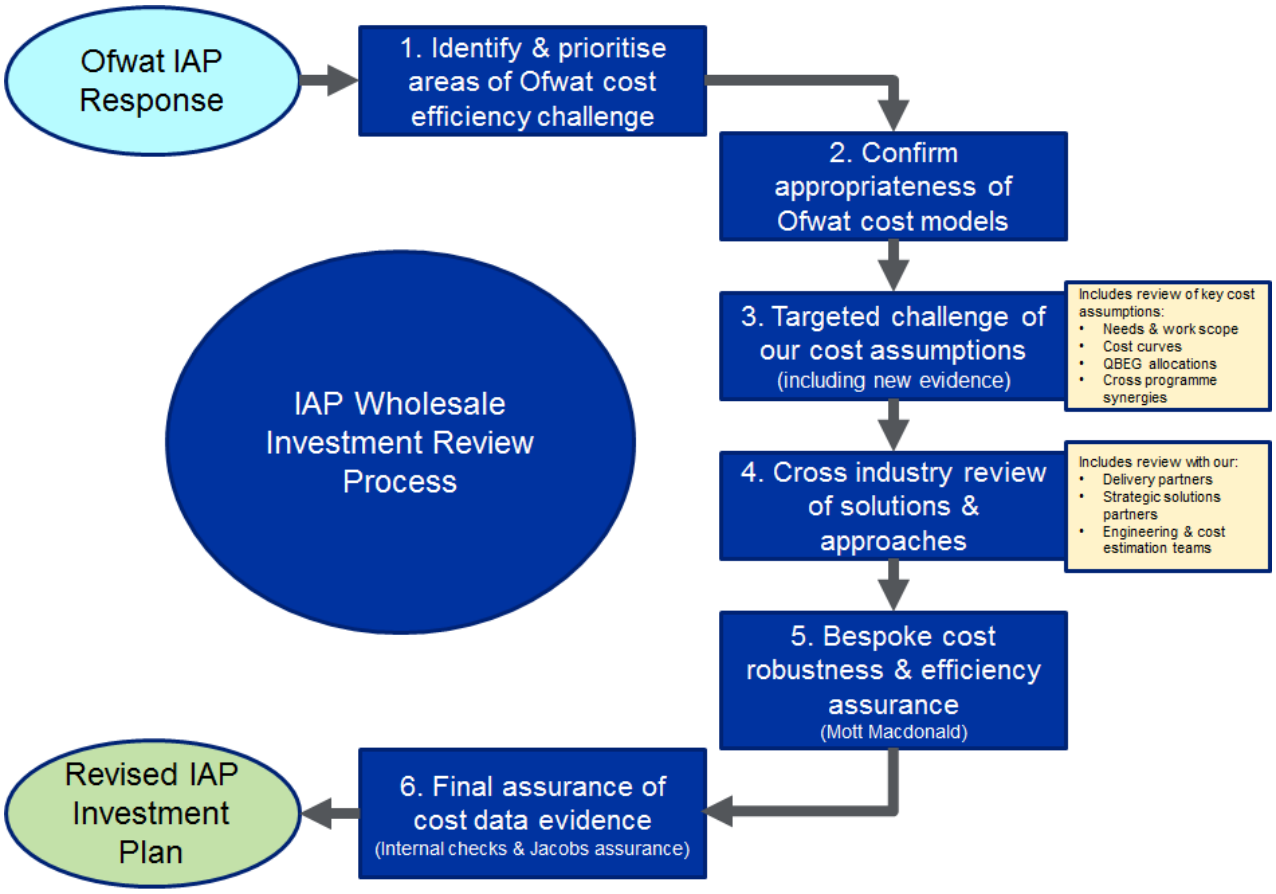
1.1. Identification of further cost saving opportunities

In developing our initial business plan in September 2018, we followed a robust and structured challenge process to help ensure that our totex forecast was in line with industry-wide efficiency improvements and reflected the best available assumptions about future efficiency gains. Our plan incorporated significant efficiency savings.

Ofwat's IAP has provided considerable new information and analysis, which has enabled us to look deeper across the industry and apply further challenge to our cost forecasts since receiving Ofwat's IAP assessment. We have been working hard with our delivery partners to identify the scope for further efficiency savings.

The process we have used to challenge our plan is shown in *CE.A1.Figure 2 – Our IAP wholesale cost review process*.

CE.A1.Figure 2 – Our IAP wholesale cost review process



Through this challenge process, we have removed £443m of totex from our wholesale plan or £353m excluding additional net removals (£90m from -£89m for [redacted], -£7m for chemicals, and +£6m of botex). This comprises:

- **Unit cost efficiency** (£156m): areas where we have reduced the unit costs of delivery of schemes within our plan (e.g. wastewater P-removal costs and water supply / demand internal interconnections), reflecting the unit costs that other companies expect to achieve in equivalent activities.
- **Scope efficiency** (£128m): areas where we have reduced cost by reducing or removing activity from our plan (e.g. wastewater chemical removal and Whitfield growth CAC costs). This has no impact on delivery of our Performance Commitments, but arises from changes to needs, new data, or change of scope of work being undertaken to deliver the same outputs.
- **Error / calculation updates** (£70m): areas where we have updated the calculation of costs in our plan, such as sewer adoptions and botex financial calculation updates (see section 2.1 for more detail on this botex update).
- **Strategic Enhancement Solutions** (£89m): this is a specific area of challenge in our plan where we have removed proposed investment (see section 4.2 for more information on this water capex update).

As part of this challenge process we have also updated the evidence to support our Cost Adjustment Claims. This has resulted in our decision to withdraw our CAC for Whitfield (£26m).

[redacted]

The substantial reduction in our cost forecasts is underpinned by granular, changes to scheme costs. We have not mechanically applied the unit costs provided by the Ofwat models. As such, there continues to be a gap between our revised plan and Ofwat's initial view of efficient costs. This is driven by aspects of Ofwat's cost assessment process which we consider contain material issues and/or errors (see section 1.3 below). Full details of where we have adjusted our costs are provided in Section 4. Costs have been updated in Business Plan Tables WS1, WWS1, WS2 and WWS2.

1.2. Board assurance over cost changes

In addition to a review by our full Board, the Board sub-committee for Delivery and Efficiency has provided further scrutiny and challenge of the revised totex proposals in our plan.

This sub-committee includes non-executive directors with particular experience in the construction and delivery sectors, as well as relevant executive directors. The sub-committee's objective is to challenge the cost and deliverability of our plan. Since September, it has continued to meet to oversee our progress towards delivery of the plan and establishment of our AMP7 delivery model.

Since the IAP, the committee has provided expert challenge of the totex changes in our revised plan, to ensure that our outcomes remain deliverable, that risk is being appropriately managed and that we have identified all of the opportunities to improve design and delivery efficiency.

1.3. The remaining gap with Ofwat's IAP

The revised total costs in our updated plan remain £406m higher than Ofwat's initial assessment at the IAP stage. Having undertaken a rigorous cost challenge process in response to the additional information provided in the IAP, we consider that the costs in our revised plan remain sufficient to allow us to deliver our regulatory and statutory obligations and the priorities of our customers.

In the remainder of this document, we provide evidence in support of our revised costs for each investment area where our costs remain higher than Ofwat's initial allowance. In these areas, we are challenging Ofwat's initial assessment for two key reasons:

- There are material issues and/or errors with aspects of Ofwat's approach that mean it is not appropriate to rely on the initial assessment to set our cost allowance; or
- Having undertaken a comprehensive optioneering and challenge process, there is additional evidence to support our view of efficient costs, which means it is not appropriate for us to lower costs further.

Our assessment, as set out in this response, is based on Ofwat's approach to assessment for the IAP and its current models. We reserve the right for further consultation ahead of the final determination, if Ofwat amends its approach and its econometric models.

Section 2: Base totex ('Botex')

Introduction to this section

Our September Business Plan included £2,293m of botex. At the IAP, Ofwat's view of our efficient botex is £2,056m. When excluding enhancement opex (discussed in Section 3), our business plan botex equated to £2,121m, representing a gap of £65m.

In our revised business plan botex has increased by £6m to £2,127m as a result of two minor adjustments (see section 2.1). This increases the gap between our revised plan and Ofwat's cost allowance to £71m (3.5%).

Having carefully reviewed Ofwat's modelling and other assumptions made for the IAP, we have identified a number of material issues that have an adverse impact on the IAP cost allowance for Southern Water. These include:

- Inconsistent treatment of costs across Ofwat's initial comparison of base efficiency. This results in an artificially larger gap between our submitted botex and Ofwat's view of efficient costs, and leads to the imposition of an inappropriately large company specific efficiency challenge;
- Technical shortcomings in Ofwat's botex econometric models, which limit the reliance that can be placed on the outputs;
- The use of model inputs that are different to the inputs contained in our data tables, which result in a materially lower cost allowances; and
- The application of a 1.5% p.a. frontier 'shift' assumption, which we do not believe is sufficiently supported by evidence.

Further evidence relating to these issues is provided in sections 2.2 to 2.5 below. As a result of these issues, we do not believe it is appropriate to revise our costs (except for the small adjustment set out in section 2.1 below).

2.1. Updates to the costs in our plan

In our revised business plan we have made two minor adjustments to our forecast of AMP7. These are:

- **Capital recharge movement (£6m botex):** as a result of the significant reductions to our capex programme, a greater proportion of fixed costs / overheads are allocated to our base costs. This results in an increase in water botex of £2m and an increase in wastewater botex of £4m.
- **Water / wastewater re-allocation (£11m):** since September, we have updated our full time equivalent (FTE) data that is used to allocate some of the shared operating costs between water and wastewater businesses. The result of this update is to increase water botex by £11m and reduce wastewater botex by £11m (net zero effect overall).

The net effect of these adjustments is an increase in the total botex in our plan of £6m, from £2,121m to £2,127m (excluding enhancement opex). The change of cost allocation from wastewater to water has no impact on our overall base costs. We summarise these adjustments in *CE.A1.Table.2 – Botex movements in our revised plan* below.

CE.A1.Table.2 - Botex movements in our revised plan

Investment Area	SRN September Submission (£m) Gross	Change in SRN costs (£m) Gross	SRN IAP Response (£m) Gross
Wholesale Botex (excluding enhancement opex)	**2120.8**	**6.0**	**2,126.8**
Water Botex (excluding enhancement Opex)	699.6	13.5	713.1
Capital recharge movement		2.1	
Overhead FTE movement		11.4	
Wastewater Botex (excluding enhancement Opex)	1421.2	-7.5	1,413.6
Capital recharge movement		3.9	
FTE movement - Opex		-11.4	

Note: CE.A1.Table 2 excludes opex enhancements

2.2 Inconsistent treatment of costs across Ofwat's initial comparison of base efficiency

In assessing our botex efficiency, Ofwat has treated certain cost items inconsistently, leading to an artificially large gap between our business plan and Ofwat's IAP allowance. As Ofwat has relied on this botex assessment to inform its level of company specific challenge on enhancements, this inconsistency results in too large a challenge to our enhancement costs.

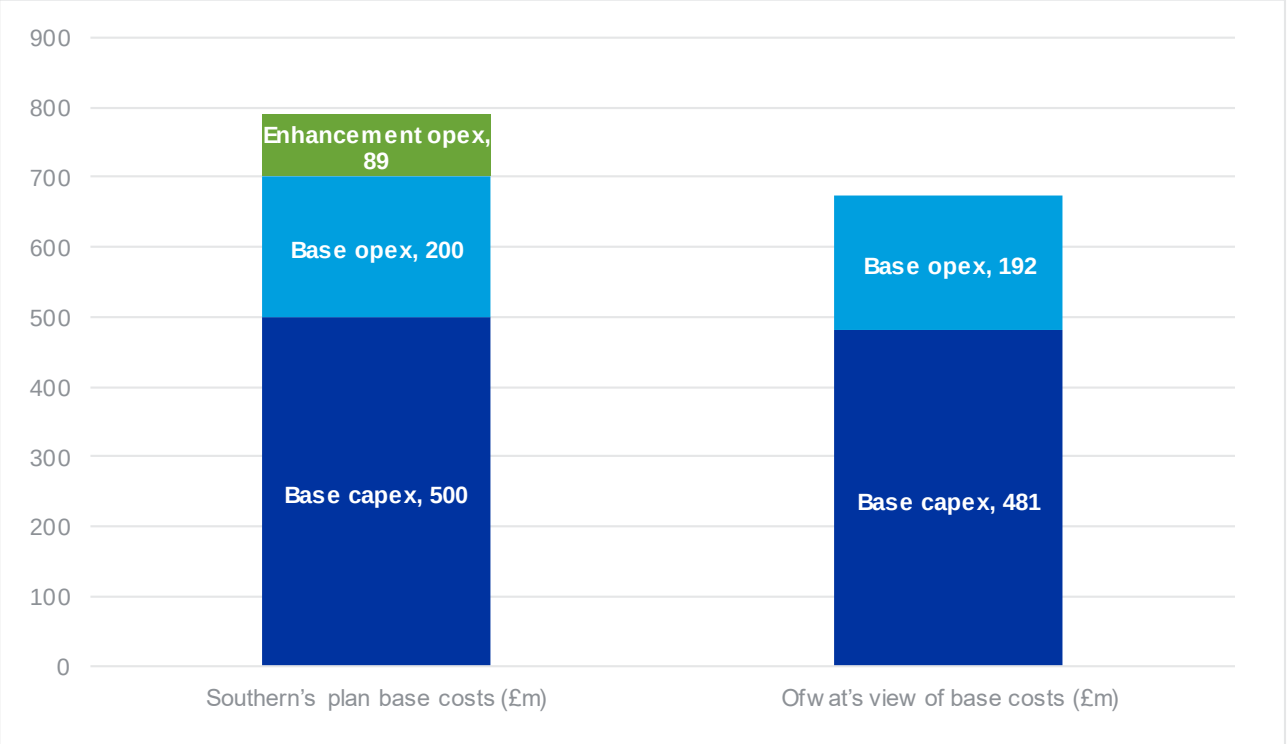
As *CE.A1.Table 3 – IAP assessment of base costs* shows, our business plan included £789m of base costs for wholesale water activities. These base costs are made up of three cost blocks: base capex (£500m), base opex (£200m) and enhancement opex (£89m).

CE.A1.Table 3 – IAP assessment of base costs

	Water	Wastewater	Total
Southern's plan base costs (£m)	788.8	1,504.4	2,293.2
Ofwat's view of base costs (£m)	672.7	1,383.3	2,056.0
Efficiency challenge (£m)	116.1	121.1	237.2

While all three blocks were included in the calculation of our submitted base costs of £789m, Ofwat's view of base costs excludes the final element (enhancement opex). *CE.A1.Figure 3 – Base cost comparison in wholesale wastewater* shows this graphically. This inconsistency results in an artificially inflated view of the inefficiency of our base costs.

CE.A1.Figure 3 – Base cost comparison in wholesale water



Note: Ofwat has assumed base opex to be the same proportion of total costs as in our plan.

On water, this inconsistency means the allowance of £673m for Southern Water, excludes £36m of opex enhancement allowances made by Ofwat (for Target 100 activities, assessed in the supply/demand model). This results in a 30 per cent greater efficiency challenge than a 'like for like' comparison. As Ofwat has informed its level of company specific challenge for enhancement costs on the efficiency of companies botex, this subsequently has a material impact on the assessment of our enhancement costs.

There is a similar issue on wastewater due to inconsistencies with the treatment of P-Removal (£8m) enhancement opex. While the impact of this is relatively small as a proportion of the IAP comparison, it is material for the assessment of our revised costs for the draft determination.

As we set out in Section 3, we believe Ofwat need to assess enhancement opex separately for the draft determination. In any case, Ofwat should ensure that the comparison of costs between our revised plan and its own calculated cost allowances is on a like-for-like basis, such that the size of any gap is not overstated.

Remedies for the Draft Determination

- Ofwat should assess opex enhancements separately for the draft determination and should ensure that its comparison of botex between company and Ofwat view is on a like-for-like basis

2.3. Ofwat botex models

Ofwat has developed a suite of 16 wastewater and five water econometric models. Ofwat averages the results of the different models to calculate allowed base costs for water and wastewater. In developing the models, Ofwat has undertaken a collaborative process with companies and consulted on a draft set of models in March 2018.

We welcome the way that Ofwat has sought to engage with companies in the development of its models. We note that the IAP models reflect many of the key issues flagged by Southern Water and other companies, including separating the assessment of base and enhancement costs by not modelling totex, and ensuring that the models do not create perverse incentives through the use of Distribution Input as scale driver.

We discuss Ofwat's IAP model suite, water service models, and wastewater service models in turn.

2.3.1. Ofwat's IAP model suite

The models that Ofwat has used for setting IAP cost allowances have changed considerably since March 2018. We therefore asked Oxera to carry out an independent assessment of Ofwat's updated suite of econometric models. A copy of Oxera's assessment is provided as a supporting document *IAP_TA11_CE_ Oxera Modelling Review*.

The main conclusions of Oxera's review were:

- The cost base definition presents a number of issues. In particular, the inclusion of opex within historical botex assessment, without associated cost drivers, could result in omitted variable bias as well as lead to inappropriately stretching efficiency challenges.
- Ofwat's decision to rely on parsimonious botex models, with limited triangulation across models with alternative specifications, increases the risk of inadequately capturing important industry cost drivers.
- Ofwat's approach to assessing frontier shift has a number of issues, including the lack of allowance for RPEs, the use of comparator sectors and time periods that are likely to overstate the growth in productivity, as well as an overlay of implausible assumption on the benefits of a totex and outcomes frame.

We agree with Oxera's general assessment of the overall robustness of these models. In addition, there are some specific issues in terms of the application of the models to Southern Water. We discuss these issues in more detail below.

2.3.2. Water service model issues

In relation to the water service botex models, we raise two issues. Firstly, significant uncertainty arises from changes to Ofwat's definition of booster pumping stations made *after* the submission of business plans. Second, we note that there is materially greater uncertainty in Ofwat's bottom-up model, yet Ofwat gives it equal weighting in its assessment.

Changes to the definition of booster pumping stations

The number of booster pumping stations is a key component of the Treated Water Distribution model (TWD1), which represents over half of the efficient cost assessed for Southern Water via the "bottom-up" assessment. It is also used in both of the "top-down", wholesale water models (WW1 and WW2).

Since submission of our business plan, Ofwat has clarified its guidance on what constitutes a booster pumping station[1]. We support the change in definition, which more fully captures the costs associated with operation of the water network. For Southern Water, this change in definition will increase the number of booster pumping stations by circa 40%.

Taken on its own, using the new booster pumping station numbers in the IAP model would increase our allowed costs significantly (>£50m, which represent 70% of the current gap between our botex forecast and Ofwat's initial view). On the assumption that the revised definition is likely to lead to significant changes in the number of pumping stations for all companies, Ofwat will need to recalibrate the affected models. This means that the magnitude of the impact is difficult for us to gauge without access to other companies' data. However, because of the dominance of smaller borehole sources within our area with boosters at the treatment works, we believe the increase will be proportionately greater for Southern Water and hence result in a material increase in our cost allowance.

Greater uncertainty in the "bottom-up" assessment models

As we have identified previously, including in our response to Ofwat's modelling consultation, granular value chain modelling often results in assessments with greater statistical uncertainty. This is because it can fail to capture trade-offs between different parts of the value chain, leading to inferred efficiency levels that are not achievable in practice.

In this respect, we welcome Ofwat's decision in the IAP not to assess water resources as a separate business unit, opting instead to assess "water resources plus", which will allow more of the trade-offs between resources and treatment to be captured. Nonetheless, it is clear that the resulting "bottom-up" granular assessment results in a range of efficiency scores (60%-138%, representing a range of 78 percentage points) that are more than twice as wide as those in the "top-down" assessments (82%-117%, representing a range of 35 percentage points). This means that the level of cost variance attributed to efficiency is more than twice as large in the "bottom-up" assessment as in the "top-down" assessment.

For Southern Water there is a material difference between the allowances derived from the two models, with the bottom-up cost allowance being £47m less than the top down. Given the magnitude of this difference, and the differences in fit between the models, we think Ofwat should attach more weight to the top-down assessments.

Remedies for the Draft Determination

- Ofwat should recalibrate its IAP models which use booster pumping stations as a cost driver, to reflect the updated definition
- It should also consider the relative weighting given to different models to better reflect model quality.

[1] Ofwat's original definition for Data Table Wn2 Line 31 was *"booster pumping stations **within** the distribution system."* Ofwat's new definition (Initial Assessment of Plans Q&A, 11th March 2019) states that we now need to include *"any site that boosts potable water **into** the distribution system."* This increases our annual average from 174 to 250.

2.3.3. Wastewater service model issues

In relation to wastewater models, we have particular concerns about the modelling of wastewater treatment scale economies and network density, which result in an inappropriate assessment of our costs overall.

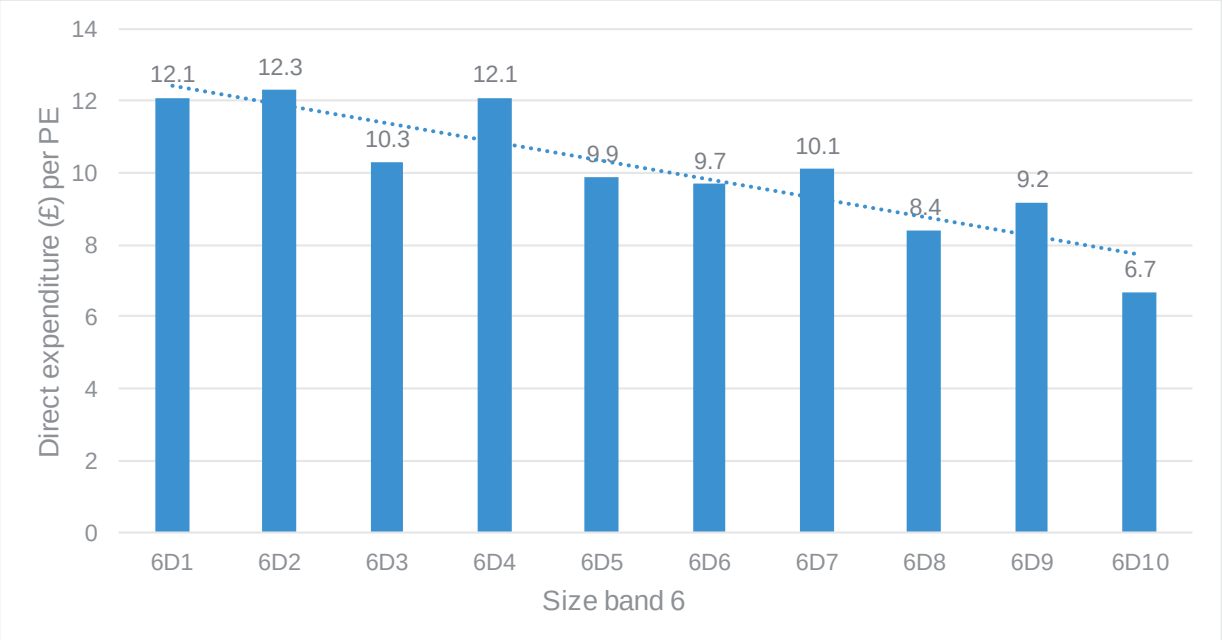
Assessment of economies of scale in treatment

Ofwat recognises in its modelling that there are significant economies of scale associated with wastewater treatment and this finding is consistent with the underlying economics. Ofwat's models control for economies of scale through the inclusion of two variables: (i) the number of treatment works in the smallest size Bands 1-3, and (ii) the number of treatment works in the largest size band, Band 6.

Band 6 captures all works with a capacity of greater than 1,500 kg/BOD/day. However, within Band 6, the largest works have the capacity to treat over 220,000 kg/BOD/day. This means size Band 6 encompasses very different sized works, with materially different costs of treatment.

Based on the data submitted by companies in September, *CE.A1.Figure 4 – Average unit cost of works within size Band 6* below shows the average unit costs of treatment for works in each decile by size. As this shows clearly, costs decline progressively with size; the largest works within size Band 6 have costs that are almost half of the costs of the smallest 40% of Band 6 works.

CE.A1.Figure 4 - Average unit cost of works within size Band 6



Source: Ofwat[2]

[2] Ofwat (2019) "Master dataset, wholesale wastewater" Available at: https://www.ofwat.gov.uk/wp-content/uploads/2019/01/FM_WWW1.xlsx [last accessed 29/03/2019]

Southern Water has very few larger works within size Band 6. The largest decile within Band 6 contains only two (out of 39) of our Band 6 treatment works. This is the second fewest in the industry. The use of Band 6 as a single cost driver will therefore tend to materially overstate the economies of scale in our works (and understate those enjoyed by companies with a greater proportion of the largest treatment works). Our preliminary modelling, introducing a new variable to capture the proportion of the very largest works, meets the relevant statistical tests and suggests that the impact for Southern Water could be in excess of £100m.

We therefore think that Ofwat should further review how it captures the impact of economies of scale within the model, to better capture the scale economics associated with the largest works within size Band 6.

Assessment of density

Ofwat uses two measures of population density as key cost drivers within its sewage collection models (SWC1 and SWC2). The intention behind this is to capture the costs associated with serving densely populated areas (e.g. urban centres). The measure used in SWC2, Weighted Average Density (WAD), is a bespoke and constructed variable, while model SWC1 uses a simpler measure (number of properties/sewer length).

If the two variables produced broadly similar results then this would provide evidence of a more robust set of cost allowances. However, for Southern Water – and indeed for all but two companies – the complex, constructed variable produces materially lower cost estimates. In our case, the difference is £70m.

Having considered closely the WAD variable, we have identified that it suffers from a significant statistical shortcoming as its statistical validity relies entirely on the inclusion of a single large outlier company (Thames Water). Removal of the outlier Thames Water would mean that the variable was no longer statistically robust. This indicates the WAD does not represent significant cost driver for the industry, but is instead capturing differences between a single, large, outlier company and the industry. Given this, we do not believe it is appropriate to rely on the WAD in assessing the allowances for other companies.

The inclusion of the WAD variable also significantly reduces the weight attributed to other important cost drivers. Most notably, it lowers the costs associated with pumping capacity, a variable we believe there are good operational and statistical grounds for including as a cost driver.

Given these issues with the SWC2 model, we believe Ofwat should apply the full weighting to SWC1 in assessing our cost allowance.

Remedies for the Draft Determination

- Ofwat should reconsider the use of a single scale economies variable for large treatment works, to better capture the significant differences within size Band 6.
- Ofwat should apply the full weighting to SWC1 in its assessment of efficient costs, giving no weight to SWC2 which relies on a density variable that is not statistically robust.

2.4. Model data inputs

In our business plan, we provided significant quantities of well-evidenced and externally assured cost driver data. In the IAP models, there are material differences between the inputs used by Ofwat and the data table inputs we provided that reflect Southern Water's particular circumstances. These differences amount to a net impact of £10m (around 15% of the gap between our business plan costs and Ofwat's IAP view of efficient botex).

Moreover, we expect this impact could increase considerably once Ofwat has addressed cross-company issues with booster pumping station definitions (as discussed above). We believe the use of company-specific forecast data, with appropriate challenge, will better represent the efficient costs of delivery in AMP7.

2.4.1. Ofwat's data inputs (cost drivers)

In order to form an independent view of cost drivers and ensure a consistent base across companies, Ofwat has used several techniques to forecast model inputs across water and waste. These include: i) a simple linear time trend extrapolating data from AMP6; ii) applying the most recent year's data; and iii) a simple average of the final three years of AMP6 as a flat figure across AMP7.

We recognise that developing an independent view of cost drivers is important to protect against the risk of unrepresentative forecasts in company business plans. However, these generic forecasting techniques produce data that are far less robust than the forecasts set out in our plan. Our forecasts have been carefully estimated, based on a deep and granular understanding of our future demand, supply and regulatory requirements. They therefore provide a significantly more robust reflection of the true cost drivers for AMP7.

In many cases, a step change in growth is expected in AMP7 (which materially affects inputs such as sewer length and the number of households/properties), which means that forecasting growth based on historical performance is not appropriate. Ofwat considers this in its Technical Appendix 2 on cost efficiency, noting that in some cases it is more appropriate to use company forecasts. We consider that Ofwat should apply this approach more widely.

Ofwat has also changed its definition of booster pumping stations[3], as discussed in Section 2.2.2 above. In isolation, this results in a significant increase to Southern Water's botex allowance. However, we recognise that this issue will be prevalent across companies and therefore will likely result in a change to Ofwat's model coefficients when aggregate changes are incorporated into Ofwat's botex model. In anticipation of changes to Ofwat's model across all companies, and notwithstanding the new definition which will result in a greater correction, we present in this response the correction of the booster pumping station input to our initial forecast only. We expect the net impact of model input corrections to be much greater than £10m when this issue has been addressed.

[3] Ofwat's original definition for Data Table Wn2 Line 31 was *"booster pumping stations **within** the distribution system."* Ofwat's new definition (Initial Assessment of Plans Q&A, 11th March 2019) states that we now need to include "*any site that boosts potable water **into** the distribution system."* This increases our annual average from 174 to 250.

2.4.2. Implications for our botex allowance

In *CE.A1.Table 4 – Summary of key model input discrepancies* below, we set out the most material differences between Ofwat's cost drivers and our cost drivers, in terms of the impact on our cost allowance.

We have assessed the impact of changing the inputs by changing the individual cost driver in isolation, holding other drivers constant. But we note that we observed a similar impact when all costs drivers were changed simultaneously. We present cases where the errors both advantage and disadvantage our cost assessment in the interests of full transparency.

For other cost drivers, the differences between forecasts are small and in isolation result in an immaterial impact on our totex allowance. We set these out in Appendix 1 for completeness and because they contribute to the aggregate impact, which is material.

CE.A1.Table 4 – Summary of key model input discrepancies

Waste/ water	Econometric model input	Issue	Impact of correcting input on SRN allowance* (£m)
Waste water	Pumping capacity / km	Ofwat uses a flat figure for pumping capacity in its econometric models. It is not clear why Ofwat has used a flat year-on-year trajectory per km sewer, when its own estimated figures on km sewer (which we also challenge in Appendix 1) increase year-on- year. This is mathematically incorrect. Pumping station capacity has increased by an average of 2% each year of AMP6. We expect this growth to continue and therefore consider Ofwat's flat figure to be inappropriate.	17.1
Waste water	Number of properties / km sewers	Our forecasts of property growth in our catchment comply with the guidance for water resources planning, as issued by the Environment Agency in collaboration with DEFRA, Ofwat, and the Welsh Government. Accordingly, it is based on housing projections by local authorities in their local plans. The use of any alternative approach for forecasting growth is inconsistent with Ofwat's own recommended methodology. Ofwat's use of a linear time trend to forecast the number of properties does not consider the step change in growth that we expect. Our catchment is expected to experience some of the fastest growth in housing development, for example around Gatwick, Ebbsfleet and Brighton. Similarly, Ofwat have used a linear time trend to forecast sewer length. As with the above, we expect a step change in growth for AMP7 that is inconsistent with the growth seen in AMP6.	6.7
Waste water	Load received at STWs (kg/BOD/yr)	Our estimated load received at sewage treatment works is based on forecast population growth from SAGE, which uses official ONS population growth forecasts. We assume 0.06kg of BOD produced by each person/day. This is an industry	-13.4

		standard set by Ofwat[4] and repeated in Environment Agency guidance[5]. An allowance for cess, trade, and non-residential population equivalent has also been factored into our estimates. Our estimates are based on a "bottom-up" approach that is more accurate and sophisticated than a simple extrapolation. In this case, Ofwat has over-estimated load which results in a higher cost allowance than our forecasts suggest is necessary.	
Water	Number of properties	The same reasoning applies as with the number of properties forecast in wastewater (see above). The use of any alternative approach for forecasting growth is inconsistent with Ofwat's own recommended methodology	-8.0
Others			7.3
Total			**9.8**

** Average across "bottom up" and "mid-level"/"top-down" models*

Remedies for the Draft Determination

- Ofwat should update the cost driver forecasts used in its botex econometric models to ensure that company-specific circumstances (including growth) are captured.

[4] For example, see "2018 Annual Performance Report Tables [Section 4N]" (Ofwat, 2018)
[5] For example, see "Waste water treatment works: treatment monitoring and compliance limits" (Environment Agency, 2019)

2.5. Efficiency frontier shift

Our September business plan included an efficiency frontier assumption of 1.0% p.a. This was based on an expert report from Oxera (which suggested an assumption of *less than* 1.0%) and Ofwat's view that there should be additional efficiency gains in the water sector arising from the move to a totex and outcomes framework[6].

Ofwat is proposing to apply a 1.5% p.a. frontier shift assumption. This is higher than recent precedents in both the water sector as well as other regulated sectors, including the CMA's conclusions on the appeal by Bristol Water[7]. The additional 0.5% p.a. efficiency shift applied by Ofwat at the IAP equates to an additional challenge of c.£10m for water and c.£20m for wastewater.

In developing their own estimates, water companies also commissioned studies from independent experts. As *CE.A1.Table 5 – Summary of frontier estimates by water companies in September business plans* below shows, the 1.5% assumption is notably above the assessment carried out by independent consultants.

CE.A1.Table 5 – Summary of frontier estimates by water companies in September business plans

Water company consultant	Water companies	Frontier shift estimate per year
Oxera	Southern Water, South East Water	0.6% to 0.8%
Economic Insight	Northumbrian Water, Wessex Water, Yorkshire Water	0.3% to 0.7%
NERA	Bristol Water	0.6% to 0.7%

Source: Ofwat (2019)

Ofwat's 1.5% frontier shift is based on two key estimates[8]:

- **1% p.a. of ongoing efficiencies in the sector**. This is based on research by Europe Economics, which suggests the frontier shift could be 0.6% to 1.2% per year for total expenditure, and 0.6% to 1.4% per year for base expenditure (excluding enhancement). Europe Economics estimates are based on historical productivity growth and the growth of better-performing sectors. Europe Economics recommend using a number towards the upper end of their range.
- **A 0.5% p.a. one-off efficiency gain** due to the introduction of the totex and outcomes framework. This is based on research by KMPG, which suggests an additional annual gain of 0.2% to 1.2% from the new price control regime. KPMG suggest the total frontier shift could range from 0.6% to 2.5%.

We commissioned a review of the evidence to support these estimates from Oxera[9] (*IAP_TA11_CE_Oxera Modelling Review*). In addition, Water UK[10] commissioned a further review from John Earwaker/First

[6] Ofwat (2018), 15 March 2018 Workshop on Totex and Outcomes https://www.ofwat.gov.uk/15-march-2018-workshop-totex-outcomes/
[7] The CMA used a 1.0% pa assumption, relative to RPI.
[8] Oxera have determined the breakdown of the 1.5% frontier shift from Ofwat's feeder model used to determine companies' modelled cost allowances. Specifically, 'Feeder model 4: Wholesale water – Water resources and water N+ cost allowances" (Ofwat, 2019).
[9] Oxera (2019), "Ofwat's base expenditure models at the IAP: a general review"
[10] Earwaker, J. (2019) "A Review of Ofwat's PR19 Approach to Estimating Frontier Shift"

Economics. Both conclude that there are shortcomings in Ofwat's evidence and that the frontier shift assumption is not justified. Their views are summarised in section 2.5.2 below.

2.5.1. Southern Water efficiency estimate

For our September Business Plan, we asked Oxera to provide an independent analysis of the potential scope for frontier shift (see *IAP_TA11_CE_Oxera Efficiency and RPEs*). This analysis considered Total Factor Productivity (TFP) in the water sector, as well as other relevant sectors, net of expected Real Price Effects (RPE). Based on this, Oxera's analysis projects real input price pressure of approximately 0.2-0.5% per annum for both water and wastewater services[11]. This results in net annual efficiency gains (TFP less RPE) of less than 1% across AMP7.

We also took account of the analysis presented at Ofwat's Totex and Outcomes Workshop (15 March 2018), which suggested a greater scope for efficiency improvements compared to Ofwat's previous principles-based framework for PR14. Based on this, we adopted a more stretching assumption than indicated by Oxera's analysis (1.0% cumulative annual increase, or 3% on average over the AMP, applied to modelled costs). Ofwat's claim that water companies have not appropriately accounted for the one-off efficiency gains from moving to a totex and outcomes framework therefore does not apply to our estimate.

2.5.2. Ofwat's 1.5% frontier shift assumption

We have reviewed the studies published by Ofwat to understand whether an assumption of 1.5% efficiency frontier shift is appropriate. Our conclusion is that it is not. This is based on a number of issues, each of which is described in more detail in the Oxera (see *IAP_TA11_CE_ Oxera Modelling Review*) and Earwaker/First Economics reports[12]. We discuss the key limitations of Ofwat's estimates of the ongoing and one-off efficiency estimates in turn.

Ongoing efficiency assumption

- **Ofwat's use of less representative sectors**

  The upper bound of Europe Economics' estimate of the frontier shift for wholesale botex (0.6% to 1.4%) is derived using TFP growth in stronger-performing comparator sectors in certain time periods. Ofwat's approach does not consider how representative such sectors are of water activities, or the appropriateness of the time period in question (Oxera, 2019). In addition, Ofwat places an equal weight on productivity in comparator sectors, ignoring whether these sectors have similar characteristics to a water company (Oxera, 2019).

- **Ofwat's lack of allowance for real price effects (RPEs) is flawed**

  Ofwat makes no adjustment for real price effects, on the basis that CPIH indexation will capture the input price inflation faced by the sector. However, it does not acknowledge or adjust for the converse. That is, if CPIH indexation captures industry input price pressures, then productivity growth will also be captured within CPIH to a non-trivial degree (Earwaker/First Economics, 2019).

  In addition, Ofwat effectively only considers wages and material, plant and equipment inflation in its estimations. These together comprise only just over half (55%) of relevant totex. No account is taken

[11] Ofwat notes that Southern Water did not project any real price effects for AMP7 in their "Technical Appendix 2: Securing Cost Efficiency" (January 2019). We would like to emphasise to Ofwat that our independent analysis, as conducted by Oxera, did find evidence of real price effects, which are incorporated into our frontier shift assumption of 1% annual efficiency.

[12] Available from: http://www.first-economics.com/PR19frontiershift.pdf

of cost pressures in the remaining half of the cost base (Earwaker/First Economics, 2019). Ofwat's assertion that management can 'control' prices, through things like hedging or long-term contracts, is flawed. These tools can help manage price volatility but cannot insulate water companies from input price increases entirely

By analysing productivity growth and input price pressures separately, Europe Economics has not accounted for the conceptual relationship between the two. Specifically, that productivity growth tends to drive increases in real wages such that in the long-run, real wages are broadly in line with economy-wide labour productivity (Oxera, 2019).

- **Ofwat's approach is inherently backward-looking**

  Given the forward-looking nature of the assessment, it would be more appropriate to place greater weight on forecasts of real wage growth and productivity (Oxera, 2019). In most recent forecasts, nominal and real wages are increasing; for example, OBR average nominal earnings growth for 2021-23 are in the range of 3-3.2%[13].

  Regarding productivity growth, which has remained slow since the 2008 financial crisis, we question whether using a blend of pre and post-crisis productivity growth provides a good estimate of the likely rate of growth for AMP7. The OBR recently revised its annual productivity growth assumption down by 0.7%[14] and it is not reasonable to assume that the water sector will not be immune to the factors driving this slowdown (Earwaker/First Economics, 2019).

One-off efficiency assumption

- **Ofwat's assumption that outperformance reflects efficiency gains**

  Ofwat have assumed that the outperformance of companies *entirely* reflect efficiency gains, building this assumption into their models. In reality, outperformance is driven by numerous factors, including the regulator's determination, the external macroeconomic environment, and company-specific-factors (Oxera, 2019). As such, undue weight is placed on historical performance as an indicator of the possible scope of the efficiency frontier.

- **Ofwat's focus on the electricity distribution price control**

  KPMG's report draws conclusions on the one-off totex/outcomes-related efficiency gain from the RIIO-ED1 electricity price control. This is the only price control where a totex framework has been in place for more than one control period. This approach relies on the assumption that the experience in electricity distribution networks will be repeated in the water sector, an assumption which is not necessarily founded in compelling evidence (Oxera, 2019).

Remedies for the Draft Determination

- Ofwat should reduce the frontier efficiency assumption from 1.5% to 1.0% in line with our plan (this equates to c.£10m in water totex and c.£20m in wastewater totex).

[13] Office for Budget Responsibility (20118), 'Economic and fiscal outlook', October, https://obr.uk/efo/economic-fiscal-outlook-october-2018/.
[14] Office for Budget Responsibility (2017), "Economic and fiscal outlook, November 2017" http://obr.uk/efo/economic-fiscal-outlook-november-2017/

2.6. Unmodelled costs

Our September business plan included £303m of botex which Ofwat has excluded from the scope of its botex modelling, principally on the basis that they are not entirely within management control. These costs consist of abstraction charges, lane rental costs and local authority rates, along with pension deficit repair costs and third party services.

Ofwat has allowed for £244m of these costs in the IAP. The differences consist of: i) a small challenge on traffic management costs and wastewater rates, which we have accepted in full; ii) a discrepancy in our plan in respect of water business rates; and (iii) differences in pension deficit repair costs. We discuss the latter two below.

CE.A1.Table 6 – Summary of unmodelled costs in our botex

Scheme		SRN Sept submission (£m)	Ofwat IAP (£m)	SRN IAP response (£m)	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Abstraction charges		23.3	23.3	23.3	0	0	0
Business rates	Water Waste	71.8 68.3	57.5 66.8	57.5 66.8	14.3 1.5	14.3 1.5	0 0
Traffic Mgmt. Act	Water Waste	10.0 1.1	9.0 0.9	9.0 0.9	1.0 0.2	1.0 0.2	0 0
Pension Deficit Repair Costs	Water Waste Retail	24.9 54.3 6.6	12.7 28.0 3.4	24.9 54.3 6.6	12.2 26.3 3.2	n/a	12.2 26.3 3.2
Third party services	Water Waste	33.1 9.4	33.1 9.4	33.1 9.4	0 0	0 0	0 0
Total		**302.8**	**244.1**	**285.9**	**58.7**	**17.0**	**41.7**

Water business rates

Our September business plan did not reflect the benefit of a rates revaluation in the business rates line, reporting it instead as a negative cost in the other opex line (see Ofwat query SRN-IAP-CA-023). We have corrected this in our revised plan costs, effectively removing the difference on water rates. This has no impact on the total botex in our plan, but does increase the size of the efficiency gap in respect of modelled costs.

Pension deficit repair costs

In our September business plan we included our forecast of the actual pension deficit repair payments that we expected to make over AMP7. We recognise, however, that Ofwat had set out clearly its approach to pension deficit repair costs at PR09, and that the allowance made in price limits would therefore be less than our actual costs. In our revised plan, we have retained our forecast of the payments we expect to make, but we recognise that these will not be allowed for in full within our price limits. The difference will be funded by shareholders.

Section 3. Recognition of enhancement costs

Introduction to this section

This section highlights a number of issues in relation to Ofwat's recognition of costs associated with delivering enhanced service levels in AMP7. These are costs that have not been included within Ofwat's enhancement models and are not adequately reflected in Ofwat's botex models. These costs are principally costs that were included as opex in our plan, but include some capex.

These costs fall in to four separate categories:

- The costs of delivering service level enhancements for leakage, pollution and flooding
- Opex arising from capital investment (e.g. additional power, chemicals costs)
- The costs of delivering our statutory obligations in respect of studies and investigations
- Catchment management costs

In the case of the first two categories, Ofwat has made no explicit allowance, but assumed that these costs are to be funded from base cost allowances (botex). In respect of the latter two, the classification of costs as between capex and opex appears to have led to different treatment between different companies, with costs categorised as opex being disallowed.

In total, the costs associated with these four areas total £178m, as shown in *CE.A1.Table 7 – Enhancement costs not recognised in the IAP cost allowances* below.

CE.A1.Table 7 – Enhancement costs not recognised in the IAP cost allowances

Section	Area of challenge	Water (£m)	Waste (£m)	Total (£m)
3.1	Costs of delivering service level enhancements	33	27	**60**
3.2	Opex arising from capex (AFCs)	11	42	**53**
3.3	Studies and Investigations	18	23	**41**
3.4	Catchment management	14	10	**24**
Total (£m)		**76**	**102**	**178**

Of the £185m included in our September business plan, we are not challenging the removal of £6m associated with non-essential use and temporary use bans restrictions, which we accept should be captured in the historic base costs used for developing Ofwat's econometric models. Due to removed schemes from the plan we have also removed £1m of wastewater opex AFC challenge too.

The remaining £178m are costs that we believe should be recognised by Ofwat in the draft determination. We provide more evidence in relation to each of these categories below.

3.1. Costs of delivering service level enhancements

In its final methodology, Ofwat set out clear expectations in relation to the setting of performance commitments (PCs) for AMP7. It required that, in the absence of clear evidence to the contrary, all companies should reduce the level of pollution and flooding to the forecast upper quartile for AMP7. In addition, it expected all companies to deliver at least a 15% leakage reduction.

Our September business plan included £60m of enhancement totex costs related to delivering these service level improvements. These are shown below in *CE.A1.Table 8 – Summary of initial position and gap to Ofwat's view of efficient costs.* Ofwat's view of efficient costs excludes £52m of these costs, including both enhancement opex and enhancement capex.

CE.A1.Table 8 – Summary of initial position and gap to Ofwat's view of efficient costs

Scheme	Type	Ofwat Table Ref	SRN Sept sub-mission (£m)	Ofwat IAP (£m)	SRN IAP response (£m)	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Leakage	Capex	WS2,Line10	33.1	0.0	33.1	33.1	0.0	33.1
Pollution	Opex	WWS2,Line83	0.4	0.0	0.4	0.4	0.0	0.4
	Capex	WWS2,Line30	10.3	0.0	10.3	10.3	0.0	10.3
Flooding	Opex	WWS2,Line77	5.7	0.0	5.7	5.7	0.0	5.7
	Capex	WWS2,Line36	10.3	7.7	10.3	2.6	0.0	2.6
Total			**59.8**	**7.7**	**59.8**	**52.1**	**0.0**	**52.1**

Ofwat asserts that because companies have delivered service improvements in the past, these costs should therefore be reflected in base allowances. Ofwat states, "*customers should not pay extra costs for companies to deliver stretching targets*"[15]. Ofwat challenges whether companies need additional funding to achieve these targets on the basis that two companies do not request enhancement funding to meet new leakage targets[16].

We do not agree that these costs, which deliver a step change in performance, are reflected in base allowances. Nor does the fact that two companies did not explicitly include any costs in their plan for these improvements provide sufficient evidence to make an industry-wide decision to disallow these costs in full.

We believe these costs are legitimate incremental costs, which are necessary to deliver the step change in service levels that Ofwat and our customers expect to see. Our revised plan therefore retains these costs. Further evidence to support the inclusion of these costs is provided below.

3.1.1. Leakage

[15] *Ofwat (2019), "PR19 Initial Assessment of Plans: Technical Appendix 2 – Securing Cost Efficiency"*
[16] *"Webinar: Securing Cost Efficiency" (7 February 2019)*

Our September business plan included leakage reductions of 15% between 2020 and 2025, in line with Ofwat's expectations and our customers' preferences. By 2025 our leakage levels will be 75 l/prop/day. This is below the level achieved by the frontier company in AMP6[17].

It is well established that as leakage is reduced, the marginal costs of reduction increase substantially[18]. In order to deliver the planned reductions for AMP7 we need to invest in new practices, new technology and critical infrastructure. The costs of this investment total £33m and include the following new activities:

- Installing 15,000 acoustic loggers to increase leakage find and fix efficiency.
- Using advanced pressure management to reduce leakage and bursts using machine learning/AI control of pressure reduction valves.
- Using satellites and drones to remotely sense leaking pipes and allow more rapid remediation.
- Installing new smart meter devices (both to help customers reduce consumption and customer side leakage).
- Combining the above as part of Single Integrated Network Strategy (SINES) into a smart network (see Technical Appendix *BP_TA.11.WN04.Water Networks*) to achieve upper quartile performance in PCC, bursts and appearance (as well as leakage).

Each of these activities is incremental to those carried out in AMP6, where our expenditure has been principally on conventional find-and-fix activity.

Ofwat argues that the costs of reducing leakage are reflected in base costs, because leakage reductions have been delivered in the past. In fact, leakage reductions of these levels have not been achieved for many years. Indeed Ofwat, in the final methodology[19], confirms that, "*The industry achieved large reductions in leakage in the late 1990s, but since 1999-00 leakage levels have remained relatively static.*" If that is the case, the data used to develop the botex models, which spans 2011-2018 cannot reflect the costs of significant leakage reductions.

Furthermore, Ofwat has been inconsistent in its treatment of supply demand options. Expenditure on leakage is a key contributor to balancing supply demand and our 15% leakage reduction commitment forms an integral part of our plan to balance supply demand in AMP7. Yet Ofwat has not allowed for any of the costs of this leakage reduction in its supply demand model. Other demand management options, such as water efficiency, have been included, along with supply options. This inconsistent treatment creates a perverse incentive for companies to minimise the contribution of leakage to balancing supply demand, on the basis that it is the only option for which no funding is allowed. We do not believe that is what Ofwat would have intended.

Independent review

Given the importance of this issue to the sector, along with a number of other companies we commissioned a report from NERA on the appropriateness of Ofwat's IAP approach.[20] A copy of their report, which supports our own views, is available online.

[17] *See, for example, Discover Water website*
[18] *UKWIR, The Economics of Balancing Supply and Demand, UKWIR Report Ref. No. 02/WR27/3, 2002*
[19] *Ofwat (2017), "Delivering Water 2020: Our Final Methodology for the 2019 Price Review"*
[20] *Nera (2019), "Assessing Ofwat's Funding and Incentive Targets for Leakage Reduction"*

Nera's report concludes that:

- Ofwat's models will systematically understate companies' investment requirements as they will not capture the step change in companies' leakage reduction expenditure.
- Failure to allow for enhancement expenditure associated with leakage reduction is inconsistent with precedent from PR14 and from other sectors.
- Ofwat's single median unit cost approach to funding reductions greater than 15% will not capture the tendency of unit costs to increase for attaining and maintaining lower levels of leakage.

Based on the above, they recommend that changes to Ofwat's funding are required to ensure companies can fund the efficient costs of delivering large leakage reductions in AMP7. They set out a number of options for doing so, including developing appropriate cost assessment tools, which recognise the increasing unit costs of leakage reduction or revising the "gated" approach to allowing for the costs of delivering leakage reductions.

3.1.2. Pollution and flooding

Our September business plan included a 43% reduction in the number of Category 1-3 pollution incidents and a 42% reduction in flooding (from 2016 performance to 2024). In both cases, our plan targets were set to deliver performance at the forecast upper quartile level of performance in AMP7, in line with Ofwat's guidance.

In the IAP Ofwat has imposed a further stretch, setting our targets at a lower level than included on our plan, but removing all costs associated with delivery. The pollution target that Ofwat has imposed represents a level of 19.5 per 10,000km sewer by 2024. In 2017, only one company (Northumbrian Water) achieved a level of pollution incidents below this according to the Discover Water website. The flooding target that Ofwat has imposed represents a level of 1.34 per 10,000 connections. Similarly, only one company in the sector (Wessex Water) has delivered historical performance at this level (based on shadow reporting of the new metric). This means that the historical costs used in the Ofwat models cannot fully reflect the costs of operating at this level, which will require significant investment in new capabilities and ways of working.

The network investment required to deliver reductions in these two areas is closely linked. Our plan included a combined total of £27m to deliver these service improvements, including:

- Installation of advanced telemetry at 33 priority sites and 105 new flow monitors to enable enhanced data and analytic capabilities along with intelligent sewer level monitors and alarms that will feed data into a real time system.
- Enhanced response co-ordination and automation allowing us to deliver faster emergency responses.
- Investment in advanced analysis tools, including predictive blockage analytics.
- Increased analysis into understanding surface water flow and the utilisation of SUDSs within our Catchment First principals to reduce flooding incidents
- A significant expansion of our award-winning education and intervention programme, targeting blockages from fats, oils and greases and wet wipes.

Each of these activities is incremental to those carried out in AMP6, representing a step change from a focus on reactive maintenance to predictive analytics and monitoring to prevent incidents. They are not activities that will be well represented in the historic data set. Furthermore, while the flooding and pollution cost functions are less well understood than for leakage, particularly at the low levels of our plan targets, it is reasonable to assume that there are similar diminishing returns on investment in these areas, meaning that the costs increase significantly at lower levels. Ofwat's approach does not take any account of this but implicitly assumes constant (or even increasing) returns to scale.

We provide further evidence to contest Ofwat's IAP assessment in the wastewater growth model section (section 4.3.2).

Remedies for the Draft Determination

- Ofwat should develop appropriate assessment tools to ensure that the efficient costs of delivering the service level improvements it has imposed, and which our customers have told us they are willing to pay for, are allowed for in price limits.

3.2. Opex arising from enhancement capex (AFCs)

Our September business plan included £54m of opex arising from enhancement capital investment (AFCs).

In our revised plan, we have removed £1.2m of AFCs relating to chemical removal and sanitary parameter schemes, where we have removed schemes associated with WINEP drivers. We have not removed any further costs, as we consider these costs to be efficient, necessary to meet our statutory obligations, and not taken account of by Ofwat in its IAP cost allowance.

A full schedule of the AFCs included in our plan is provided in *CE.A1.Table 9 – AFCs summary* below. Individually many of these are small, but combined they are very material. In this section, we provide evidence and arguments for why these costs should be allowed for.

CE.A1.Table 9 – AFCs summary

Cost line (water/waste)		Ofwat Table Ref	SRN Sept submission (£m)	Ofwat IAP (£m)	SRN IAP response (£m)	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Raw water deterioration	Water	WS2 Line 52	9.4	0	9.4	9.4	0	9.4
Supply / Demand	Water	WS2 Line 46	1.0	0	1.0	1.0	0	1.0
SEMD	Water	WS2 Line 54	1.0	0	1.0	1.0	0	1.0
Eels Regulations	Water	WS2 Line 41	0.01	0	0.01	0.01	0	0.01
P-Removal	Waste	WWS2 Lines 65+66	18.6	0*	18.6	18.6	0	18.6
Nitrate Removal	Waste	WWS2 Line 64	5.9	0	5.9	5.9	0	5.9
Growth (Network + Treatment)	Waste	WWS2 Lines 72+73	3.4	0	3.4	3.4	0	3.4
Flow to Full Treatment	Waste	WWS2 Line 56	3.3	0	3.3	3.3	0	3.3
Sanitary Parameters	Waste	WWS2 Line 67	2.9	0	2.4	2.4	0.5	2.4
Transferred Private Sewers & Pumping Stations	Waste	WWS2 Line 78	1.7	0	1.7	1.7	0	1.7
Sludge Growth	Waste	WWS2 Line 50	1.6	0	1.6	1.6	0	1.6
Storm Tank Capacity	Waste	WWS2 Line 57	1.4	0	1.4	1.4	0	1.4
Event Duration Monitoring	Waste	WWS2 Line 53	1.1	0	1.1	1.1	0	1.1
Chemical Removal	Waste	WWS2 Line 59	0.8	0	0.1	0.1	0.7	0.04
Conservation Drivers	Waste	WWS2 Line 51	0.6	0	0.6	0.6	0	0.6

UV Disinfection	Waste	WWS2 Line 68	0.4	0	0.4	0.4	0	0.4
First Time Sewerage S101A	Waste	WWS2 Line 48	0.4	0	0.4	0.4	0	0.4
WINEP Groundwater	Waste	WWS2 Line 62	0.2	0	0.2	0.2	0	0.2
Flow Monitoring	Waste	WWS2 Line 70	0.02	0	0.02	0.02	0	0.02
Spill Frequency	Waste	WWS2 Line 58	0.01	0	0.01	0.01	0	0.01
Total			**53.7**	**0**	**52.4**	**52.4**	**1.2**	**52.4**

**Note: Ofwat have used a mixture of capex and totex models that incorporate this opex data. They only provide a capex allowance. Hence, why we assume this is zero opex for the Ofwat IAP.*

3.2.1. Ofwat's assessment

Ofwat has made no separate allowance for AFCs within its cost allowances. In "*Technical Appendix 2: Securing cost efficiency"* Ofwat argues that:

"This is because the opex associated with historical enhancement programmes is included in the data used to generate our base models."

That is, it assumes that opex arising from capex is fully captured in the historical botex baseline. We think this logic is flawed and needs to be revisited. It is also counter to the approach that Ofwat has taken to making allowance for AFCs at previous price reviews and risks undermining the totex regime introduced at PR14.

The additive nature of AFCs

Ofwat's assertion that because AFCs were incurred in previous price control periods, it is included within botex models, implicitly rests on an assumption that AFCs are non-recurring. This is not the case.

It is clear that, while opex arising from historical enhancement capex is included in the data set used to develop the botex models, this opex does not fall away to be replaced by opex from new capital investment. Instead, it persists and is added to by opex associated with new capex.

Case study: Water treatment AFCs

To illustrate the additive nature of AFCs, it is useful to look at an example from our water supply business unit.

For a number of our sources in the Lewes Valley in East Sussex, in AMP5 we installed a Granular Activated Carbon (GAC) treatment to control pesticides in the catchment. This consisted of a new treatment process at the head of the works, with additional operating costs being incurred for additional pumping, backwash and media replacement. In AMP7 we will need to add a further process stage to manage increasing nitrate concentrations in the raw water sources. This will result in significant additional power costs, along with some chemicals and labour costs. These costs are clearly additive and so the fact the historical dataset includes the costs associated with operation of the GAC plant, does not mean that the costs of the additional nitrate treatment process are also included.

Regulatory precedent

Ofwat has recognised the additive nature of AFCs at all previous price reviews[21]. For example, at PR09 Ofwat allowed for an additional £62m of opex (post-efficiency in 2007-08 prices) associated with the environmental quality programme, supply demand and enhanced service levels. (See 'Post-efficiency opex' tab of Annex 2 of Southern Water's PR09 supplementary report.) We have seen no evidence that the position has fundamentally changed since then in a way that would justify Ofwat making no allowance for AFCs at PR19.

Totex approach

In all of our optioneering, we seek to identify solutions that minimise the whole life cost of meeting new standards and customer expectations. This is consistent with Ofwat's move to a totex regime at PR14, which recognised that historically there had been a bias towards capex solutions in the sector, and delivers best value for customers in the long-term. Ofwat's treatment of AFCs in the IAP, if maintained, runs the risk of undermining the benefits of the totex-based regime. If it is expected that opex associated with future schemes will be disallowed, companies will have a string incentive to develop solutions that minimise opex at the expense of capex. This is clearly not in customers interests.

Remedies for the Draft Determination

- Ofwat should revise its approach and make appropriate allowance for opex that is necessary to deliver statutory obligations and customer priorities.

[21] While the use of totex (rather than botex and enhancement models) at PR14 did not allow for the separate identification of AFCs at PR14, Ofwat's PR14 totex models did include time trend variables, which would have captured increasing AFCs

3.3. Studies and Investigations

Our September business plan included £41m of opex enhancements related to WINEP studies and investigations.

These costs were categorised as in our plan as opex. Consistent with its overall approach Ofwat has treated all opex as being included within botex allowances. Thus, it makes no explicit allowance in the IAP for delivery of these statutory obligations.

We note however, that other companies have categorised the same costs as capex and thus received an allowance for these costs. This is clearly inconsistent given that the nature and driver of these costs is identical; only the accounting treatment differs. Our updated business plan therefore retains these costs, details of which are asset out in *CE.A1.Table 10 – Studies and investigation costs* below.

CE.A1.Table 10 – Studies and investigation costs

Cost line (water/waste)	Ofwat Table Ref	SRN Sept submission (£m)	Ofwat IAP (£m)	SRN IAP response (£m)	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Water							
WINEP Investigations	WS2 Line 58	15.2	0	15.2	15.2	0	15.2
WINEP WFD Measures Studies	WS2 Line 57	2.5	0	2.5	2.5	0	2.5
Wastewater							
WINEP Investigations	WWS2 Line 63	21.3	0	21.3	21.3	0	21.3
Chemical Investigations	WWS2 Line 60	2.0	0	2.0	2.0	0	2.0
Total		**41.0**	**0**	**41.0**	**41.0**	**0.0**	**41.0**

3.3.1. Ofwat's assessment

Ofwat's treatment of costs associated with studies and investigations is inconsistent and is unduly influenced by the accounting classification of these costs as opex or capex.

Historically, we have accounted for most studies and investigations as capex, on the basis that these typically led to capital investment. Following the introduction of the totex regime, and the increasing prevalence of opex-based solutions, we have revisited the accounting treatment of these costs and in our business plan we have classified all studies and investigations as opex.

Having reviewed Ofwat's IAP and other companies' business plans we note that there are differences in the accounting treatment of these costs between companies, with some continuing to report them as capex and some reporting them as opex. Under Ofwat's regulatory accounting guidance both treatments appear to be allowed for. However, those companies which have treated these costs as capex in their plan have been allowed costs for *identical activities* relating to studies and investigations, whereas those classifying them as opex have not. We note that within the IAP costs allowances, 13 water companies have received an average of £19m and eight wastewater companies have received an average of £14m for studies and investigations in their enhancement allowances.

We believe that it is appropriate and necessary for Ofwat to make a separate allowance for these costs, which have historically been treated as capex for most companies and thus not represented in the botex

data set. The costs in our plan have been through a rigorous costing, review and assurance process and were deemed to be valid, reasonable, efficient and robust by our independent assurers (see *IAP_TA11_CA_Jacobs Letter of Assurance – Cost Assessment Review*). In Appendix 2 we provide full details of the water and wastewater studies and investigations costs.

We do not believe that Ofwat would have intended there to be differences in companies cost allowances arising solely from differences in accounting treatment. We would therefore expect Ofwat to revise its treatment of these costs and make an appropriate allowance, on a consistent basis for all companies, within the draft determination.

Remedies for the Draft Determination

- Ofwat should revise its approach to studies and investigations costs to ensure a consistent an even-handed treatment across companies, which fully reflects the costs associated with delivering on statutory obligations under the WINEP programme.

3.4. Catchment management

Our September business plan included £24m of opex enhancements related to catchment management in both our water and wastewater businesses. In both cases, because these costs were classified as opex rather than capex, Ofwat has treated them as included in the botex allowance. This has the effect of excluding the costs from Ofwat's view of efficient costs.

As with studies and investigation costs (see above), Ofwat's regulatory accounting guideline would have permitted this expenditure to be classified as capex or opex, and indeed this is an approach, which Southern Water has adopted historically. We suspect that other companies have classed these costs as capex for AMP7 and received funding as a result. *CE.A1.Table 11 – Catchment management costs* provides details of these costs, which total £24m

CE.A1.Table 11 – Catchment management costs

Catchment Management		Ofwat Table Ref	SRN Sept submission (£m)	Ofwat IAP (£m)	SRN IAP response (£m)	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
P-Removal	Waste	WWS2 Lines 65+66	10.5	0*	10.5	10.5	0	10.5
Nitrate - Raw water deterioration	Water	WS2 Line 52	5.6	0	5.6	5.6	0	5.6
Pesticides - Raw water deterioration	Water	WS2 Line 52	5.0	0	5.0	5.0	0	5.0
Catchment Compliance - Raw water deterioration	Water	WS2 Line 52	3.0	0	3.0	3.0	0	3.0
Total			**24.0**	**0**	**24.0**	**24.0**	**0.0**	**24.0**

**Note: Ofwat have used a mixture of capex and totex models that incorporate this opex data. They only provide a capex allowance. Hence, we assume this is zero opex for the Ofwat IAP.*

The issues with Ofwat's assessment of catchment management costs are the same as that presented for studies and investigations in Section 3.3 above. Differences in the accounting treatment of the same type of cost have led to differences in their treatment in the setting of cost allowances. We do not believe this is what Ofwat would have intended and we would expect it to review the treatment of these costs for the draft determination, making appropriate allowance for these activities in enhancement costs, irrespective of their opex/capex classification.

In addition, to these generic issues, we have some specific concerns with Ofwat's modelling of P-removal schemes, which we describe below.

3.4.1. P-removal opex – modelling issues

In our September business plan, we included a total of £321m of enhancement costs related to P-removal schemes. This comprised £29m of opex and £292m of capex. Ofwat have only included £211m as a capex allowance. Some of this gap relates to the removal of AFCs (addressed above), however some of the gap arises from Ofwat's approach to modelling.

Ofwat stated, in "*Technical Annex 2 – Securing Cost Efficiency*", that its modelling accounts for enhancement opex for P-removal. However, having studied Ofwat's model closely, we do not believe this is the case. We observe that Ofwat has taken the simple average of two models to determine P-removal allowances:

[redacted]

- A capex only model; and
- A "totex" model, in which the average enhancement opex included in companies' business plans is removed from totex. This model is effectively also a capex only model[22].

This is in contrast to Ofwat's modelling of enhancement opex for supply demand expenditure, in which water efficiency enhancement opex is explicitly allowed for where it delivers a supply demand benefit. This means that P-removal opex to deliver catchment solutions is excluded from Ofwat's analysis and needs to be taken account of in the draft determination.

Remedies for the Draft Determination

- Ofwat should revise its approach to modelling of enhancement opex to remove the distortions that have arisen from differences in accounting classification of identical costs.

[22] The latter model is additionally problematic as the "average" opex that is deducted from totex is likely to be heavily distorted by inconsistencies in companies' accounting classification of P-removal costs.

Section 4. Enhancement modelling

Introduction to this section

This section covers enhancement expenditure from our September business plan of £1,389m. The explanation of £418m of this figure is explained in Section 4.2 on water, and £971m of this figure is explained in Section 4.3 on wastewater.

In this section we:

- Summarise the costs we have removed from our plan in response to Ofwat's challenge;
- Assess the overall robustness and limitations of Ofwat's modelling of enhancement costs; and
- Provide further evidence in relation to each of Ofwat's enhancement models where there remains a gap between our plan and Ofwat's allowance.

4.1. Ofwat's overall approach to modelling enhancement capex

We have a number of overarching concerns with Ofwat's approach to assessing efficient enhancement costs. Ofwat's approach results in a significantly higher efficiency adjustment being imposed on companies, like Southern, with larger enhancement programmes.

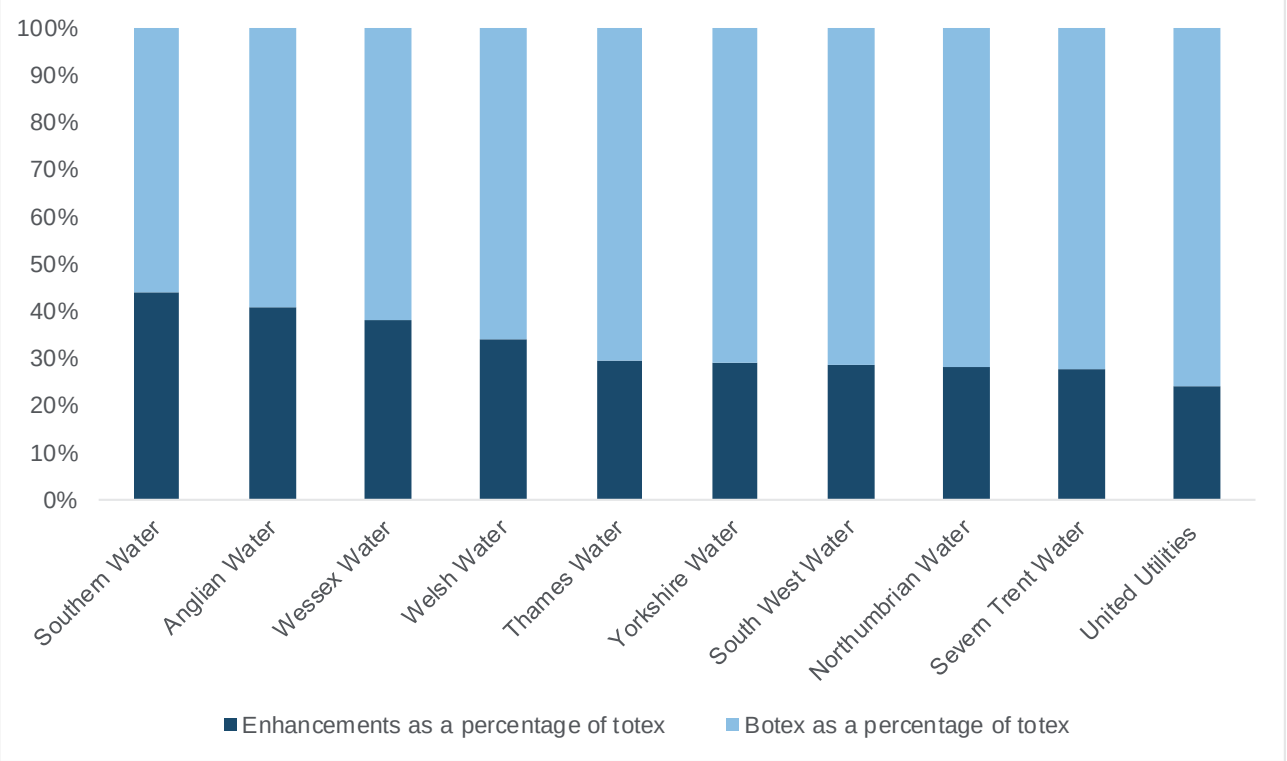
Ofwat has developed unit cost and econometric models for benchmarking company costs. Ofwat has also made use of shallow and deep dives, where the investment areas do not lend themselves to statistical modelling. In general, this type of approach provides a transparent and consistent basis for assessing company costs.

Ofwat has, however, recognised the inherent difficulty and uncertainty around the assessment of enhancement costs. In "Technical appendix 2: Securing Cost Efficiency", Ofwat notes, "The efficient level of enhancement costs is more difficult to estimate than for base costs". This is because enhancement costs are typically highly company-specific and irregular in their nature. This means there is less opportunity to compare the cost of schemes and solutions between companies and across time.

There are also known data uncertainties, as there is a greater degree of variation in how companies define and report enhancement activities and costs. While Ofwat has sought to standardise base costs, it has not been possible to carry out and put in place comparable processes and standards for enhancement expenditure.

Southern Water has one of the largest enhancement programmes across water and wastewater, in both proportionate and total terms. This is primarily driven by environmental commitments, which are outside of management control. Because of this, a greater proportion of our total expenditure is comprised of enhancement costs. This, in turn, means a greater proportion of our total costs have been assessed using less established benchmarks and with greater associated uncertainty, compared to most other companies. This point is illustrated in the CE.A1.Figure 5 – Botex and enhancements as a proportion of totex across water and wastewater below.

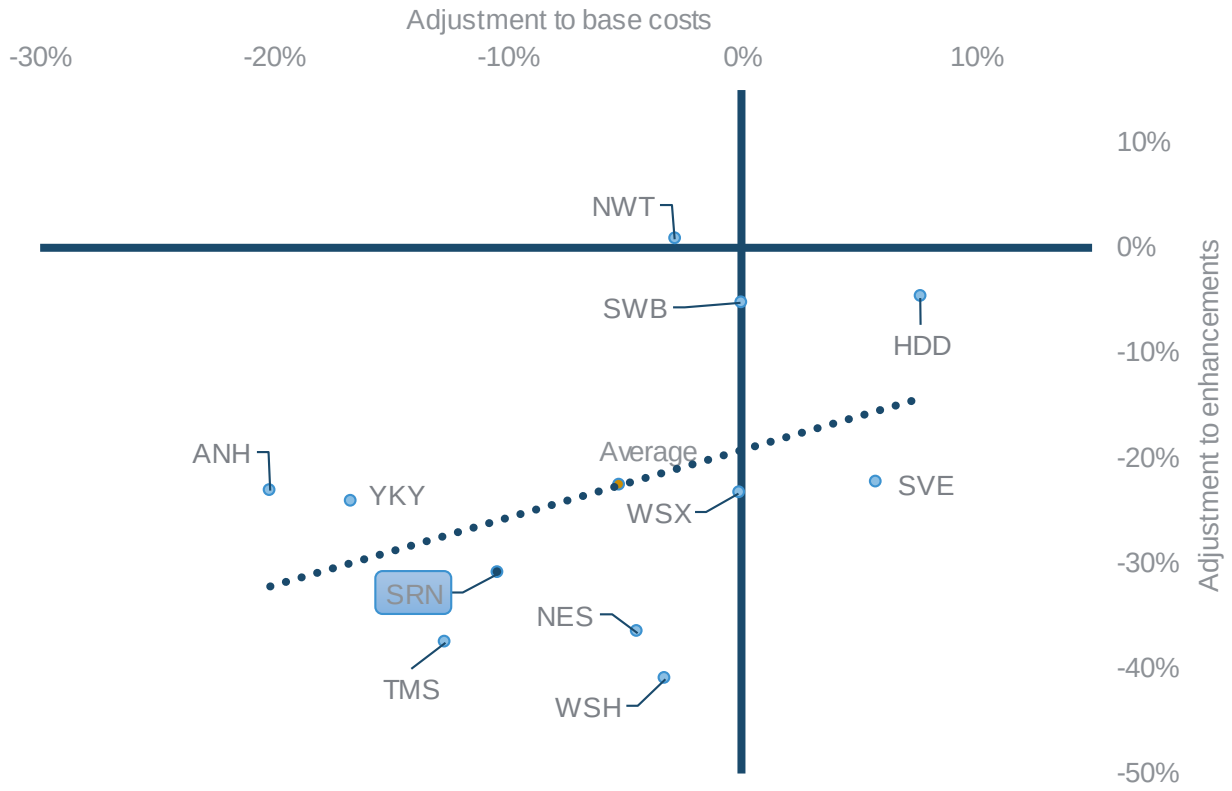
CE.A1.Figure.5 - Botex and enhancements as a proportion of totex across water and wastewater companies



We note that Ofwat has applied significantly larger efficiency adjustments to enhancement spend than it has base costs. As CE.A1.Figure 6 – Ofwat's efficiency adjustments to base vs. enhancements shows, the average adjustment to base costs across the industry was 5% at the IAP, the same figure for enhancements was almost five times higher at 23%.

Companies with larger enhancement portfolios have been exposed to greater efficiency challenges, and this challenge has been based on less established benchmarks with greater uncertainty. All else being equal, this would suggest that if two companies had the same genuine level of efficiency, the company with a larger enhancement programme would have been assessed to be less efficient in the IAP.

CE.A1.Figure 6 - Ofwat's efficiency adjustments to base vs. enhancements



4.1.1. Ofwat's use of discretionary efficiency challenges

One of the drivers behind the greater levels of adjustments to enhancements costs is the extent of discretionary efficiency challenges imposed by Ofwat.

Ofwat has applied these efficiency challenges across the assessment of enhancement costs as follows[23]:

- **Enhancement models** – Ofwat has applied varying challenges across the different enhancement models, depending on the quality of the model and spread of company projections around the modelled benchmarks. The challenges vary from "no adjustments" (beyond average efficiency) to applying 14% upper quartile challenge on 'flow to full treatment'.
- **Shallow dives** – Ofwat has applied a "company specific adjustment" to costs where Ofwat considers that the need and scope of the expenditure is justified, but where Ofwat judges there to be insufficient evidence that costs are efficient. The size of this challenge is based on Ofwat's view of the efficiency of the company's base costs and certain enhancement costs.

[23] Technical appendix 2, p.16-17

- **Deep dives** – in addition to applying "company specific adjustments", Ofwat has applied a 20 percent efficiency in deep dives to costs where Ofwat judges the company to provide insufficient evidence of a thorough options appraisal.

While we recognise the need to reflect the uncertainty in a risk-based assessment, it appears the choice of efficiency challenge is largely arbitrary:

- In the case of "**enhancement models**", Ofwat has not provided a clear and transparent breakdown of how it assessed model quality and how this relates the specific levels of adjustments used. This is an issue highlighted in Oxera's independent review. We would encourage Ofwat to revisit the decision to apply an UQ challenge in the 'flow to full treatment' (see section 4.3.1), which has resulted in an £18m additional cost challenge.
- On "**shallow dives**", we consider that Ofwat's IAP overstates the extent of the gap between our base costs and the efficient benchmark, which in turn means the level of efficiency adjustment for enhancement is also overstated..
- On "**deep dives**", no rationale or evidence is given for the size of the discretionary efficiency challenges in Ofwat's IAP publications.

Given the overall greater efficiency challenge applied to enhancement costs, as compared to botex, and the limitations of the modelling in this area, we believe Ofwat should apply these adjustments only where there is specific evidence to support them.

4.2. Wholesale water enhancement – summary of revised plan

Our September business plan included £500m of enhancement expenditure for water (excluding enhancement opex reallocated to botex). This section covers £418m of this expenditure[24]. As outlined in *CE.A1.Table 12 – Summary of water enhancements costs (excluding enhancement opex)* below, we have now reduced this expenditure by £27m to £391m.

CE.A1.Table 12 - Summary of water enhancement costs (excluding enhancement opex)

	SRN September submission Gross (£m)	Ofwat IAP Gross (£m)	SRN revised costs (£m)	SRN remaining gap (£m)
Growth	102.7	65.8	102.7	36.9
Supply demand capex (excluding strategic regional solution development)	214.9[A]	170.8	193.0	22.2
Lead	19.8	13.5	19.8	6.3
Raw water deterioration (capex)	55.4	49.9	55.4	5.5

[24] The remaining £82m of which we are challenging £76m is covered in Section 3.

	SRN September submission Gross (£m)	Ofwat IAP Gross (£m)	SRN revised costs (£m)	SRN remaining gap (£m)
Freeform impounding reservoirs	11.7	6.7	9.4	2.7
Metering	13.2	10.7	10.7	-
Strategic regional solution development	*89.4*	*75.3*	*0.0*	-
Total	**417.7**	**317.4**	**391.0**	**73.6**

Note A. The costs presented in this table exclude leakage, include the Supply / Demand T100 opex, but exclude all other water enhancement opex. Please refer to Section 3 for details on these costs.

In our revised plan, we have fully accepted Ofwat's initial assessment of our metering costs. We have also partially accepted Ofwat's assessment of our costs for supply and demand and freeform impounding reservoirs.

However, we have not adjusted our plan in other areas – each of these areas is explained in sections 4.2.1 – 4.2.5 below. In summary:

4.2.1 Growth (water)

Ofwat challenged us to reduce our costs by £37m. We do not accept this challenge:

- We have strong evidence that the costs in our plan are efficient; and
- We have identified material shortcomings in Ofwat's model that results in average unit costs being materially understated.

CE.A1.Table 13 - Summary of plan changes: Growth

	SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Growth	102.7	65.8	102.7	36.9	0.0	36.9

Our September 2018 business plan

Our plan included £103m for growth. Our programme consisted of three separate components:

- **New Connections** (£45m) – costs to install 64,963 new water connections over the course of AMP7,
- **Section 41 Requisitions** (£56m) – costs to deliver new water mains on developer sites, and
- **Infrastructure Growth Network Capacity and Growth Resilience** (£2m) – costs to ensure that additional growth has no impact on existing customer levels of service

Ofwat's initial assessment

Ofwat's initial assessment reduced our plan costs by £37m, based on an average unit cost assessment. Having carefully reviewed the modelled costs, we believe there are some material data and methodological concerns with the way that Ofwat has calculated these average unit costs. This results in average unit costs

[redacted]

being materially understated and Ofwat understating the level of expenditure to support critical enhancement activities.

Changes to our September plan

We have not amended our September plan. We continue to believe the costs included in our plan represent the efficient costs for delivering the activities above. Further evidence to support these costs is provided below.

Evidence to support our revised costs

Our plan costs remain at £103m, £37m higher than Ofwat's allowance. We have retained these costs on the basis that:

- We have strong evidence that the costs in our plan are efficient; and
- We have identified material shortcomings in Ofwat's model that results in average unit costs being materially understated.

New Connections: Our new connections programme will install 64,963 new connections for £45m, a unit rate of £692 per connection (as per our AMP6 programme). This compares to an industry AMP6 average of £890 per connection and AMP6 industry upper quartile of £764 per connection.

Ofwat's own benchmark data for these activities (Water Services Regulation Authority (Ofwat) Comparative Study: Cost of new water supply connections work (Section 45 Water Industry Act 1991)) are significantly higher. Against Ofwat's own benchmark data, our proposed unit costs are extremely efficient.

Section 41 Requisitions: Our Section 41 requisitions programme will deliver new water mains on developer sites for £56m. Our costs are based directly on our AMP6 actuals, extrapolated for growth. In AMP7 these requisition costs will be fully borne by the developer, which ensures customers do not pay for on-site works. Based on AMP6 delivery, we have assumed that all of this work will be delivered by Southern Water, but we are actively working to encourage more S51 self-lay partners to engage in this activity.

Infrastructure Growth Network Capacity and Growth Resilience: This programme will ensure this additional growth has no impact on existing customer levels of service. This will be delivered for £2m. Based on the size of our network this equates to the lowest per km rate (£165 per km, based on APP2 submissions) in the industry for network reinforcement.

Shortcomings in Ofwat's benchmarks

Our evidence points to the fact that our AMP7 forecast growth costs are efficient, but they remain significantly higher than the benchmark costs calculated by Ofwat.

We have material concerns about the robustness of Ofwat's benchmarks. Specifically, our concerns are:

- Southern Water's historic connection costs are not fully included in the modelled data. IFRS changes in 2016 meant that costs prior to this point were treated as opex – these are therefore not represented in the capex model. This needs to be taken into account across the industry. It would mean a *totex* growth model would be more appropriate than the capex growth model Ofwat has used.
- The varying degrees of Self-Lay penetration is not represented clearly in the models. Some companies appear to treat self-lay payments as cash; these are therefore excluded from the modelled costs. Some activities will not be represented at all due to income never being received (i.e. water connections). We have very low levels of self-lay activity in our region compared to many companies, which will distort the outputs of the simple capex model applied. We consider that Ofwat should update the current model to a totex model that includes all components of costs/payments relating to growth. In this way, all companies will be directly comparable.

- There appear to be volume inconsistencies within the data selected for the unit cost approaches (i.e. number of connections), as well as inconsistencies in how companies have interpreted Ofwat's definitions. From the company App28 submissions, there are nine of the companies which show significant variances (+- 30%) between historical and forecast costs (and volumes) which would suggest inconsistent changes in accounting treatment/cost allocations and volume classifications between AMP6 to AMP7.
- Our analysis of the company data tables shows that many companies (for example Wessex Water and Affinity Water) have included no future connection spend within WS2, despite receiving income. Southern Water has provided gross figures in WS2 (as per table guidance). We note that other companies appear to have provided net figures. This discrepancy means that the costs associated with these activities would not be appropriately represented in the capex model.

Overall, we have significant concerns with the approaches Ofwat has taken. We do not think the model in its current form can be relied upon to produce robust cost allowances.

4.2.2 Supply demand enhancement

Ofwat challenged us to reduce our costs by £44m. We have reduced our planned expenditure by £22. We do not accept £22m of Ofwat's challenge and in particular:

- The adjustment to [redacted] costs (£2m),
- The reduction in WRMP future planning costs (£7m), or
- The imposition of a company-specific efficiency adjustment in the case of long term enhancement or internal interconnection (£14m).

CE.A1.Table 14 - Summary of plan changes: supply demand enhancement

	SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
2020-25 SDB enhancement	51.8	46.4	46.4	5.4	5.4	0.0
Long-term enhancement	83.4	73.5	83.4	9.9	0.0	9.9
Internal interconnections	70.8	50.9	56.6	19.9	14.2	5.7
Mitigation and monitoring	2.3	0.0	0.0	2.3	2.3	0.0
WRMP Future Planning	6.6	0.0	6.6	6.6	0.0	6.6
Total	**214.9**	**170.8**	**193.0**	**44.1**	**21.9**	**22.2**

Our September 2018 business plan

Our plan included £344m to balance supply and demand, including addressing significant reductions in our abstraction rights. We discus costs associated with Leakage enhancement (£33m), opex AFCs (£1m), non-essential use (NEU) bans and temporary use bans (TUBs) (£6m) in section 3. We discuss the removal of Strategic regional solutions (£89m, not reflected in the table above) as well as the remaining £215m in this section.

We need to address a 294 Ml/d supply/demand deficit by 2030. We will be making significant investments in AMP7 to meet this need. This will include demand side enhancements (reducing demand by 38 Ml/d by

2025), developing new water resources (including [redacted] and water re-use) and building new strategic transfers with our neighbours (including through the Regional Water Grid).

Ofwat's initial assessment

Ofwat has challenged our plan in the following areas (a total challenge of £98.3m):

- **Strategic regional solution development:** challenge aimed at the proposed [redacted] scheme (£14m).
- **2020-25 SDB enhancement:** Industry average rate challenge of 10% (£5m).
- **Long term enhancement:** Scheme specific ([redacted]) and Capex efficiency challenge (£10m).
- **Internal interconnections:** Scope challenge and capex efficiency challenge (£20m)
- **WRMP Future Planning**: Reallocation to botex challenge (£7m)
- **Mitigation and monitoring:** Reallocation to botex challenge (£2m)
- **Leakage:** Ofwat makes no cost allowance for leakage, which contributes 1/3 of the total supply demand increment delivered in AMP7 (£33m, see section 3).
- **NEU & TUBs:** Reallocation to botex challenge (£6m, see section 3)
- **WRMP AFCs**: Reallocation to botex challenge (£1m, see section 3)

We set out our response to Ofwat's challenges below, having first explained how we have updated the costs in our September Plan.

Changes to our September plan

In our revised plan, we have reduced our enhancement expenditure for supply demand (excluding strategic regional solution development) from £215m to £193m. This includes the following changes:

- **Strategic regional solution development ([redacted]):** We recognise Ofwat's challenge to our plans for a [redacted] scheme at [redacted] This scheme currently represents one potential solution to meet the supply demand deficit in our Western area by March 2027. Ofwat proposed that companies in the South East would have access to £75m totex allocated through a strategic regional group. At this stage, we have excluded any money allocated through this arrangement from our revised plan - this is on the basis that the early nature of these proposals would potentially result in misleading bill movements if the entire £75m was included at this stage.

  The table below illustrates the impact of excluding the AMP7 project costs for [redacted] (£89m) from our September submission and excluding £75m from Ofwat's IAP. For the avoidance of doubt, we are entirely committed to working as part of this group for a set of appropriate long term solutions to our supply demand balance in the South East (as set out in our response to query SRN.CMI.A9 and SRN.CE.A3). We will then work with Ofwat to determine the most appropriate mechanism for funding the required work (currently £89m).

CE.A1.Table 15 – Impact of excluding [redacted] costs from our Plan and Ofwat's IAP

	SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Total (incl strategic regional solution	**344.4**	**246.1**	**227.1**	**98.3**	**117.3**	**56.3**
Strategic regional solution dvpt [Fawley [redacted]]	89.4	75.3	0.0	14.1	89.4	-

[redacted]

Total (excl strategic regional solution)	**255.0**	**170.8**	**227.1**	**84.2**	**27.9**	**56.3**

- **2020-25 SDB enhancement:** Ofwat has applied an industry unit rate efficiency challenge (£5m). Having reviewed our costs, we believe we can deliver at the level of cost Ofwat has assessed and therefore accept the further efficiency challenge on these costs.
- **Internal interconnections:** Ofwat has applied a scope efficiency challenge of 20% (£14m). Over six months have elapsed since we finalised the content of our Plan and, in the light of further analysis we accept that we can meet this cost challenge (see IAP_TA11_CE_Mott MacDonald Cost Estimating Assurance).
- **Mitigation and monitoring:** Ofwat has removed mitigation and monitoring costs ([redacted]) from Supply Demand Investigations and Future Planning (£2m). We will accept this as an additional challenge to our base allowance.

Evidence to support our revised costs

After updating our Plan, there remains a gap of £22m between Ofwat's initial assessment of supply and demand costs and our revised business plan, excluding £33m of leakage, £1m of opex (as discussed in Section 3) and strategic regional solution development (£89m). We have not adjusted our costs to close this gap for the following reasons:

- **Long-term enhancement (£10m):** Ofwat adjusted our projected costs for the proposed [redacted] plant in [redacted] (by £2m) with reference to the "industry median costs". Ofwat does not explain how these industry median costs were derived. Given only one [redacted] plant has been commissioned in the UK, we question the validity of any approach that draws on a single data point. We also do not consider the additional 10% company specific efficiency adjustment is appropriate (£8m), as explained in Section 4.1.
- **WRMP Future Planning (£7m):** Ofwat have historically funded WRMP planning through enhancement modelling. As a result of this we have not accounted for these costs as base costs historically. We consider that Ofwat should continue to fund this WRMP future planning investment as part of a shallow dive assessment. Our estimated costs (£7m) were assured by Jacobs prior to our September submission and were deemed to be robust and efficient.
- **Internal interconnections (£6m):** We do not consider the 10% company specific efficiency adjustment is appropriate, as explained in Section 4.1.

4.2.3. Lead standards

Ofwat challenged us to reduce our costs by £6m. We have not reduced our costs because:

- We continue to believe the costs in our Plan are efficient costs, and
- We have concerns about the robustness of Ofwat's econometric models

CE.A1.Table 16 - Summary of plan changes: Lead

	SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Lead	19.8	13.5	19.8	6.3	0.0	6.3

Our September 2018 business plan

Our plan included £20m to protect customers from risks associated with lead in drinking water.

Work in this area will include a trial in Deal, Kent where we plan to replace all lead pipes including communication and supply pipes. In addition, we will be subsidising the replacement of lead pipes within customers' homes (the costs for this customer-participation measure will be funded through an ODI and are not discussed here). More broadly we will also be replacing 28,000 lead communication pipes across the region as part of our long-term strategy to eliminate lead communication pipes by 2045 (as endorsed by the DWI).

Ofwat's initial assessment

Ofwat has applied a 32% efficiency adjustment, reducing our costs to £14m. This is based on econometric models, which calculate an allowance that is materially lower than our plan costs.

Changes to our September plan

We have not amended our September plan. We continue to believe the costs included in our plan represent the efficient costs for delivering the activities above. We also have concerns about the robustness of Ofwat's econometric models and their lack of consideration for unit cost.

Evidence to support our costs

We believe Ofwat's initial allowance needs further consideration for two key reasons:

- The allowance is based on an econometric model that gives an inappropriate weight to historical and forecast asset stock and replacement rates.
- Ofwat does not consider proposed unit costs. As a result, Southern Water are being challenged despite proposing to deliver frontier levels of unit cost efficiency to replace lead pipes, in addition to delivering the most ambitious lead standards programme.

Ofwat's econometric model

We have assessed Ofwat's "Meeting lead standards enhancement feeder model" and note that two panel data models have been used, one based on historical data and one on forecasts for AMP7. In each of these models, the key cost drivers are: i) the historical/forecast number of total lead communication pipes, and ii) the historical/forecast number of lead pipes replaced in AMP6/AMP7. We question why total lead pipe asset

stock (historical and current) is relevant to the cost of asset replacement. The use of this variable fails to satisfy any test of engineering logic.

Overall, Ofwat's models do not reflect the true drivers of cost for lead standards enhancements. The equal focus given to lead pipe asset stock and planned replacements is inappropriate. The key driver of costs is the forecast percentage of these pipes, which are planned for replacement in AMP7. As such, we believe a unit cost approach is more appropriate.

Unit costs

Ofwat has also imposed an almost 60% reduction in allowed unit replacement costs (compared with those allowed at PR14). The rationale for this significant reduction is not clear.

We observe that, within the published models, Ofwat has conducted analysis based on unit costs – however, this analysis has not formed part of the cost allowance. It is not clear why this is the case.

On a unit cost basis, our plan delivers frontier levels of cost efficiency (our forecast unit cost for PR19 is £710 per pipe, compared to an industry average of over £1,500).

Based on Ofwat's £14m allowance, derived from its econometric models, our effective allowed replacement costs are £484 per pipe. This is not deliverable and Ofwat's own analysis of unit costs demonstrates that no company has delivered unit costs this low in AMP6 and only one company out of 11 is forecasting costs below this level in AMP7. The average allowance is £1,476 per pipe replaced.

There are considerable variances between the allowed unit rates for lead pipe replacement across the industry. Moreover, there are clear inconsistencies in companies' allowances and replacement programmes. For example, Severn Trent receive an allowance of £11m (80% of our allowance), despite having a significantly smaller replacement programme (just 14% of ours).

CE.A1.Table 16 - Variances in company allowances and unit costs

Company	Communi-cation pipes replaced	Actual costs (£m)	Allowance model (£m)	Modelled costs (£m)	Business Plan Unit Cost (£)	OFWAT Modelled Unit Cost (£)
Southern Water	27,919	19.8	13.5	13.5	710.9	483.5
Wessex Water	9,000	5.6	4.8	4.8	620.0	537.6
Thames Water	53,837	76.4	37.7	37.7	1,419.5	700.0
United Utilities	25,120	-	17.8	17.8	708.5	708.5
Affinity Water	8,860	9.2	8.4	8.4	1,038.4	949.8
Sembcorp Bournemouth Water	2,500	4.0	2.8	2.8	1,600.0	1,113.9
Northumbrian Water	9,282	4.0	11.7	11.7	431.3	1,260.0
Sutton & East Surrey Water	1,435	1.7	2.6	2.6	1,198.6	1,829.9
Anglian Water	5,250	25.0	10.0	10.0	4,766.2	1,899.0
South Staffs Water	1,665	3.5	3.4	3.4	2,102.6	2,043.2
Severn Trent Water	3,980	16.4	11.1	11.1	4,115.3	2,788.3

Company	Communi-cation pipes replaced	Actual costs (£m)	Allowance model (£m)	Modelled costs (£m)	Business Plan Unit Cost (£)	OFWAT Modelled Unit Cost (£)
Yorkshire Water	7,606	12.3	21.5	21.5	1622.8	2,824.3
Hafren Dyfrdwy	255	2.9	1.1	1.1	11,490.2	4,336.9
Bristol Water	644	0.3	2.9	2.9	504.7	4,546.4
Portsmouth Water	50	0.3	1.8	1.8	5,000.0	35,568.5
South East Water	20	-	1.2	1.2	57,750.7	57,750.7
Dwr Cymru	0.0	15.0	-	10.3	0.00	0.00
				UQ	**708.5**	**708.5**
				Median	**1419.5**	**1829.9**

4.2.4. Raw water deterioration

Ofwat challenged us to reduce our costs by £51m. We have not reduced our costs, because:

- We have strong evidence that the costs in our plan are efficient
- Our solutions have been subjected to significant levels of optioneering, the options were costed using our externally benchmarked cost curves, and this area of our plan has been subjected to internal challenge and an external audit by Jacobs.

CE.A1.Table 18 – Summary of plan changes: Raw water deterioration

	SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Raw water deterioration (capex)	55.4	49.9	55.4	5.5	0.0	5.5

Our September 2018 business plan

Our plan included £78m of totex to protect customers from the deterioration of raw water quality that we are experiencing at 14 of our works. This includes £23m of enhancement opex, which we discuss in Section 3. The remaining £55m relates to enhancement capex.

The concentration of nitrate in raw water has been increasing since the 1980s. We expect concentrations to continue to increase in AMP7. We need to intervene in a number of areas to ensure treated water concentrations remain below the limit set by the Drinking Water Inspectorate (DWI). We are using a number of measures to control treated water nitrate concentrations such as catchment management, raw water blending and nitrate removal. Depending on location, these measures are used individually or in combination to provide the lowest whole life cost solution for rising raw water nitrate concentrations.

Ofwat's initial assessment

In the IAP, Ofwat has applied a discretionary 10% efficiency adjustment to our business plan costs of £55m, reducing them to £50m.

Changes to our September plan

We have not amended our September plan. We continue to believe the costs included in our plan represent the efficient costs for delivering the activities above. Ofwat does not provide any evidence that our costs are not efficient, but has applied an arbitrary 10% reduction.

Evidence to support our costs

Our solutions in this area have been subjected to significant levels of optioneering. Through the DWI long term planning process the needs were confirmed and options were reviewed. The options were costed using our externally benchmarked cost curves. This area of our plan has also been subjected to internal challenge and an external audit by Jacobs.

4.2.5. Freeform – impounding reservoirs

Ofwat challenged us to reduce our costs by £5m. We have reduced our Plan by £2m, however, a gap of £3m remains. We do not accept:

- Ofwat's 20% scoping challenge, or
- The imposition of a company-specific efficiency adjustment.

CE.A1.Table 19 – Summary of plan changes: Impounding reservoirs

	SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Freeform Impounding Reservoirs	11.7	6.7	9.4	5.0	2.3	2.7

Our September 2018 business plan

Our plan included £12m for safety enhancements on our impounding reservoirs. [redacted]

Ofwat's initial assessment

Ofwat has applied a 43% efficiency adjustment, reducing our costs from £12m to £7m. This is driven by three factors:

- A re-allocation to botex (£2m) –Ofwat consider that these section 12 remedial works (e.g. minor concrete repairs, handrail replacement, valve repairs etc) are base activities;
- A 20% efficiency adjustment, due to insufficient justification that the best option for customers has been selected; and
- An additional 10% efficiency adjustment due to company-level capex efficiency challenge.

[redacted]

Changes to our September plan

We have reduced our September plan by £2m, reflecting Ofwat's reallocation of costs to botex. We accept the rationale for the re-allocation and accept this as an additional challenge to our base allowance (see Section 3 for more information).

Evidence to support our revised costs

Our revised plan remains £3m higher than Ofwat's initial allowance. We believe the following areas need further consideration:

- 20% scoping challenge (£2m)
- 10% company specific efficiency challenge (£1m)

With respect to Ofwat's scoping challenge, [redacted]

[redacted]

[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

[redacted]

CE.A1.Table 21 – Reservoir date of inspections

[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

In developing our view on the efficient cost of meeting these requirements, we engaged our All Reservoir Panel Engineers to help us consider a wide number of options for each site, these options included:

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

[redacted]

- [redacted]
- [redacted]

[redacted] Reports for the remaining sites can be provided if required.

With respect to the additional 10% efficiency, no justification or evidence is provided to support this. We believe the optioneering information provided above demonstrates that our costs are efficient and the 10% adjustment should be removed.

4.3 Wholesale wastewater enhancement – summary of revised plan

Our September business plan included £1,140m of totex enhancement expenditure for wastewater (excluding opex enhancements, which we have already discussed in Section 3). Since our submission, we have removed £76m due an error related to sewer adoptions costs. As this was a non-cash and fair value accounting item, it should not have been included. £20m associated with flooding and pollution is discussed in section 3[25]. A further £65m of our September submission related to Cost Adjustment Claims, these are covered in section 5. Ofwat funded our plan in full for costs associated with section 101a (£5m), N-removal (£3m), spill frequency (£0.4m), flow monitoring (£0.2m). As these were fully funded, we do not discuss these schemes further. This section covers the remaining £971m of our original expenditure, which we have revised down to £733m, as shown in *CE.A1.Table.22 – Summary of waste enhancement costs (excluding enhancement opex)* below.

Scheme	SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m) Gross	Cost reductions accepted (£m) Gross	Remaining difference (£m) Gross
Costs we have accepted in full						
Chemical Removal (capex)	45.3	10.0	2.70*	35.3	42.6	-7.3
Resilience (Black Rock)	4.5	0.0	0.0	4.5	4.5	0.0
P-removal (capex)	292	211.2	211.2	80.8	80.8	0.0
Total	**341.8**	**221.2**	**213.9**	**120.6**	**127.9**	**-7.3**
Costs we have partially accepted or not accepted						
Flow to full treatment (capex)	148.5	115.3	145.1	33.1	3.4	29.8
Growth (capex)	262.8	198.1	219.4	64.7	43.4	21.3
Storm Tank Capacity (capex)	128.6	70.7	88.1	57.9	40.5	17.4
Sludge enhancement (capex)	4.8	0.0	4.8	4.8	0.0	4.8
Event duration monitoring (capex)	4.4	0.7	4.4	3.7	0.0	3.7

[25] In addition to the £20m for pollution and flooding, we discuss a further £83m of costs.

Sanitary Parameters	48.0	25.6	28.7	22.4	19.3	3.1
Conservation Drivers (capex)	19.0	12.9	15	6.1	4	2.1
UV Disinfection (capex)	13.1	11.1	13.1	2.0	0.0	2.0
Total	**629.2**	**434.4**	**518.6**	**194.7**	**110.6**	**84.2**
Grand Total	**971.0**	**655.6**	**732.5**	**315.3**	**238.5**	**76.9**

We provide further evidence below in the areas where we have not fully accepted Ofwat's view of efficient enhancement costs (sections 4.3.1 to 4.3.8).

4.3.1. Flow to full schemes

Ofwat challenged us to reduce our costs by £33m. We have reduced our costs by £3m. However, a gap of £30m remains:

- We consider there is a strong case for Ofwat to conduct a "deep dive assessment" on our proposed investment at the Budds Farm wastewater treatment works. If we remove Budds Farm, the costs of the remaining programme are in line with Ofwat's modelled benchmark (before the application of the upper quartile).
- We do not accept the imposition of an additional upper quartile challenge to the results from Ofwat's benchmarking, which does not reflect the quality of the model.

CE.A1.Table 23 - Summary of plan changes: Flow to full schemes

	SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Flow to full treatment (capex)	148.5	115.3	145.1	33.1	3.4	29.8

Our September 2018 business plan

Our plan included £152m to deliver and operate IMP5 (one of the improvement drivers under the WINEP) flow to full treatment schemes, in line with the WINEP. This included £3m of AFCs, which we discuss in Section 3 above. This section relates to the remaining £149m of capex.

Our programme consisted of 61 flow to full treatment schemes. Delivery of these requirements is to be achieved principally through increasing storm tank capacity.

Ofwat's initial assessment

Ofwat's initial assessment allowed for costs of £115m for these works. This represents a challenge of £33m to our costs.

This was based on six different econometric models and the application of an upper quartile efficiency challenge of £19m (14%). This is the only occasion when Ofwat has applied this type of upper quartile

challenge. The impact of the upper quartile challenge is particularly marked for Southern Water because of the scale of our programme. We receive the largest absolute upper quartile adjustment of any company.

Changes to our September plan

We have reviewed the individual schemes in our programme and identified one scheme (at our Budds Farm Wastewater Treatment Works) that is a significant outlier. The costs of this one scheme were £35m in our September business plan, representing 23% of total costs for flow to full schemes. We have had additional independent assurance on this single scheme and, as a result, we have revised the costs by £4m (from £35m to £31m for this scheme). However, the scheme remains an outlier.

If we remove Budds Farm, the costs for the remaining programme are in line with Ofwat's modelled benchmark (before application of the additional upper quartile challenge, discussed below). We therefore suggest that Ofwat complete a "deep dive assessment" for this scheme on the basis that it is a clear outlier. To facilitate this deep dive, details of the scheme are provided below.

Upper quartile challenge

As noted above, the largest element of Ofwat's challenge to our business plan costs is derived not from the benchmarking, but from the application of a further upper quartile challenge of 14%.

If it were the case that this particular model was statistically more robust than the other enhancement models, and therefore better able to identify the efficient level of costs, then it may be appropriate to apply a greater efficiency challenge. However, we have seen no evidence to demonstrate this.

We commissioned an independent review from Oxera[26] on the robustness of the enhancement models to understand whether there was any basis for singling out this particular model for the application of a more stretching efficiency challenge. Oxera observe that the range of efficiency scores is much wider for FFT models than the aggregate base models, ranging from 34% to 170%. These significant divergences mean that residuals should not be interpreted as relating to efficiency only. This large range of scores, perversely, leads to a more challenging benchmark. At 14%, the FFT upper quartile benchmark is far more challenging than the corresponding upper quartile benchmark for the aggregate wastewater models.

Oxera conclude that the use of an upper quartile benchmark requires strong justification in any modelled cost area and, crucially, that it is far from evident that such a benchmark is appropriate. Therefore, we are not adjusting our costs in line with Ofwat's upper quartile challenge. we consider that Ofwat should remove the additional efficiency challenge applied within this model.

A copy of Oxera's report is provided in the *IAP_TA11_CE_Oxera Modelling Review*.

[redacted]

[26] "Ofwat's base expenditure models at the IAP: a general review" (Oxera, March 2019)

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

4.3.2. Growth (wastewater)

Ofwat challenged us to reduce our costs by £41m (excluding our CAC). We have reduced our costs by £17m. However, a gap of £24m remains:

- We do not accept the proposed reduction in the cost of our treatment growth schemes as these have been costed in a consistent, robust and efficient way, and have been assured.
- Nor do we accept the reduction in the costs we anticipate to reduce flooding incidents, which are the lowest in the industry.

CE.A1.Table 25 – Summary of plan changes: Growth (the capex shown is in-line with Ofwat's enhancement model for wastewater growth)

	SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Treatment Growth (capex)	97.2	93.0	97.2	4.2	0.0	4.2
Network Growth (capex)	139.2	105.0	122.2	34.2	17.0	17.2
Flooding (capex)*	10.3	7.7	10.3	2.6	0.0	2.6

[28] For non-infrastructure investment, this on-cost element is primarily contractor on-costs but also includes site complexity risk, and risk simulations; these are significant parts of the non-infrastructure costing process. These on-costs have been reviewed and independently assured prior to our September submission and are deemed to be reasonable, robust and cost efficient (particularly when applied at the programme level). In the case of Budds Farm, where potential inefficiency has been highlighted through Mott Macdonald benchmarking activity; we have applied a further efficiency to ensure that these costs remain efficient.

Total (excl. CAC)	**246.7**	**205.7**	**229.7**	**41.0**	**17.0**	**24.0**
Whitfield CAC (capex)	26.4	0.0	0.0	26.4	26.4	0.0
Grand Total	**273.1**	**205.7**	**229.7**	**67.4**	**43.4**	**24.0**

**Note: flooding is also discussed in Section 3.*

Our September business plan

Our plan included for £279m of totex costs associated with Wastewater growth. This is made up of £6m of enhancement opex relating to flooding (as discussed in Section 3) and £273m capex which covers:

- **Treatment Growth** (£97m) – costs to increase treatment capacity to meet future growth
- **Network Growth** (£139m) – costs to increase network capacity on our existing network, including costs for requisitions
- **Flooding** (£10m) – costs to reduce the number of flooding incidents through enhancing our capabilities to monitor flows and levels remotely in flood risk locations, enable proactive control of network assets, develop our predictive analytics capability and improve pumping resilience (these are discussed in Section 3)
- **Whitfield CAC** (£26m) – costs to provide for a new works to treat flows from the major development at Whitfield in Kent

The Whitfield CAC, which we have now withdrawn, is discussed in Section 5 below. The remainder of this section relates to the other three elements.

Ofwat's initial assessment

Ofwat's initial assessment reduced our planned capex for treatment growth, network growth and flooding by £41m, based on two econometric models covering past and future expenditure. Both of these models use the number of new connections as a cost driver.

What remains unchanged from our September plan

In our revised plan, we have reduced our costs for network growth by £17m (15%). However, we have not identified any opportunities to reduce our other expenditure and our treatment growth and flooding programmes remain unchanged. This results in a gap of £24m.

Our AMP7 treatment growth programme

Expenditure for treatment growth schemes has been costed in a consistent, robust and efficient way. We followed assured processes to develop these costs prior to our September submission. Further review at the IAP stage has not identified any further opportunity to reduce costs.

The remaining £3m gap on a £97m treatment growth programme is within the margin of error of the modelling. We therefore believe our revised costs should be allowed for in full.

Our AMP7 flooding programme

Ofwat has included all flooding-related costs within its growth models.

Our flooding programme is based on a totex approach, with rigorous cost benefit analysis, to ensure it delivers the lowest whole life cost. The evidence to support our proposals was presented in our September submission technical annex *BP_TA.12.WW07_Flooding and Pollution strategies*. The key features of our flooding programme include:

- A systems-level approach to resilience planning which includes investment in sewer level monitors and predictive modelling to greatly improve real-time visualisation of sewer network system performance and provide warning of potential flooding.
- Improvement in the long-term resilience of our sewer network to extreme storms through increased investment in SuDS schemes.
- The creation of a dedicated new team to focus on the data collection and analysis related to external flooding so that we can better understand its root causes.
- Targeted mitigation at properties with the highest risk of a repeat external flooding incident.
- Continuation of our highly effective sewer misuse campaign which has been key in reducing blockages (and consequential flooding) by 12% between 2015-16 and 2017-18.

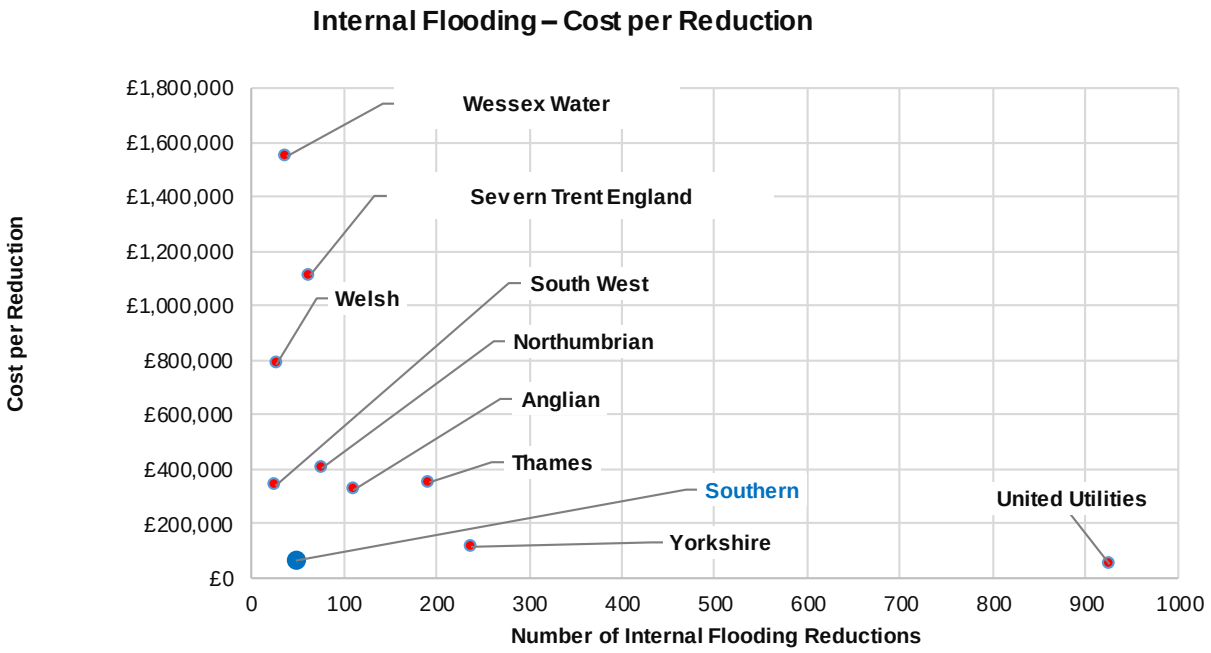
We will continue to follow this approach in AMP7, focusing on the activities which are set out in the table below.

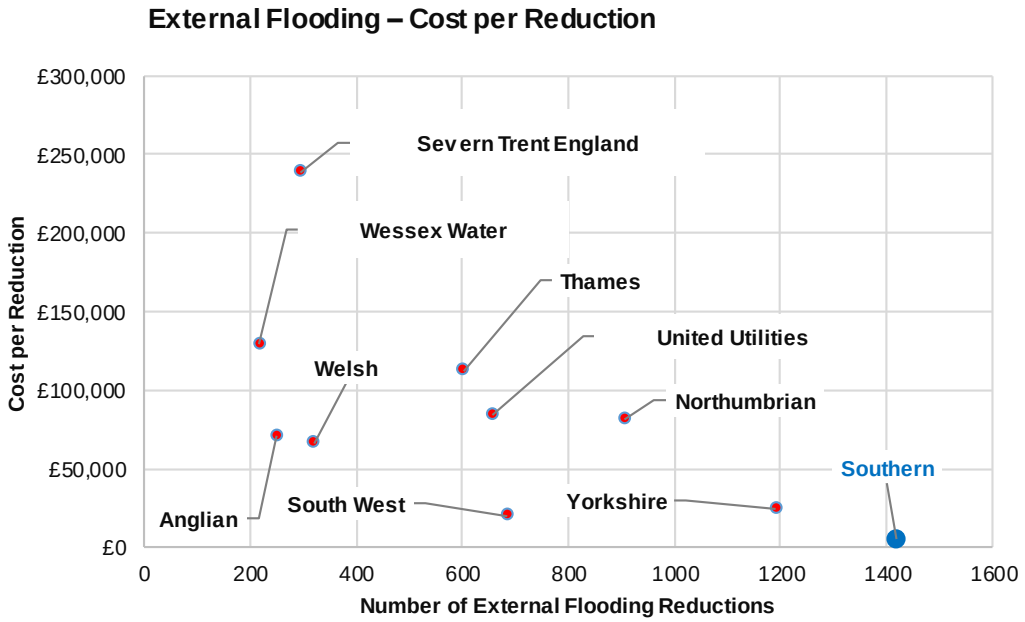
CE.A1.Table 26 – Enhanced Internal and External Flooding Reduction Activities in AMP7

Activity	Description	AMP7 Total	Investment Type
Internal Flood Mitigation	Installation of non-return valves, flood barriers and other flood mitigation activities to prevent internal flooding	£2.8m	Capex
External Flooding Enhancement	Creation of a dedicated new team to focus external flooding data. Installation of external flooding mitigation measures such as anti-flood devices, flap valves and sealing manhole covers. Targeting properties with the highest risk of a repeat external flooding incidents.	£5.8m	Capex
SuDS schemes	We will contribute £1.7m (enhancement) on an Eastbourne SuDS scheme	£1.7m	Capex
	Total Capex	**£10.3m**	
Sewer misuse campaigns	FOG and Unflushables education continued from AMP6. Use bio-chemicals to digest FOG.	£1.7m	Opex
Sewer level monitors	Linked sewer level monitors installed in key parts of the network with telemetry to supply real-time information on flows and levels to provide warning of potential flooding.	£1.3m	Opex
Predictive modelling	Predictive modelling software in conjunction with real-time information to predict potential flooding to enable mitigation to be implemented and/or improve the response to incidents.	£2.7m	Opex
	Total Opex (see section 3)	£5.7m	
	Total TOTEX	**£16m**	

As detailed in technical annex *BP_TA.12.WW07_Flooding and Pollution strategies* of our September Business Plan submission, we looked at different flooding options to come up with the most cost effective solutions for customers. Indeed, the selected solutions represent some of the least cost approaches in the UK. As shown below, we have **the lowest cost per incident reduction for both internal and external flooding**. We are confident that our proposals represent value for money for customers and are efficient and we consider our flooding expenditure (capex and opex) should be fully allowed within the Ofwat growth model.

CE.A1.Figure 8 – Internal and External Flooding Cost per Flooding Incident Reduction Industry Data





Changes to our September plan

In our revised plan, we follow our IAP wholesale cost review process (see section 1) and have reduced our costs for network growth by £17m (15%). While we have not yet identified specific opportunities to reduce costs, this reduction reflects our ongoing commitment to continue to look for innovative, lower cost solutions. We have also updated our revenue forecast for Infrastructure Charges (received from developers) to align with the revised investment forecast.

The £17m cost reduction is in addition to the £70m efficiency challenge already applied in our September Business Plan. This will be challenging to deliver.

These updates leave us with a remaining gap on sewer network growth of £17m. We believe, although difficult to prove or evidence, that there may be differences in scope and size of growth solution between companies that the Ofwat model is just not able to pick up. This means that our costs may continue to look inefficient against the models but our costs already include a very stretching, network growth specific, efficiency challenge of £87m. Our approach to growth, options and innovation are described in Technical Annex TA 12.WW05 Wastewater Growth.

Our historic unit costs have been projected forwards and subjected to an efficiency challenge. The scope of work generally is very simple (pipes and manholes) with limited scope for innovation or alternative approaches. This means that further cost efficiencies are unlikely.

The 'need' and demand here is driven externally by developer requests. We have no reason to believe that lower volumes will apply. Revenues and expenditure within this area are proposed to balance, in line with the proposed new approach to treat the income offset from 2020. As a result of this simplistic approach, we do not think Ofwat's models suitably allow for the remaining requisition expenditure included within network growth in particular.

4.3.3. Storm tank capacity

Ofwat challenged us to reduce our costs by £58m. We have reduced our costs by £41m. However, a gap of £17m remains. We do not believe there are further opportunities to reduce our costs in this area

CE.A1.Table 27 – Summary of plan changes: Storm tank capacity

	SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Storm Tank Capacity (capex)	128.6	70.7	88.1	57.9	40.5	17.4

Our September business plan

Our plan included £130m totex to deliver and operate IMP6 storm tank capacity schemes. This included £1m of AFCs, which we discuss in Section 3. This section relates to the remaining £129m of capex. This driver is

explained in our September Business Plan[29]. The programme includes investment at 45 storm tank assets to increase capacity.

Ofwat's initial assessment

Through its cost assessment modelling, Ofwat has challenged the unit cost efficiency of our storm tank schemes (a challenge amounting to £54m). Ofwat also applied an additional £4m (5%) discretionary cost challenge to the costs derived from its econometric models.

Changes to our plan

Ofwat's IAP provided us with more information on industry benchmarks, which has enabled us to further assess the efficiency of our costs. Utilising our IAP wholesale cost review process (see Section 1), we have identified opportunities to reduce our business plan costs by £41m, including:

- By working with our delivery partners we identified £20m of efficiency savings, including:
  - Reviewing and challenging our design standards to remove unnecessary costs e.g. proposing above ground, as opposed to buried, pipework.
  - Changing design solutions, including developing leaner solutions and some shorter life assets e.g. above ground tanks, rather than concrete submerged tanks.
  - Identifying more upstream options - we believe there is potential to utilise more schemes in the catchment e.g. SuDS, to remove some surface flows from the network.
- Through independent review of our cost curves. This review identified that there the cost of our small storage tank schemes (<280m3 storage) were 37% greater than industry benchmarks, and that for the larger storage tanks schemes (>280m3 storage) costs were 12% greater than industry benchmarks. We used this information to recalibrate our cost projections[30].

Despite these adjustments, there remains a gap between our revised costs and Ofwat's assessment, which we discuss below.

Evidence to support our revised costs

The Ofwat model, due to its design, is unable to pick up some differences between companies costs. It is possible, for example, that some companies have some form of existing storage capacity at sites that they can utilise more optimally. In contrast, we have a very limited opportunity to find spare capacity. Unfortunately, without knowing the scope of the options other companies have included under this driver it is difficult to substantiate this idea. However, it is possible that this sort of un-modelled cost, plus the potential for model inaccuracies, could account for our costs continuing to look £17m inefficient.

In summary, we have identified £41m of capex savings by going through a rigorous review process. Our revised programme will require £88m to deliver the required environmental benefits. We do not believe there are further opportunities to reduce costs given the significant challenge applied to costs before and after our September submission. We believe these costs to be robust and efficient and value for money for customers. Therefore, we believe these costs should be fully allowed in the Ofwat funding allowance model.

[29] TA.12.WW06, page 44
[30] To ensure consistency of approach, we applied the same cost percentage reductions to the Slow hill Copse storage tank solution detailed under Conservation Drivers.

4.3.4. Sludge enhancement

Ofwat challenged 100% of our costs (equivalent to £5m) on the basis that we did not provide adequate evidence. We have now provided the evidence that Ofwat sought.

CE.A1.Table 27 – Summary of plan changes: Sludge enhancement

	SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Sludge growth – Budds Farm Cake reception (capex)	3.0	0.0	3.0	3.0	0.0	3.0
Sludge growth – CHP removal (capex)	1.8	0.0	1.8	1.8	0.0	1.8
Total	**4.8**	**0.0**	**4.8**	**4.8**	**0.0**	**4.8**

Our September 2018 plan

Our plan included £6m of sludge enhancement totex. This included:

- £3m enhancement capex to fund a new cake reception facility at Budds Farm Sludge Treatment Centre (STC) to accommodate AMP7 sludge growth
- £2m enhancement capex to upsize combined heat and power (CHP) engines on 9 STCs.
- £1m enhancement opex arising from the Budds Farm STC cake reception capex scheme (part of a least cost totex solution) and £1m enhancement opex arising from AMP6 capex schemes (not included within AMP6 baseline budgets used to derive AMP7 operating costs).

The £2m enhancement opex relating to AFCs is discussed in section 3 above. This section refers to the remaining £5m enhancement totex.

Ofwat's initial assessment

Ofwat challenged 100% of our capex, based on a deep dive assessment.

Specifically, Ofwat has challenged:

- That there is a lack of clarity on whether the sludge growth scheme being put forward was an opex or capex solution; and
- That there is a lack of evidence in relation to trading opportunities to manage sludge growth now and in the future.

We discuss both of these points below.

Changes to our costs

We have not revised the costs of this scheme in our updated plan. The capex remains at £5m.

Evidence to support our plan costs

Clarity on the proposed scheme

Our sludge growth programme consists of two capex schemes, one to increase the capacity of our Combined Heat and Power (CHP) engines and one to provide additional capacity at our Budds Farm STC.

Trading opportunities explored

Before committing to capital investment to accommodate sludge growth in our region, we looked to our neighbouring wastewater companies to assess whether they can provide the required treatment capacity, avoiding unnecessary capital works (more details are provided in our IAP action response to SRN.CMI.B1a). In summary, in 2016 we approached Thames Water to understand whether they had available capacity on their southern border to accommodate the forecast growth requirement. Thames Water confirmed at the time they had limited capacity for additional sludge cake at their Crawley STC (approx. 0.5tds/day) which could be utilised in an emergency scenario, but also stated their preference to retain this as redundancy for their own sludge operation. They also disclosed a small amount of capacity for additional liquid imports at their Basingstoke STC, but our cost benefit analysis showed that transfer activities were uneconomical, due to the additional transport distances.

The available treatment capacity disclosed by Thames Water was deemed to be insufficient to meet the demands of the growth challenge and thus informed our conclusion that enhancement investment at Budds Farm STC was necessary and provided the best value solution to the growth challenge. This understanding was reconfirmed in a meeting with Thames Water management in February 2019.

In order to ensure that future opportunities are identified and any change in circumstances that might affect the economics of sludge transfers are not missed, Southern Water and Thames Water have both identified appropriate responsible people to re-initiate sludge trading negotiations. Both parties have committed to continue to looking for and to exploit opportunities to enter into trading arrangements to the mutual benefit of both parties and our customers.

Budds Farm scheme: overall, we forecast that our treatment capacity requirement will increase by 3.7% in AMP7. We can manage some of this within our current capability but have identified a significant shortfall in capacity in Sussex by the end of AMP7. We plan to meet the needs of the Sussex sludge growth requirement by utilising existing but constrained digester capacity at our Budds Farm STC in Portsmouth. We will achieve this by installing new capacity to enhance the cake reception facilities at Budds Farm STC. Without this work, we will not be able to utilise the Budds Farm facilities to address the growth in Sussex.

In order to remove the capacity constraints, we need to enhance the capacity of the cake reception facilities at Budds Farm STC. This requires investment in new assets, including:

- A raw cake storage silo;
- Conveyors;
- Hoppers
- Pass forward pumping and SAS mixing;
- Cake blending;
- Asset integration; and
- Upgrades to control systems.

The need has been identified through a robust optimisation process, which considered all indigenous capacity as well as trading opportunities (see above). We note that Ofwat accepts that the growth in sludge

which this scheme is required to meet is outside of management control and the scheme represents the best option for customers.

Our totex costs for this sludge growth enhancement are robust and efficient; we have taken time to assess the optimal totex solution which combines opex and capex. The section above illustrates the trading options we explored as part of the options assessment process for this. Our preferred solution has been assessed on a whole-life cost basis. We discuss in more detail in Section 3 how our approach is underpinned by the fundamental principles of Ofwat's totex framework.

CHP renewal: Our plan included £2m of capex to fund the growth component of our CHP engine renewal programme. Some of our CHP engines will reach the end of their useful lives during AMP7 and are scheduled to be replaced under our capital maintenance programme. However, we will take the opportunity to upsize certain engines based on the associated sludge growth requirement – allowing for future growth. Accordingly, a proportion of the programme associated with provision of additional capacity has been identified as enhancement capex. A breakdown of the programme and associated allocation of costs is set out in *CE.A1.Table 28 – CHP renewal programme* below.

[redacted]

[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
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[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

[redacted]

4.3.5. Event duration monitoring

Ofwat challenged £4m of our costs, based on median industry unit costs. However, Ofwat has not modelled the full number of schemes that we are delivering due to a misinterpretation of Ofwat's table guidance, which we have now corrected.

CE.A1.Table 29 – Summary of plan changes: Event duration monitoring

	SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Event duration monitoring (capex)	4.4	0.7	4.4	3.7	0.0	3.7

Our September 2018 plan

Our plan included £5m of totex for event duration monitoring. This included £1m of AFCs, which we discuss in Section 3. This section relates to the remaining £4m of capex costs. This included installation of new or upgraded Event Duration Monitoring (EDM) telemetry as well as permit changes to enforce more frequent EDM measurements.

Ofwat's initial assessment

Ofwat has made an allowance of <£1m in the IAP, based on the median industry unit cost for EDM schemes, applied to 52 schemes. Ofwat's modelling does not yet reflect the answer we provided to a query (SRN-IAP-CA-018) on the number of schemes in our plan, which did not reconcile to the expected number from WINEP.

Changes to our September plan

We have not amended our costs, which remain at £4m capex.

Evidence to support our plan costs

We updated data table WWS4, line 7, in response to Ofwat query SRN-IAP-CA-018. The revised data included the additional sites where we are installing upgraded as well as first-time event duration monitoring. *CE.A1.Table 30 – EDM schemes* below shows the breakdown of the event duration monitoring schemes, which should be included in the model, as per our query response.

CE.A1.Table 30 - EDM schemes

	Sites	Capex (£m)	WINEP Drivers
New installations	52	1.197	U_MON1 *12 U_MON3 *40
Upgraded installations	314	3.124	U_MON1 *130 BW_MON *166 SW_MON * 18
Permit changes only	118	0.098	U_MON1 *118

Total	**484**	**4.419**	**-**

4.3.6. Sanitary parameters

Ofwat challenged us to reduce our costs by £22m. We have reduced our costs by £19m. However, we do not consider it appropriate to reduce our cost estimates further - our plan costs are within the reasonable margin of error of Ofwat's econometric model.

CE.A1.Table 31 – Summary of plan changes: Sanitary parameters

	SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
Sanitary Parameters	48.0	25.6	28.7	22.4	19.3	3.1

Our September 2018 business plan

Sanitary parameters refers to lines 20 and 67 of table WWS2, and covers all investment to meet new or tightened consent conditions for one or more of the sanitary parameters unless the objective is associated with a specific cost driver code for which there is a dedicated line elsewhere in this table.

This driver covers improvements required for the sanitary parameters of Biochemical Oxygen Demand and Ammonia. These improvements are in order to meet Water Framework Directive Objectives for specific water bodies, and are based on Environment Agency modelling. These solutions require enhanced treatment ability on site.

Our plan included £51m of totex for delivering and operating Sanitary Parameter driver schemes. This included £3m of AFCs, which we have discussed in Section 3. This section relates to the remaining £48m of capex.

Ofwat's initial assessment

Ofwat's initial assessment reduced our plan costs by £22m, based on the average of two econometric models.

Changes to our plan

Following Ofwat's challenge, we have further challenged our business plan costs, taking account of the additional information available in the IAP. We have also taken extra final effluent samples which have enabled us to identify a number of further cost reductions, including:

- **Removing two schemes,** where additional sampling data shows that we can meet the permit conditions without capital investment. (£6m)
- **Updated permit:** In the case of one further scheme, we have been able to reduce the scope and associated cost, based on changes to the permits since publication of the business plan. (£1m)
- **Synergies:** We have reduced the cost of two schemes as we identified there are synergies with other drivers. (£6m)
- **Specification change:** We have updated the design of two schemes (reducing costs by £6m)

- **No change:** For the twelve remaining schemes, we have not identified any opportunities and therefore believe our costs are robust and efficient. (£23m).

CE.A1.Table 32 – Sanitary parameters scheme cost updates below sets out the capex changes on a scheme by scheme basis.

[redacted]

Two of these drivers (WFD_IMPg/m Biochemical Oxygen Demand and WFD_IMPg/m Ammonia) are currently amber in WINEP3 and will require a cost adjustment process should there be any changes in future versions of the WINEP. We have detailed our cost adjustment approach for these in our response for SRN.CE.A4.

Evidence to support our costs

Our revised costs are £28m, which represents a gap of just £3m from between Ofwat's initial assessment and our plan. We have not adjusted these costs because:

- Our costs are based on a detailed bottom-up assessment of requirements, which has been subject to further independent review and challenge following the IAP.
- Ofwat's modelled costs are not materially different from our plan costs and are within the reasonable margin of error of what is a relatively simple econometric model. We note for example that, excluding our plan costs, the range of efficiency scores (the ratio of modelled costs to business plan costs is 0.62 to 2.52 a factor of four. In addition only three of ten companies had business plan costs within 25% of the modelled cost. This suggests that the model is not a good predictor of efficient costs and a significant proportion of the divergence is explained by factors other than differences in efficiency.

4.3.7. Conservation Drivers

Ofwat challenged us to reduce our costs by £6m. We have reduced our costs by £4m and have provided further information on the breakdown of our programme. We consider this additional information meets Ofwat's evidential bar.

CE.A1.Table 33 - Summary of plan changes: Conservation Drivers

SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)

Conservation Drivers (capex)	19.0	12.9	15.0	6.1	4.0	2.1

Our September 2018 plan

Conservation drivers refer to lines 4 and 52 of table WWS2, and cover all investment to meet conservation drivers (the Habitats and Birds Directives, the CRoW Act, the NERC Act, the Marine and Coastal Access Act, invasive non-native species and the UK Biodiversity Action Plan) where this investment has not been covered elsewhere.

For our plan this only included our non-Ultra Violet (UV) solutions for Shellfish schemes, as all other wastewater conservation driver investment is covered elsewhere in table WWS2.

Our plan included £20m of totex to deliver and operate our conservation driver schemes. This included £0.8m of AFCs, which we have discussed in Section 3. This section relates to the remaining £19m of enhancement capex.

Ofwat's initial assessment

Ofwat's initial assessment reduced our plan costs to £13m. This was based on their deep dive review which identified the following concerns:

- Ofwat considered our breakdown of the shellfish programme unclear in terms of storage solutions, UV solutions and the inclusion of investigations. Ofwat also considered there to be a lack of clarity over individual schemes and the options explored, and a high average scheme cost relative to benchmarks.
- As a result, Ofwat applied a company specific efficiency challenge of £3m and a further 20% efficiency challenge of £3m.

Changes to our September plan

We have reduced capex costs by £4m, as a result of following our IAP wholesale cost review process (Section 1):

- We identified an overlap between the Shellfish tank storage scheme at Millbrook and an IMP_6 driven storage solution at the same site (reducing costs by £1m).
- We also applied the same cost reductions and efficiencies described in the Storm Tank Capacity section, which reduced costs by £3m for the Slowhill Copse conservation driver storm tank scheme.

Evidence to support our revised costs

Ofwat has applied discretionary efficiency challenges to our costs based on:

- A lack of clarity of the breakdown of our programme
- Lack of clarity over individual schemes and the options explored and higher pre scheme unit costs than other companies.

We address these two points below.

Breakdown of our programme

The line definition for 'conservation drivers' refers to all investment for schemes required to meet conservation drivers that are not reported elsewhere. Based on this, we have only included our Shellfish Water, non-UV schemes as all other wastewater conservation driver investment is reported elsewhere in Table WWS2.

There are no shellfish investigations recorded in this line. All our studies and investigation schemes are recorded as opex in table WWS2, line 63, with the exception of Chemical Monitoring Schemes, which we have been included in table WWS2, line 59.

Our programme consists of five schemes, which are all storage solutions. Three of these are network solutions and two are WWTW storm tank solutions. Within these five, we have identified an overlap between the Millbrook solution for this driver and for the IMP 6 storm tank driver and the capital costs have been removed to prevent double counting.

Details of the five schemes and their revised costs are provided in *CE.A1.Table 34 - Revised plan costs: conservation driver* below.

CE.A1.Table 34 - Revised plan costs: conservation driver

[redacted]

High average scheme costs

As noted above, we have removed the capex relating to our scheme at Millbrook, as it is included under the IMP 6 storm tanks driver.

The most expensive scheme in our programme is the storm solution at Slowhill Copse WWTW. We have reviewed and challenged the capex costs for this storm tank scheme from £12m to £9m. This scheme is based on identical solutions to those under the IMP 6 Storm Tank programme. We have therefore applied the same cost factor review for Slowhill Copse.

We have benchmarked this using Ofwat's storm tank capacity IAP model. This results in a cost allowance of £12m for this scheme. We are therefore confident that the revised costs for this solution are efficient.

To identify the solutions in our plan we undertook a comprehensive options appraisal process as outlined below:

- We undertook an initial review of the spill reduction requirements in order to meet the no deterioration requirements for Shellfish Waters.

[redacted]

- Following this review, a technical assessment was made as to the appropriate location for interventions to reduce spill frequency.
- At the identified locations, we undertook an engineering feasibility assessment on the following options:
  - Develop a storage solution
  - Reduce the impermeable area upstream of the location to reduce surface flows
  - Upgrade existing structures, for instance to reduce infiltration or increase pass forward flow.

4.3.8. UV disinfection

Ofwat applied a discretionary 15% challenge to our costs (equivalent to £2m). We do not consider this challenge to be justified - our costs are by far the lowest of the five companies with costs in this area.

CE.A1.Table 35 – Summary of plan changes: UV disinfection

	SRN Sept submission (£m) Gross	Ofwat IAP (£m) Gross	SRN IAP response (£m) Gross	Difference (Sept. vs. IAP) (£m)	Cost reductions accepted (£m)	Remaining difference (£m)
UV Disinfection	13.1	11.1	13.1	2.0	0.0	2.0

Our September 2018 plan

Our plan included £14m of totex to deliver and operate our Ultra Violet (UV) disinfection schemes. This included <£1m of AFCs, which we have discussed in Section 3. This section is concerned with the remaining £13m of enhancement capex.

This included investment at two sites to install Ultra Violet disinfection schemes at wastewater works in order to increase the quality of shellfish waters.

Ofwat's initial assessment

Ofwat has applied a 15% discretionary efficiency challenge to our submitted costs. This is based on a company level efficiency only.

Changes in our revised plan

We have not changed our capex costs regarding UV disinfection, which we believe are efficient. They remain at £13m.

Evidence to support our plan costs

In assessing our costs via a shallow dive, Ofwat has not presented any evidence or specific justification for the application of a 15% reduction in our business plan costs for this area. As Ofwat note in the UV model however, this adjustment "*puts [the unit cost] below median cost*".

In fact, our business plan costs per population served are by far the lowest of the five companies with costs in this area. Our plan costs were £63,783 per population served by the relevant treatment works compared with the next lowest at £83,025 (United Utilities) and an average allowed cost of £295,006 per population served. Despite this, Ofwat has applied the largest efficiency challenge of the three companies not subject to a deep dive.

On the basis that our business plan unit costs are materially lower than any other company, we believe the application of a 15% reduction is unreasonable and unjustified.

Section 5. Cost Adjustment Claims

Introduction to this section

This section outlines the extent to which our Cost Adjustment Claims have changed since our September Business Plan. It responds to Ofwat's IAP feedback and provides additional information and evidence to support our two remaining claims:

- Bathing waters - £32.4m; and
- Thanet Groundwater Protection Scheme - £32.9m.

5.1. Our September 2018 submission

The Cost Adjustment Claims (CACs) included within our September 2018 submission were:

- **Bathing waters** (£32.4 m): this claim relates to work which will improve the bathing water quality and long-term resilience of seven bathing waters, enhancing the water quality, amenity value and economy in the local areas. This is a customer-driven claim. Our customers consistently tell us that the quality of the bathing waters in our region is a key priority for them. This is why we propose to improve five bathing waters classed as 'Sufficient' or 'Poor' to 'Good', and to improve two bathing waters from 'Good' to 'Excellent'
- **Thanet Groundwater Protection Scheme** (£32.9 m): this claim will deliver the third phase of Thanet Sewer groundwater scheme, which will prevent the risk of pollution of groundwater sources. This scheme is a statutory requirement under the Water Industry National Environmental Programme (WINEP3).
- **Growth – Whitfield** (£26.4 m): this claim related to work required for a sewage treatment solution for a growth hotspot in the Whitfield development where we expected to see significant, concentrated growth at levels far higher than the national average, and which was unlikely to be adequately funded through the modelled cost allowance

5.2. Ofwat's IAP feedback

Ofwat provided feedback on the quality of CACs against eight assessment gates. Below is a summary of Ofwat's IAP assessment for our CACs:

- **Bathing Waters**: Partial Pass (allowed adjustment £19.4m): All gates were at least partially passed, except robustness of costs where there were doubts over cost efficiency and the overlap with base maintenance. A provisional 40% reduction was applied pending analysis of base overlap and provision of evidence that costs are efficient.
- **Thanet Groundwater Protection Scheme**: Partial Pass (allowed adjustment £26.4m). Need for investment, need for adjustment and best option for customers were all assessed as 'Pass'. However the CAC did not provide a cost estimate breakdown, provided insufficient evidence on cost efficiency, and lacked detail of how the proposed Performance Commitment was intended to work. A 20% challenge has been applied to the claim cost based on concerns against the 'Robustness of costs' gate
- **Growth – Whitfield:** Rejected (allowed adjustment £0.0 million). The CAC was rejected because it did not provide any evidence that the development cannot be accommodated by an incremental increase in catchment capacity. Should the 'Need for Investment' be proven, the design of the preferred options

should be more clearly set out and costs transparently presented, and the capacity of the proposed new build works need further justification.

5.3. Our revised CACs

Having reviewed the IAP feedback we have revised our CAC claims and we provide further supporting evidence as follows:

- **Bathing Waters** (£21.3 million): we are submitting a reduced cost claim following a review of a potential overlap with base investment and a revision to the overhead which previously applied on this CAC. Our revised cost also reflects updated delivery estimates for named sites and minor scope removal relating to works will be delivered in AMP6. We provide further evidence below, comprising details of our Bathing Water selection process, an external assessment of our cost efficiency and examples of how efficiency has been built into our costs.
- **Thanet Groundwater Protection Scheme** (£33.9 million): we retain the value of our initial claim. We provide below a breakdown of cost, scope and assumptions for each solution item, and provide an external assessment of our cost efficiency. We describe below our approach to ensuring on-costs are efficient and provide details of a revised ODI to ensure customers are protected in the event of non-delivery or a delay.
- **Growth – Whitfield** (*£0.0 million, withdrawn*). Since September 2018 we have continued to review the actual build rate at Whitfield, which is at the lower end of the forecast growth rate. As part of the IAP review we have reviewed whether the 'need' for our proposed investments has changed. The lower build rate means that the full scheme is less likely to be required during AMP7, although some interim measures may be required until a larger scheme is progressed. Consequently we have removed the cost adjustment claim of £26.4m from the plan, and any interim actions should be covered by the Ofwat growth models. For further information in relation to wastewater growth investment please see our response to *SRN.CE.A1*

Below we provide fuller descriptions of the IAP feedback received for the Bathing Waters and Thanet Groundwater Protection Scheme CAC and how we have addressed the feedback in this submission. Full details of our CAC response is provided in Appendix 3. Cost Adjustment Claims (CAC).

5.3.1. Bathing Waters

September 18 claim**: £32.4m**
IAP**: Partial Pass, allowed adjustment £19.4m**
Revised claim**: £21.3m**

IAP feedback	Our response
Need for adjustment: PARTIAL PASS. References to rehabilitation and refurbishment of existing assets suggest that there may be a degree of overlap with capital maintenance **Robustness and efficiency of costs: FAIL.** SRN seems to fail to consider the potential overlap with base maintenance	Following completion of our 'Challenge and Review Process' we have: ■ confirmed there is no duplication of Bathing Water CAC Delivery costs elsewhere in the business plan ■ identified that CAC Investigation costs for several sites were mirrored in WINEP investigation costs, and have removed these CAC Investigation costs from the claim ■ validated that the package of work required to deliver Bathing Water quality improvement is enhancement expenditure, because this programme of work is specifically designed to improve Bathing Water quality beyond current levels (and is supported by customer WtP) ■ assessed the scope of each delivery cost element to review whether there is overlap with base expenditure and

	to ensure that the intervention is appropriately described. Following this review, we have removed costs associated with Misconnection Rectification scope from the CAC claim
Best option for customers: PARTIAL PASS. It is unclear why SRN proposes to improve two bathing waters to 'Excellent' when the 'WTP' for improving them to 'Good' is greater and the cost of doing so would presumably be lower (if only marginally)	We have provided details of our process and criteria for selecting Bathing Waters for this CAC, including an assessment of 32 long-listed sites in terms of cost-benefit, deliverability and affordability. We provide evidence that the proposed sites represent the best blend of cost-benefit for customers whilst meeting Willingness to Pay criteria and minimising the impact on customer bills. In particular, we excluded the remaining candidate to 'Good' sites on the basis of one or other of (a) low certainty of solution or (b) considerations of affordability. (For the avoidance of doubt, the candidate to 'Good' sites are not the same as the candidate to 'Excellent' sites.)
Robustness and efficiency of costs: FAIL. Overheads seem very high and this requires explanation which the claim fails to provide us with.	We initially applied a non-standard approach to overheads on this CAC, to reflect the low confidence placed on cost estimates (which had been developed before investigations had taken place to validate scope). We have now applied our standard costing approach, which significantly reduces the cost of the Bathing Water CAC and brings the overhead approach into line with rest of the business plan.
Robustness and efficiency of costs: FAIL. SRN fails to provide sufficient evidence to demonstrate the efficiency of costs	An independent review of the robustness and efficiency of a sample of our Bathing Water CAC concluded that our direct costs are broadly aligned with the assurers' benchmark of efficient costs (aggregate costs were 1.7% above benchmark), therefore providing evidence of the efficiency of our direct costs. In addition we have provided a summary of our approach to ensuring cost robustness and efficiency of key cost items.
Robustness and efficiency of costs: FAIL. Our confidence in the costings is also undermined by material increases in estimates for two of the bathing waters for which estimates were provided in SRN's PR14 business case (an approximate doubling of costs at Felpham and quadrupling at Littlestone).	■ We have explained that the revision in our forecast costs between PR14 and PR19 reflects a step change in our understanding of the interventions required at Felpham and Littlestone, following completion of AMP6 investigations. At both locations it has been identified that significant asset interventions are required to achieve and sustain the requisite Bathing Water quality improvements. ■ We have identified small amounts of scoped work which has been delivered in AMP6, and we have reduced costs at these sites accordingly (£20k reduction at Felpham for Bird & Dogs Measures, £6k reduction at Littlestone against Private Infrastructure Allowance) ■ As a result of our review process, the cost estimate provided for delivering the CSO Bognor Main at Felpham has been revised up to £1.7m. This revised figure represents our latest view of the cost of delivering this critical enhancement.

5.3.2. Thanet Groundwater protection scheme

September claim: **£32.9m**
IAP: **Partial Pass, allowed adjustment £26.4m**
Revised claim: **£32.9m**

IAP feedback requiring action	Our response
Robustness and efficiency of costs: FAIL. SRN does not provide any breakdown of the £32.9m.	We have provided details of scope, assumptions and costs for each solution item of the Thanet Groundwater Protection Scheme CAC. We have not revised our cost claim to reflect an implicit allowance because we do not have sewer survey, sewer rehabilitation or adit sealing works planned in the Phase 3 area of Margate during AMP7.
Robustness and efficiency of costs: FAIL. SRN does not explain how any efficiency challenge has been incorporated, and there is no statement regarding the cost efficiency of this scheme.	An independent review of the robustness and efficiency of Phase 3 costs concluded they are 14% below benchmark, therefore evidencing the efficiency of our costs. We have shared the assumptions which have informed our Phase 3 costing along with examples of how learning from AMP6 delivery has driven efficiency in Phase 3.
Robustness and efficiency of costs: FAIL. SRN does not provide any indication of the scale of on-costs or risk element, both of which gave us concern at PR14 and prompted a significant cost challenge.	We have confirmed that all contingency items were removed from our Phase 3 costs in our original submission. We have shared the key variables driving our cost estimates and have confirmed that any variation in these assumptions will be moderated through the 'Contractor Project Related Costs & Client Project On-Costs' component of the 'Project Uplift'.
Customer protection: PARTIAL PASS. Explain how protection works if SRN does not deliver the scheme but still spends all the £33m claimed.	To provide robust customer protection we have revised the ODI to mirror AMP6 arrangements, which will now protect protect customers in the event of non-delivery and delay.

Appendices

Introduction to this section

This section contains additional and detailed information to support our response. It contains the following:

- **Appendix 1: Model data inputs** – provides the granular breakdown of the differences in botex econometric model inputs to our submitted data tables. It supports our response in Section 2.4.
- **Appendix 2: Studies and Investigations Costs** – provides the granular breakdown of our water and wastewater costs relating to WINEP studies and investigations. It supports our response in Section 3.3.
- **Appendix 3**: **Cost Adjustment Claims** – provides additional information regarding our Cost Adjustment Claims. It supports our response in Section 5.

Appendix 1. Ofwat's model inputs

This appendix provides the detailed evidence behind our challenge that Ofwat has used inappropriate inputs in their econometric models, which has resulted in Southern Water being allocated £9.8m less botex than is appropriate – as considered in Section 2.4.

A1.1. Water

Table CE.A1.Table A1 – Summary of implications of model input differences in water botex models below summaries the impact on Southern Water's totex allowance in a static model in which only the variable is question is corrected. We note that the net impact in a dynamic model in which all inputs are corrected results in a similar impact to correcting the static model.

CE.A1.Table A1 – Summary of implications of model input differences in water botex models

Econometric model input	Impact of using corrected data inputs on SRN botex allowance (£m)		
	Average	Top-down	Bottom-up
Number of households	- 8.0	-11.3	-4.8
Number of booster pumping stations per lengths of main	3.0	4.5	2.1
% of water treated at complexity levels 3 to 6	-2.3	-2.2	-2.3
Lengths of main (km)	0.2	0.0	0.4
Total	**-7.1**	**-8.9**	**-4.6**

A1.1.1. Number of properties

Our property growth forecasts were generated by a third party organisation (Experian). The forecasts were produced in accordance with the guideline issued by the EA in collaboration with Defra, the Welsh Government and Ofwat (Water Resources Planning Guideline, May 2016). The recommended methodology referred to in the guideline is described in the following document:

- UK Water Industry Research (UKWIR) and Environment Agency's new guidance on population, household, property and occupancy forecasting for WRMP (UKWIR Report Ref No. 15/WR/02/8 – Feb 2016).

Section 5.3 (Forecast population, properties and occupancy) in the planning guideline states, *"….you will need to base your forecast population and property figures on local plans published by the local council…"* Accordingly, the forecast property figures in our plan are based on data from local plans. This was recognised by Ofwat in response to our draft Water Resource Management Plan (WRMP) when they made the following statement *"The demand forecast is well documented, reference to the industry guidance has been made and it appears to have been followed. This includes the use of local authority plan-based projections".* The use of any alternative approach for forecasting growth is inconsistent with Ofwat's own recommended methodology.

Growth forecasts are a fundamental component of our business plan. They contribute to our understanding of how demand and load will vary in the future, thus allowing us to better plan our resources and assets. Having robust and granular plan based forecasts, rather than historic linear trends, gives a clearer picture of how and where growth will materialise.

To be transparent and consistent with our approach to all model inputs, we believe that the property data should be updated to reflect the local plan based data in line with the Ofwat guidance.

For Water, the discrepancy between the figures is less than 2% each year; however, the Ofwat econometric model over-predicts the number of properties. The impact on Southern Water's totex allowance for Water is -£8m relative to Ofwat's IAP estimate. We have highlighted this despite the fact this disadvantages us on an individual input basis, we feel it is important to highlight where we can improve the accuracy of the input data.

CE.A1.Table A2 – Model input differences: number of properties

Year	Econometric model input	SW data table input	Percentage difference (%)	Data table reference
2017-18		1,114,160		Ws3, Line 8
2018-19		1,121,889		
2019-20		1,129,319		
2020-21	1,162,287	1,143,215	1.6	
2021-22	1,175,844	1,156,473	1.6	
2022-23	1,189,401	1,169,369	1.7	
2023-24	1,202,958	1,182,151	1.7	
2024-25	1,216,516	1,194,283	1.8	
Impact of corrected data inputs on SRN allowance (£m)			**-8.0**	

A1.1.2. Number of booster pumping stations per lengths of main

The number of 'booster pumping stations per kilometer of mains' in Ofwat's econometric model differs from the number calculated from entries in the September 2018 version of, our data table WN2 by 0.1% to 1.5%.

In our original September business plan, the number of booster stations remained constant until the final year of AMP7 when it will decrease by two. This change occurs upon completion of a new service reservoir and the removal of two booster pumping stations. These changes are part of our ongoing Network 2030 programme. In contrast, Ofwat has used last year's data, divided by a linear time trend of mains length. This is inaccurate as we can be certain of the number of booster pumping stations we plan to have over AMP7.

[redacted]

Furthermore, Ofwat issued a clarification regarding booster pumping stations, changing th definition from "*within"* the network, to "into and within". This changes the number of booster pumping stations significantly[31], from an average of 174 to 250. This 40% increase in the number of booster pumping stations leads to a corresponding 40% increase in the number of booster pumping stations per kilometer. We discuss the potential impact on our modelled botex allowance further in Section 2.2.

Correcting the inputs to our original September 2018 data submission results in Southern Water being allocated an additional £3.0m. We emphasise that we expect this is increase further when Ofwat's updated definitions and revised industry data are incorporated into Ofwat's models.

CE.A1.Table A3 – Model input differences: number of booster pumping stations per mains

Year	Econometric model input	Original Sept 2018 data		Data table reference
		Number of booster PSs	Number of booster PSs per km [calculation]	
2020-21	0.01222	174	0.01241	Wn1, Lines 9-22
2021-22	0.01219	174	0.01238	
2022-23	0.01217	174	0.01234	
2023-24	0.01214	174	0.01230	
2024-25	0.01211	172	0.01213	
Impact of corrected data inputs on SRN allowance (£m)			**3.0**	

A1.1.3. Percentage of water treated in bands 3 to 6

Ofwat has used a simple linear time trend to project water treated and water treated in Bands 3 to 6; this variable is an indirect result of these projections.

The SW data table entries show a small stepped increase in the amount of water treated at complexity levels 3 to 6 at the end of year 2 and also at the end of year 4. This aligns with the forecast completion of the nitrate schemes within our Network 2030 programme. This programme will see the raw water from a number of sources consolidated at larger treatment works. It will also see the addition of ion exchange plant for physical removal of nitrate at a number of those sites. Our bottom-up estimate is based on our latest accurate view of what our water treatment works are doing and our understanding of our environmental commitments.

The discrepancy between the figures results in a –£2.3m impact on Southern Water's totex allowance.

[31] Ofwat's original definition for Data Table Wn2 Line 31 was *"booster pumping stations **within** the distribution system."* Ofwat's new definition (Initial Assessment of Plans Q&A, 11th March 2019) states that we now need to include "*any site that boosts potable water **into** the distribution system"* This increases our annual average from 174 to 250.

CE.A1.Table A4 – Model input differences: percentage of water treated in bands 3 to 6

Year	Econometric model input (%)	SW data table input [calculation] (%)	Percentage point difference	Data table reference
2020-21	90.52	89.18	0.01	Wn1, Lines 9-22
2021-22	91.34	89.18	0.02	
2022-23	92.15	89.55	0.03	
2023-24	92.96	89.55	0.03	
2024-25	93.78	92.67	0.01	
Impact of corrected data inputs on SRN allowance (£m)			**-2.3**	

A1.1.4. Lengths of main (km)

Ofwat's mains length forecasts have been generated using a simple linear time trend. This is inappropriate as it does not accurately reflect the work we are planning to do to meet the population growth we expect in AMP7, in line with our local plans. Our projections in data table WN2 and CE.A1.Table A5 are based on our forecast for the new mains that we are planning to deliver up to 2025.

Our forecast differs from Ofwat's econometric model inputs, resulting in a positive impact on Southern Water's botex allowance of £0.2m when the inputs are corrected.

CE.A1.Table A5 – Model input differences: lengths of main (km)

Year	Econometric model input	SW data table input	Percentage difference (%)	Data table reference
2020-21	14,018	14,017	0.0	Wn2, Line 1
2021-22	14,051	14,059	-0.1	
2022-23	14,084	14,101	-0.1	
2023-24	14,117	14,143	-0.2	
2024-25	14,150	14,185	-0.2	
Impact of corrected data inputs on SRN allowance (£m)			**0.2**	

A1.2. Wastewater

Table *CE.A1.Table A6* summaries the impact on Southern Water's totex allowance in a static model in which only the variable in question is changed. We note that the net impact in a dynamic model in which all inputs are changed results in an immaterial difference.

CE.A1.Table A6 – Summary of implications of model input differences in waste botex models

No.	Econometric model input	Impact of using corrected data inputs on SRN totex allowance (£m)		
		Average	Bottom up	Mid-level
1	Pumping capacity / km	17.1	17.1	17.1
2	Load received at STWs (kg/BOD/yr)	-13.4	-11.0	-15.0

3	Number of properties / km sewers	6.7	6.7	6.7
4	% load treated in STWs in size band 6	3.2	2.9	3.4
5	Sewer length (km)	1.4	1.4	1.4
6	% load received by STWs with ammonia	1.3	0.1	1.7
7	Sludge produced (tds/yr)	0.3	0.6	0.0
8	% load treated in STWs in size band 1-3	0.2	0.2	0.2
9	Number of properties	No material impact	No material impact	No material impact
10	Number of STWs / property	No material impact observed	No material impact observed	No material impact observed
Total		**16.8**	**18.5**	**15.2**

A1.2.1. Pumping capacity per sewer length

Ofwat uses a flat figure for pumping capacity in its econometric models. It is not clear why Ofwat has used a flat year-on-year trajectory per km sewer when its own estimated figures on km sewer increases year on year. This is mathematically incorrect. Pumping station capacity has increased by an average of 2% each year of PR14. We expect this growth to continue and therefore consider Ofwat's flat figure to be inappropriate.

We request that Ofwat should instead use the length of sewer contained in our original data tables. This approach would be more consistent than using a flat figure for the AMP. The argument to use Southern Water's length of sewer remains the same.

The inconsistences in Ofwat's data results in a significant reduction in Southern Water's appropriate totex allowance of £17.1m. We believe that Ofwat's approach is materially incorrect and that our totex allowance should account for this additional £17.1m.

CE.A1.Table A7 – Model input differences: Pumping capacity per sewer length

Financial year	Econometric model input	SW data table input	Percentage difference (%)	Data table reference
2021	3.16	3.40	-7.5	WWn3 J7
2022	3.16	3.45	-9.2	WWn3 K7
2023	3.16	3.51	-11.0	WWn3 L7
2024	3.16	3.56	-12.7	WWn3 M7
2025	3.16	3.62	-14.4	WWn3 N7
Impact of corrected data inputs on SRN allowance (£m)			**17.1**	

A1.2.2. Load received at STWs (kg/BOD/yr)

Our estimated load received at sewage treatment works is based on forecast population growth from SAGE, which uses Official National Statistics (ONS) population growth forecasts. We assume 0.06kg of BOD

produced by each person/day. This is an industry standard set by Ofwat[32] and repeated in Environmental Agency guidance[33]. An allowance for cess, trade, and non-residential population equivalent has also been factored into our estimates.

Our estimates are based on a bottom-up approach that is more accurate and sophisticated than simple extrapolation. In this case, Ofwat has over-estimated load, which results in a higher cost allowance than our forecasts suggest is necessary. We have no reason to believe that Ofwat would have more accurate data regarding the load received at STWs, and consider our data submission to be representative of Southern Water.

Our full process is described in WWn4 Lines A – H, I16, and has been independently audited as part of business plan assurance process.

In this case, correcting the model input results in Southern Water being allocated a -£13.4m lower totex allowance than Ofwat have provided in their IAP. We have highlighted this despite the fact that it does not advantage us to raise this point. The divergence of Ofwat's data inputs results in Southern Water being unfairly disadvantaged with a lower totex allowance than Ofwat's econometric models suggest is appropriate.

CE.A1.Table A8 – Model input differences: Load received at STWs

Financial year	Econometric model input	SW data table input	Percentage difference (%)	Data table reference
2021	311,943	307,828	1.3	WWn4 N90
2022	316,561	310,381	2.0	WWn4 N71
2023	321,179	312,949	2.6	WWn4 N52
2024	325,797	315,490	3.2	WWn4 N33
2025	330,415	319,111	3.4	WWn4 N14
Impact of corrected data inputs on SRN allowance (£m)			**-£13.4m**	

A1.2.3. Number of properties / km sewers

Our property growth forecasts were generated by a third party organisation (Experian). The forecasts were produced in accordance with the guideline issued by the EA in collaboration with Defra, the Welsh Government and Ofwat (Water Resources Planning Guideline, May 2016). The recommended methodology referred to in the guideline is described in the following document:

- UK Water Industry Research (UKWIR) and Environment Agency's new guidance on population, household, property and occupancy forecasting for WRMP (UKWIR Report Ref No. 15/WR/02/8 – Feb 2016).

[32] For example, see "2018 Annual Performance Report Tables [Section 4N]" (Ofwat, 2018)
[33] For example, see "Waste water treatment works: treatment monitoring and compliance limits" (Environment Agency, 2019)

Section 5.3 (Forecast population, properties and occupancy) in the planning guideline states, *"…you will need to base your forecast population and property figures on local plans published by the local council…"* Accordingly, the forecast property figures in our plan are based on data from local plans. This was recognised by Ofwat in response to our draft Water Resource Management Plan (WRMP) when they made the following statement *"The demand forecast is well documented, reference to the industry guidance has been made and it appears to have been followed. This includes the use of local authority plan-based projections".* The use of any alternative approach for forecasting growth is inconsistent with Ofwat's own recommended methodology.

Growth forecasts are a fundamental component of our business plan. They contribute to our understanding of how demand and load will vary in the future, thus allowing us to better plan our resources and assets. Having robust and granular plan based forecasts, rather than historic linear trends, gives a clearer picture of how and where growth will materialise. For example, the linear trend does not reflect the step change in growth that is predicted for large housing developments at places like Gatwick, Brighton, Ebbsfleet and others, which are included in local authorities planning forecasts.

To be transparent and consistent with our approach to all model inputs, we believe that the property data should be updated to reflect the local plan based data in line with the Ofwat guidance.
For Waste, the discrepancy does not lead to a material impact on Southern Water's cost allocation.

Similarly, Ofwat have used a linear time trend to forecast sewer length. As with the above, we expect a step change in growth for AMP7 that is inconsistent with the growth seen in AMP6. This is due to GIS level improvements in mapping that have initially identified gaps in the public sewer network which is likely to increase the forecast total length of sewer further.

CE.A1.Table A9 – Model input differences: Number of properties / km sewer

Financial year	Econometric model input	SW data table input	Percentage difference (%)	Data table reference
2021	2,013,578	2,027,614	-0.7	WWs3 J14
2022	2,026,366	2,050,660	-1.2	WWs3 K14
2023	2,039,155	2,073,276	-1.7	WWs3 L14
2024	2,051,944	2,095,452	-2.1	WWs3 M14
2025	2,064,732	2,116,724	-2.5	WWs3 N14
Impact of corrected data inputs on SRN allowance (£m)			**6.7**	

A1.2.4. Percentage load treated in STWs in size band 6

Ofwat have applied a flat figure across AMP7, taking the average of the final three years of AMP6. We emphase that this is inappropriate. We have a firm understanding of the changes we expect over AMP7. Any forecast increases in population that would cause an STW to change size band during the reporting period have been captured and are considered to be accurate and proportionate. This is expressed in table WWn4.

Although the differences are small, it is simply inappropriate to apply a flat average when our accurate data points to changes over AMP7. For example, we anticipate a decrease in the percentage of load treated in STWs in size band 6 because a higher proportion of wastewater growth in AMP7 occurs in catchments served by STWs in size bands 1-5 than in STWs of size bands 4 and below. We have no management control over where development occurs.

Ofwat's model is overstating the extent to which we treat using size band 6, as it assumes an average across 3 years instead of reflecting the declining proportion treated in size band 6 that we expect, based on

local growth and development projections. Additionally all of our big treatment works are at the lower end of band 6 (Budds Farm - our largest – is only the 27th largest in the UK by population equivalent). This suggests that STW size band 6 does not accurately account for economies of scale in Southern Water's case. Our total number of STWs > size band 5 remains stable at 42 for the whole period.

We therefore consider our data submission to be representative. Improving Ofwat's data inputs results in Southern Water being allocated and additional £3.2m.

The full process is described in WWn4 Lines A – H, I16, and has been independently audited as part of business plan assurance process.

CE.A1.Table A10 – Model input differences: Percentage load treated in STWs in band 6

Financial year	Econometric model input (%)	SW data table input (%)	Percentage point difference	Data table reference
2021	82.63	81.86	0.8	WWn4 N89/N90
2022	82.63	81.84	0.8	WWn4 N70/N71
2023	82.63	81.83	0.8	WWn4 N51/N52
2024	82.63	81.83	0.8	WWn4 N32/N33
2025	82.63	81.51	1.1	WWn4 N13/N14
Impact of corrected data inputs on SRN allowance (£m)			**3.2**	

A1.2.5. Sewer length (km)

We outlined in item number 3 above how Ofwat's linear time trend is inappropriate. Correcting this variable, results in Southern Water being allocated an additional £1.4m in our botex allowance.

CE.A1.Table A11 – Model input differences: Sewer length

Financial year	Econometric model input	SW data table input	Percentage difference (%)	Data table reference
2021	39,864	39,886	-0.1	WWn3 J21 & J22
2022	39,957	40,036	-0.2	WWn3 K21 & K22
2023	40,051	40,166	-0.3	WWn3 L21 & L22
2024	40,144	40,308	-0.4	WWn3 M21 & M22
2025	40,237	40,448	-0.5	WWn3 N21 & N22
Impact of corrected data inputs on SRN allowance (£m)			**1.4**	

A1.2.6. Percentage load received by STWs with ammonia <3mg/l

Ofwat apply a flat figure across AMP7, using the most recent year's data. This is inappropriate. We have confidence in our forecasts as they are based upon the number of environment permits we receive from the Environment Agency – there is no uncertainty in this number and can be confirmed directly with the Environment Agency. Our forecasts have been incorporated into our estimates and independently audited. This is expressed in table WWn4.

Our data involves an increase in the percentage load in the final year of AMP7, when we are expected to deliver upon EA requirements and therefore Ofwat's flat line approach is inappropriate as there is no uncertainty regarding these regulatory requirements. The corrected data results in Southern Water being allocated £1.3m more.

The full process is described in WWn4 Lines A – H, I16, and has been independently audited as part of business plan assurance process.

CE.A1.Table A12 – Model input differences: Percentage load received by STWs with ammonia

Financial year	Econometric model input (%)	SW data table input (%)	Percentage point difference	Data table reference
2021	14.9	15.2	-0.3	WWn4 AB90/N90
2022	14.9	15.2	-0.3	WWn4 AB71/N71
2023	14.9	15.2	-0.3	WWn4 AB52/N52
2024	14.9	15.2	-0.4	WWn4 AB33/N33
2025	14.9	15.6	-0.7	WWn4 AB14/N14
Impact of corrected data inputs on SRN allowance (£m)			**1.3**	

A1.2.7. Sludge produced (tds / yr)

Ofwat state they have used company forecasts. However, we note there are small discrepancies (to the decimal place) between our data input submission and Ofwat's econometric input. We cannot account for this difference.

We have no reason to believe that our tds forecast is inaccurate or misrepresentative. Our sludge forecast is reported annually as part of the Annual Performance Report. Overall governance for mandatory regulatory reporting is provided by the Regulatory Compliance Framework (RCF) which is independently audited to provide assurance in data quality. As described in the RCF, sludge forecasts are based on a triangulation between measured volumes captured at the point of treatment and theoretical sludge makes derived from population forecasts and STW treatment categories. This represents industry best practice.

Correcting Ofwat's data inputs results in a £0.3m positive impact on Southern Water's totex allowance.

CE.A1.Table A13 – Model input differences: Sludge produced

Financial year	Econometric model input (%)	SW data table input	Percentage difference (%)	Data table reference
2021	125	125	-0.4	Bio1 J7
2022	126	126	-0.3	Bio1 K7
2023	127	127	-0.4	Bio1 L7
2024	128	128	-0.2	Bio1 M7
2025	129	129	0.1	Bio1 N7
Impact of corrected data inputs on SRN allowance (£m)			**0.3**	

A1.2.8. Percentage load treated in STWs in size band 1-3

Ofwat have applied at three-year average across the whole of AMP7. This is inappropriate. STW size band parameters are clearly defined in the line descriptions for WWn4 and are well understood. Any forecast increases in population (according to official ONS forecasts) that would cause an STW to change size band during the reporting period have been captured and are considered accurate and proportionate. This is expressed in table WWn4.

The full process is described in WWn4 Lines A – H, I16, and has been independently audited as part of business plan assurance process.

Correcting the model input results in a positive impact on Southern Water's botex, and we urge Ofwat to adhere to accurate data forecasts throughout their econometric modelling.

CE.A1.Table A14 – Model input differences: Percentage load treated in STWs size band 1 to 3

Financial year	Econometric model input (%)	SW data table input (%)	Percentage point difference	Data table reference
2021	2.57	2.61	- 0.04	WWn4 SUM(N84:N86)/N90
2022	2.57	2.59	- 0.02	WWn4 SUM(N65:N67)/N71
2023	2.57	2.57	- 0.00	WWn4 SUM(N46:N48)/N52
2024	2.57	2.55	0.02	WWn4 SUM(N27:N29)/N33
2025	2.57	2.52	0.05	WWn4 SUM(N8:N10)/N14
Impact of corrected data inputs on SRN allowance (£m)			**0.2**	

A1.2.9. Number of properties

We have considered the divergence in data inputs for the number of properties in Section A1.2.3 above. We emphasise that we cannot reconcile Ofwat's numbers with ours, which have been calculated using established methodology (e.g. Environment Agency) and using our own historical datasets.

CE.A1.Table A15 – Model input differences: Number of properties

Financial year	Econometric model input	SW data table input	Percentage difference (%)	Data table reference
2021	50.51	50.84	-0.6	Calc
2022	50.71	51.22	-1.0	Calc
2023	50.91	51.62	-1.4	Calc
2024	51.11	51.99	-1.7	Calc
2025	51.31	52.33	-2.0	Calc
Impact of corrected data inputs on SRN allowance			**Immaterial impact**	

A.1.2.10. Number of STWs / property

We consider above the accuracy and robustness of our forecasts for STWs and number of properties. Combining our figures, we observe a difference with Ofwat's numbers.

CE.A1.Table A16 – Model input differences: Number of STWs / property

Financial year	Econometric model input (%)	SW data table input (%)	Percentage difference (%)	Data table reference
2021	0.0181	0.0180	0.7	WWn4 N100
2022	0.0180	0.0178	1.2	WWn4 N81
2023	0.0179	0.0176	1.6	WWn4 N62
2024	0.0178	0.0174	2.1	WWn4 N43
2025	0.0175	0.0171	2.5	WWn4 N24
Impact of corrected data inputs on SRN allowance			**Immaterial impact**	

Appendix 2. Studies and investigation costs

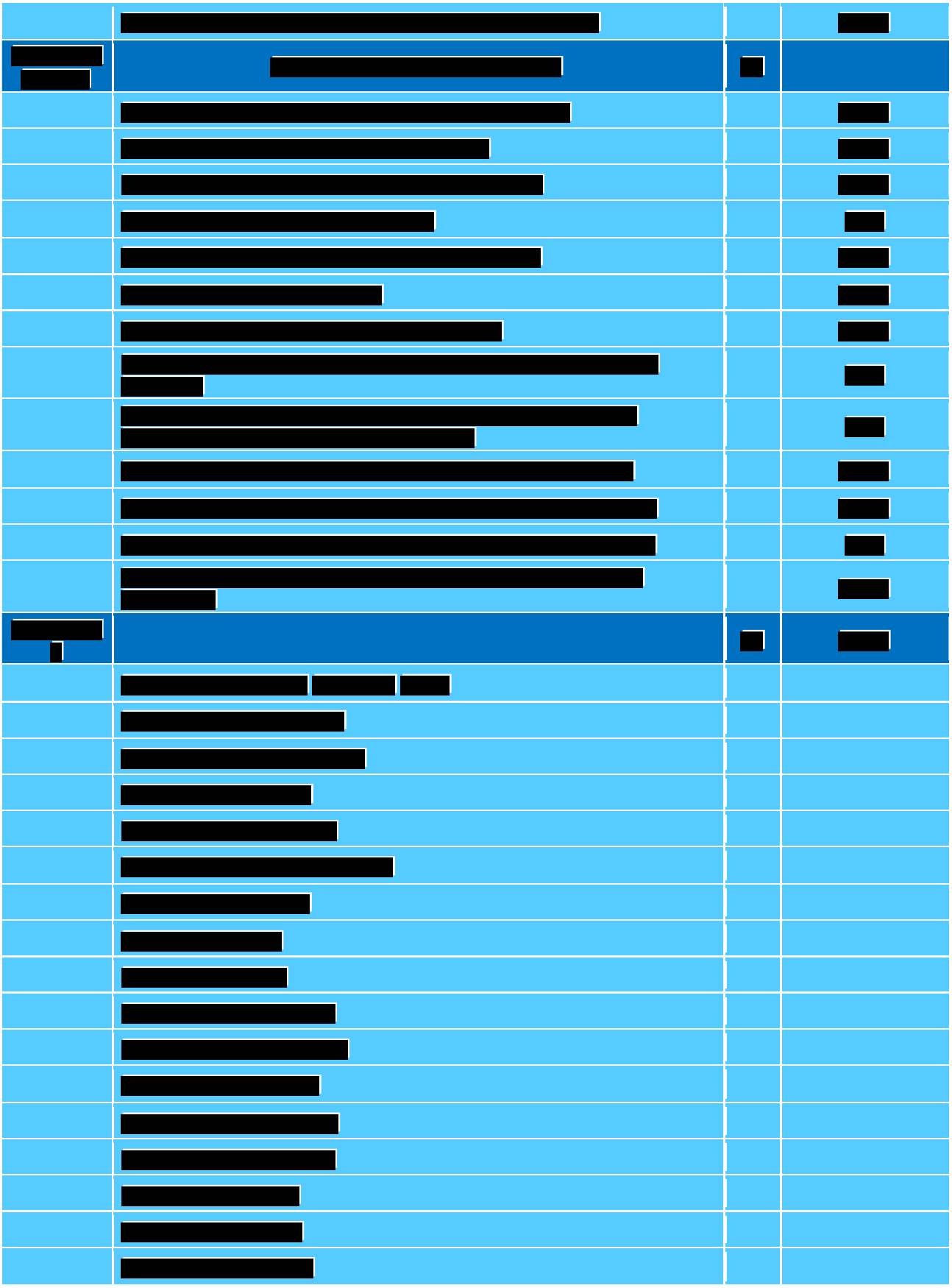
This Appendix provides the detailed cost forecasts relating to WINEP studies and investigations in our business plan, as discussed in Section 3.

A1.1. Wastewater

The Table below provides details of our business plan forecasts for WINEP studies and investigations in wastewater.

CE.A1.Table A17 - Wastewater WINEP investigations costs

[redacted]



[redacted]

A1.2. Water

The table below provides details of our business plan forecasts for WINEP studies and investigations in wastewater.

CE.A1.Table A18 - Water WINEP investigations costs

[redacted]

Appendix 3. Cost adjustment claims

3.1. Bathing Waters

CE.A1.Table 19 – *Cost Adjustment Claim: Bathing Waters* below sets out Ofwat's IAP assessment for our Bathing Waters CAC.

CE.A1.Table 19 – Cost Adjustment Claim: Bathing Waters

Area: Cost Adjustment Claim – Bathing Waters
Concern: ■ 'Partial accept' considered appropriate as all gates at least partially passed, except robustness of costs where we have doubts over cost efficiency and the overlap with base maintenance. ■ Provisional 40% reduction applied pending more considered analysis of overlap with base maintenance and receipt of evidence to support high on-costs and showing that overall costs are efficient.
Required Action: ■ **Need for adjustment: PARTIAL PASS**. The investment constituting the claim is neither statutory-driven enhancement set out in WINEP3, nor wholly base maintenance, though references to rehabilitation and refurbishment of existing assets suggest that there may be a degree of overlap with capital maintenance. It is clear, however, that the proposed enhancements are not fully included in our modelled baseline and that the modelled allowances would, in the round, be insufficient to accommodate them in the absence of this claim. ■ **Best option for customers**: **PARTIAL PASS.** SRN explains that the selection of bathing waters for improvement was made on the same criteria that were applied in AMP6 and agreed with the CCG. Recent engagement with customers shows that the scale and pace of the work has wide support. SRA performed CBA on the 32 bathing waters that did not reach 'Excellent' in 2016-17 and it selected the most cost beneficial combination of improvements for which the cumulative cost fell within the WTP envelope. That said, it is unclear to us why SRN proposes to improve two bathing waters to 'Excellent' when the 'WTP' for improving them to 'Good' is greater and the cost of doing so would presumably be lower (if only marginally). ■ **Robustness and efficiency of costs: FAIL**. The value of the claim is broken down by bathing water (with the 'Excellent' component assumed to be the median combined cost of 2 of the 4 candidates). However, SRN seems to fail to consider the potential overlap with base maintenance (much of cost is associated with sewer rehab, WPS refurb etc.). Also, at 101% of design and construction costs, overheads seem very high and this requires explanation which the claim fails to provide us with. SRN fails to provide sufficient evidence to demonstrate the efficiency of costs. ■ Our confidence in the costings is also undermined by material increases in estimates for two of the bathing waters for which estimates were provided in SRN's PR14 business case (an approximate doubling of costs at Felpham and quadrupling at Littlestone).

Need for adjustment, PARTIAL PASS

- References to rehabilitation and refurbishment of existing assets suggest that there may be a degree of overlap with capital maintenance

Best option for customers, PARTIAL PASS

- It is unclear to us why SRN proposes to improve two bathing waters to 'Excellent' when the 'WTP' for improving them to 'Good' is greater and the cost of doing so would presumably be lower (if only marginally)"

Robustness and efficiency of costs: FAIL

- SRN seems to fail to consider the potential overlap with base maintenance (much of cost is associated with sewer rehab, WPS refurb etc.)
- Overheads seem very high and this requires explanation, which the claim fails to provide us with.
- SRN fails to provide sufficient evidence to demonstrate the efficiency of costs
- Our confidence in the costings is also undermined by material increases in estimates for two of the bathing waters for which estimates were provided in SRN's PR14 business case (an approximate doubling of costs at Felpham and quadrupling at Littlestone).

Rationale for improving two bathing waters to 'Excellent'

We have proposed improving two bathing waters to 'Excellent', rather than improving other bathing waters to 'Good' because, as explained below, we excluded the remaining candidate to 'Good' sites on the basis of one or other of:

- low certainty of solution; and
- considerations of affordability.

For the avoidance of doubt – and to correct an apparent misapprehension in the IAP assessment – the candidate to 'Good' sites are not the same as the candidate to 'Excellent' sites.

Our approach for selecting Bathing Waters for improvement in AMP7 can be summarised as:

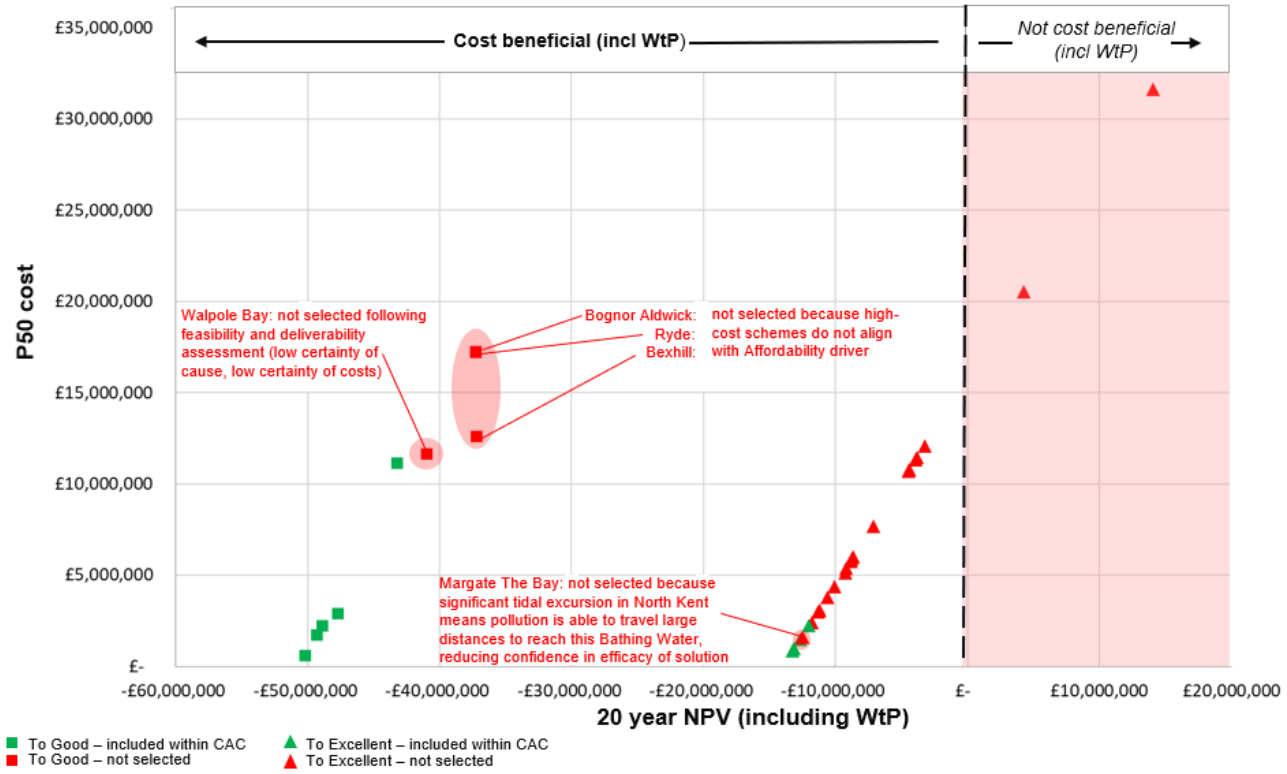
- Assessment of 83 Bathing Water locations against relevant assessment period (water quality) classifications. Sites consistently achieving 'Excellent' were removed, as were sites which had received considerable investment to improve to 'Excellent'
- Cost benefit analysis of 32 sites based on 20 year NPV including Willingness to Pay benefit of £3,248,728/year to Good, and £867,716/year to Excellent
- Assessment of 32 Bathing Waters against criteria of cost, amenity, certainty of root cause, deliverability, timescales, environmental assessments and social capital

Our CAC proposed improvements relate to the following Bathing Waters:

- Five 'To Good' sites: Broadstairs, Viking Bay; Littlestone; Lancing, Beach Green; Hastings, Pelham Beach; Felpham
- Two 'To Excellent sites' from a list of four: Gurnard, Seagrove, Ramsgate Sands; Pevensey Bay

The rationale for including two 'To Excellent' sites in the Bathing Waters CAC, rather than additional 'To Good' sites, is based on an assessment of the 32 sites in terms of cost-benefit, deliverability and affordability. This is summarised in *CE.A1.Figure A1 - P50 Cost of 'To Good' and 'To Excellent' Bathing Waters against 20 Year WLC (WtP).*

CE.A1.Figure A1 – P50 Cost of 'To Good' and 'To Excellent' Bathing Waters against 20 Year WLC (WtP)



The proposed Bathing Waters programme represents the best blend of cost-benefit for customers whilst meeting Willingness to Pay criteria and minimising the impact on customer bills. Our programme prioritises 'To Good' improvements as our customers have told us that these are the Bathing Water enhancements they value the most. Figure 1 illustrates why we have selected the five named 'To Good' schemes, as these are the most cost beneficial.

Figure 1 also shows why an optimal AMP7 Bathing Water programme should include additional 'To Excellent' improvements rather than selecting additional 'To Good' schemes. The remaining four potential 'To Good' sites have been excluded due to either low certainty of solution and consideration of affordability. If an additional 'To Good' scheme was to be selected, the next for consideration would be Walpole Bay, Margate. This site is a poor candidate because of concerns around the feasibility of delivering effective interventions at this location. There is very low certainty around the cause of water quality issues at Walpole Bay, and consequently there is low cost certainty for the programme of Bathing Water improvements required at this site. Schemes with such low levels of confidence in likely impacting sources and such low cost certainty have been deemed inappropriate to include in a CAC.

The remaining 'To Good' sites (Ryde, Bognor Aldwick and Bexhill) are all high-cost schemes, and inclusion of any of them in this CAC would cause the CAC claim to be considerably higher cost. Selection of these schemes would not align with our Affordability driver and as such they have not been included. However there are sixteen feasible 'To Excellent' schemes with a lower forecast cost that these 'To Good' schemes, and delivery of two of our four short-listed 'To Excellent' sites means we can still meet customer preferences and deliver additional Bathing Water improvements (well within customer Willingness To Pay) but at significantly lower cost, moderating impact on customer bills. This approach also aligns with our long-term objective to improve all Bathing Waters to Excellent. However, should Ofwat favour a different balance of

Bathing Water improvements for AMP7 delivery, we would be willing to discuss this before final determination.

Review of potential overlap with capital maintenance

Ofwat's IAP report included a statement querying whether there was overlap between Bathing Water CAC solution costs and capital maintenance. As part of our 'Challenge and Review Process' we have targeted areas of apparent inefficiency, reviewed the robustness of our costs and revisited our cost assumptions.

Following this review, we can confirm that there is no duplication of Bathing Water CAC delivery costs elsewhere in the business plan; all proposed delivery costs exist only as part of the CAC. However, as part of this review we have identified that some Investigation costs included in the CAC were mirrored in the costing for WINEP investigations. Consequently, we have reduced the CAC Investigation costs accordingly to ensure there is no overlap with the WINEP investigation allocation. The revised Investigation costs are shown *in CE.A1.Table 20 - Bathing Water CAC cost breakdown (£m).*

Delivering the Bathing Water improvements described in our claim will require a suite of coordinated interventions at each location. The cost breakdown provided in *CE.A1.Table 20 - Bathing Water CAC cost breakdown (£m)* summarises the analysis and activities required to realise the water quality improvements to 'Good' and 'Excellent' as specified in our submission. We consider the package of work required to deliver these outcomes to be enhancement expenditure, because this programme of work is specifically designed to improve Bathing Water quality beyond current levels.

However, we acknowledge that the presentation of solution costs in our submission did not adequately convey the scope or enhancement nature of the interventions. We have therefore assessed the scope of each delivery cost element to review whether there is overlap with base expenditure and to ensure that the intervention is appropriately described.

WPS Upgrades

This cost element covers enhancement investment in WPS assets to improve performance and service levels, reduce spill frequencies from operational causes and increase operational resilience. We acknowledge that the original terminology of 'WPS refurbishment' was misleading and have revised this to 'WPS upgrade' in our IAP response.

Without delivery of this CAC scope, no WPS upgrade works are planned for AMP7 delivery in named Bathing Water catchments. Experience from AMP6 BWEP shows us that WPS enhancement investments are critical to achieving and sustaining 'Good' and 'Excellent' status. Our strategy is to move from a position where Bathing Waters may be associated with several WPS which all fail in emergency conditions once per season on different days (perfectly legally) towards a position where one WPS emergency spill is experienced over a five or ten year duration. This shift is critical because it only takes >3 events per bathing season to lose Good status, or >2 events for Excellent.

Below are examples of potential WPS upgrades for named Bathing Waters which demonstrate the enhancement nature of the investment (note that scope will only be confirmed once investigations are complete):

- Littlestone: There are a number of WPSs in the Littlestone catchment with insufficient emergency storage provision in the event of pump failure. Potential WPS enhancement interventions to improve resilience and support a sustainable Bathing Water quality improvement include:
  - Additional Storage at Queen's Road WPS (~420m3) to improve storage, build resilience and enable tankering if required

- Additional Storage at Clarke Road WPS (~48m3) to improve operational resilience
- Additional Storage at Meehan Road WPS (~57m3) to improve operational resilience
- Associated sewer upgrade: 283 metre combined sewer on Queen's Road from 150mm to 225mm.

- Felpham: there are multiple WPS impacting Felpham which require investment to reduce the risk of pollution, enhance monitoring capability and improve operational resilience. Examples of potential WPS enhancements which would support a sustainable Bathing Water quality improvement 'to Good' at Felpham include:
  - Shripney Road: installation of instrumentation for more accurate level monitoring. Increase capacity of submersible pumps and additional pipework to improve performance, reduce spill frequency and improve operational resilience

Other potential WPS enhancement at named Bathing Waters (requiring validation through field investigations) include installation of auto changeover on pumps and provision of backup generators to provide resilience to support Bathing Water quality improvements.

WTW Upgrades

Our claim includes enhancement investment for installation of UV treatment at Lidsey WTW, which impacts Felpham. Investigations indicate the main cause of human pollution from the Aldingbourne and Lidsey Rife is likely to be continuous discharges from the WTW, and growth is likely to increase this contribution by ~9%. The proposal to install tertiary treatment is considered to be enhancement investment as it will improve treatment capacity, capability and performance to a level above that required by current permit levels and is a crucial enabler for improving and securing the required improvement in Bathing Water quality.

WPS / CSO Storage

Our claim includes enhancement investment for CSO storage at Felpham. This investment will provide the additional storage required to reduce spills to less than three per season, the standard for 'Good' Bathing Waters. We consider this to be enhancement investment as it will improve service levels, reduce spill frequencies from operational causes and increase operational resilience.

Additional WQ Sampling

Additional WQ sampling is critical to the ongoing monitoring of Bathing Water quality, improving our insight into the effectiveness of our interventions and measuring the benefits of water quality improvements.

Additional WQ sampling is an integral part of our package of work to deliver enhanced water quality and is considered to be enhancement spend because these activities would otherwise not take place.

Hydraulic Modelling & Flow Surveys

This cost item is a component of WPS/CSO Storage investment. It was split out from WPS/CSO Storage in our submission to support cost transparency.

Delivery of hydraulic modelling & flow surveys is critical for delivery of Bathing Water quality improvements. It enables us to reverify models to match CSO spill frequency figures and to confirm and validate storage sizes. Historically, matching spill frequencies was not possible until event duration monitors were installed in AMP6. We consider this activity to be enhancement investment as it is a component of WPS / CSO storage enhancement, which will improve service levels, reduce spill frequencies from operational causes and increase operational resilience.

Misconnection (to property)

This covers our proactive search for pollution sources. The investment covers the survey works necessary to track the pollution detected at the surface water outfall back to point sources, such as misconnections at property level.

We consider this to be enhancement investment as identification of misconnections is an integral part of the suite of interventions required to diagnose pollution sources, crucial for improving water quality levels. This is a non-standard activity which otherwise would not take place.

Misconnection Rectification

This covers the rectification of misconnections, a crucial intervention for mitigating point source pollution. We consider this to be enhancement spend as rectification of misconnections is a key enabler for improving water quality levels.

However, we note that the Environment Agency has previously indicated misconnection rectifications should not be included within Bathing Water NEP works on the expectation such work should be delivered under base expenditure. Upon consideration of the Environment Agency's position we have removed costs associated with Misconnection Rectification from the CAC claim.

Enhanced Sewer Rehab

We consider delivery of proactive sewer rehabilitation to be enhancement investment as it is a key enabler within our enhancement package to improve bathing water quality. Our AMP6 experience has shown us that delivery of the required improvements in Bathing Water quality requires proactive targeting of high-risk sewers for intervention. Without delivery of this CAC scope, no sewer rehabilitation works are planned for AMP7 delivery in named Bathing Water catchments.

Our review of the Southern Water Risk Scored Sewers (RSS) database has identified the highest risk sewers in each location, principally category 5-7 sewers. We will refine this prioritisation using results from field investigations to further target our interventions to include potential root cause sewers not picked up through RSS. In addition, our proactive approach is cognisant that the exfiltration of foul flows can occur from leaking joints and abandoned laterals which are unlikely to be category 5 failures, another aspect of our non-standard approach which is over-and-above the criteria and thresholds for base maintenance.

Enhanced Network Maintenance

Our AMP5 and AMP6 experience has demonstrated the significance of enhanced network maintenance in achieving Bathing Water improvements.

Increasing the frequency of 'base' tasks such as FOG visits, CSO inspections and jetting over-and-above the BAU threshold reduces the likelihood of pollution events caused by blockages. We consider this to be enhancement investment as it represents a series of proactive activities which are required to enhance bathing water quality and will be delivered over-and-above our base threshold.

Private Infrastructure Allowance

This cost item covers mitigation measures that may be required on the private sewerage network. Typical scope items include alarms and telemetry on private WPS, lining or replacing leaking private sewers or laterals, and upgrading connections to the public network from private septic tanks or cess pits.

An example of the requirement for such a cost item is can be found at Littlestone, where a large percentage of households chose not to connect to the first-time sewerage scheme in 2007. In Felpham there are a

number of permitted sewerage discharges into the Aldingbourne Rife which do not have the same water quality permit conditions as the Southern Water wastewater treatment works.

We consider this to be enhancement investment as it covers a proactive diagnosis and mitigation of pollution sources over-and-above our base threshold.

Agricultural Measures

This covers measures to reduce pollution from agricultural sources. Potential interventions range from fencing watercourses to prevent livestock excreting directly into the water to complex interventions, such as constructing wetlands to provide preliminary treatment for polluted runoff.

We consider this to be enhancement investment as these interventions on third party assets are key enablers to improving bathing water quality and would not otherwise take place.

Bird & Dog Measures

This covers measures to reduce urban and coastal diffuse pollution. Potential interventions include helping councils deliver 'soft' bird deterrents (such as seagull proof bins) and additional dog enforcement officers, but also education campaigns, litter picks and gulley stencils.

We consider this to be enhancement investment as these interventions and activities, delivered in tandem with third parties, are key enablers to improving bathing water quality and would not otherwise take place.

Evidence of cost efficiency: Overheads

The IAP included a statement that overheads seemed high and requested an explanation. As part of our 'Challenge and Review Process' we have reviewed how project and corporate overhead were presented in our original submission.

Our initial costing of the Bathing Water CAC applied a non-standard approach. We chose a non-standard approach because of the low confidence we placed on cost estimates which were developed before investigations had taken place to validate scope. We adopted a costing approach which allocated scheme-level contingency as well as programme-level contingency to manage the high levels of uncertainty around these scope and cost interventions. However, as a result of our 'Challenge and Review Process' we have decided to apply our standard costing approach, which brings the Bathing Water CAC costs in line with rest of the business plan. We acknowledge that this standard approach to costing for such low confidence scope means we carry extra risk relating the delivery of these schemes.

CE.A1.Table 20 - Bathing Water CAC cost breakdown (£m) shows the revised project uplift and corporate overhead which has now been applied to Bathing Water CAC costs.

Mott McDonald have reviewed our on-costs and concluded that

- The allowance for Project Overheads is benchmarked low (46%) below the industry comparators
- Allowances for project risk, site specific complexities and tender-to-out turn ratios are benchmarked as comparable
- The SW Corporate Overhead element is benchmarked high above the industry comparator

Evidence of Cost Efficiency: Delivery

Our delivery of Bathing Water improvement schemes over the last two AMPs has enabled us to improve our cost forecasting for AMP7 and, based on our lessons learned, to build in efficiencies. We anticipate our

AMP6 programme will deliver agreed bathing water quality improvements for a lower cost than allocated at PR14, and we have used the learning of AMP6 to ensure our AMP7 costs represent a cost-efficient proposal to deliver the specified Bathing Water improvements. Our Bathing Water CAC costs have been developed in accordance with the principles described in *BP_TA.14.4 Bottom-up Cost Estimation* to ensure consistency and cost efficiency across our business plan.

Mott MacDonald have provided an independent review of the robustness and efficiency of our Bathing Water CAC (see IAP_TA11_CE_Mott MacDonald Cost Estimating Assurance). They have concluded that **our direct costs for delivering this work are broadly aligned with their benchmark of efficient costs (aggregate costs were 1.7% above benchmark), therefore providing evidence of the efficiency of our direct costs.**

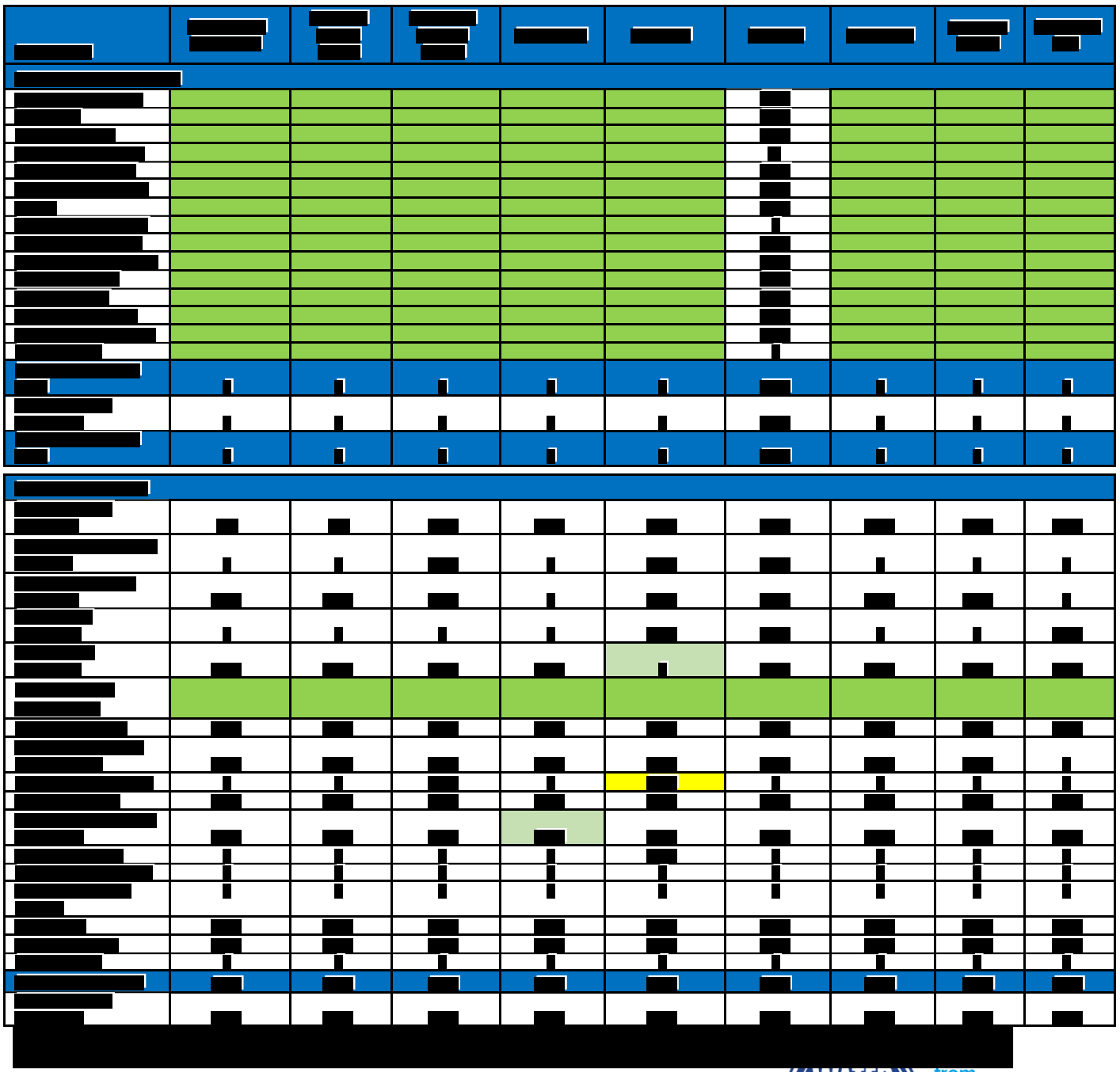
The IAP assessment shows an increase in forecast costs between PR14 and PR19 for Bathing Water improvements at Littlestone and Felpham. This revision in our forecast costs is a reflection of the step change in our understanding between PR14 and PR19 of the interventions required to achieve and sustain 'Good' Bathing Water status at these two sites. This improved understanding has been informed by BWEP investigations carried out at both locations during AMP6. PR14 costs were developed based on desktop investigations which inferred likely schemes but the field investigations have provided a step change in scope clarity. At both Littlestone and Felpham it has been identified that significant asset interventions are required to achieve and sustain the requisite Bathing Water quality improvements, as outlined in the previous section which provided an indicative profile of the WPS enhancement expected at Littlestone. Earlier in this section we illustrated that the proposed schemes at both locations remain the most cost beneficial schemes for improving Bathing Water quality to 'Good'.

As part of our 'Challenge and Review Process', we have reviewed and tested key cost elements for cost robustness and cost efficiency. Below is a summary of our approach to ensuring cost robustness and efficiency for key cost elements.

- **WPS Upgrades:** The full scope of WPS enhancement solutions cannot be finalised until investigations have been completed, which provides a challenge for the accurate costing of Bathing Water WPS enhancement interventions. We made the decision not to use new build estimates to represent WPS investment in our CAC as this would likely significantly exceed the actual cost of enhancement, inflating the value of the claim. To ensure our CAC did not include excessive cost we derived WPS enhancement costs from a bespoke model of typical WPS refurbishment. As demonstrated earlier in this section, our initial analysis has already identified robust examples of the enhancement nature of potential WPS investments.
- **WTW Upgrades:** Our claim includes enhancement investment for UV treatment at Lidsey WTW as a key enabler to improving bathing water quality at Felpham. The costs were developed by CET and externally assured.
- **WPS / CSO Storage**: Our claim includes enhancement investment for CSO storage at Felpham. The costs were developed by CET and externally assured. As a result of our review process, the cost estimate provided for delivering the CSO Bognor Main has been revised up to £1.695m. This revised figure represents our latest view of the cost of delivering this critical infrastructure enhancement. Figure 2 shows that the site remains cost beneficial. The benefit of selecting sites where AMP6 work is ongoing is that we have an increasingly informed view of the scope of work required because our understanding of root causes is significantly improved, enabling us to iteratively refine our programme of the most effective interventions.
- **Sewer Upgrades:** costs were developed on the basis of the lengths of risk scored sewers graded 5, 6 or 7 within proximity of the bathing water or key pathways. Costs were developed by CET, checked against AMP6 project cost for confidence and were and externally assured.
- **Misconnection (to property):** the cost covers the installation of wire mesh cages across the surface water network and property level surveys to confirm the individual property or location of the misconnection. Costs were checked against AMP6 project cost for confidence

- **Agricultural Measures:** Costs were based on AMP6 BWEP forecast measures and cost estimates on a per-farm basis, with the cost per farm multiplied by number of farms in the catchment.
- **Bird & Dogs Measures:** Costs based on AMP6 BWEP forecast measures and cost estimates from all seven Bathing Waters. As part of our review process we have identified that this scope of work for one site (Felpham) has been delivered in AMP6, so we have made a £20k reduction in the CAC costs for this site
- **Enhanced Network Maintenance:** Costs were developed by CET based on existing network maintenance rates extended to additional sewer lengths.
- **Private Infrastructure Allowance:** Costs were based on AMP6 BWEP forecast measures and cost estimates from all seven improvement sites. As part of our review process we have identified that an element of this scope of work for one site (Littlestone) has been delivered in AMP6. Approximately £6k of work has been delivered n AMP6 so the CAC costs for Littlestone have been reduced by this amount.

CE.A1.Table 20 – Bathing Water CAC cost breakdown (£m)



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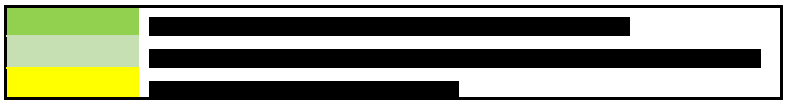
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3.2. Thanet Groundwater

CE.A1.Table 21 – Cost Adjustment Claim: Thanet Groundwater sets out Ofwat's IAP assessment for the Thanet Groundwater CAC.

CE.A1.Table 21 – Cost Adjustment Claim: Thanet Groundwater

Area: Cost Adjustment Claim – Thanet Groundwater
Concern: ■ Our considered view is that the evidence provided in the claim has three limitations. Firstly, there is insufficient evidence on the efficiency of the cost estimate. Secondly, the claim lacks any sort of breakdown of the cost estimate. Finally, the claim lacks detail of how the proposed Performance Commitment is intended to work ■ In view of the concerns described against the 'Robustness of costs' gate, we apply a 20% challenge to the claim cost. This challenge is based on the difference between SRN's PR14 BP estimate of £59.9m and projected outturn of £47.1m. Our considered view is that a challenge of 20% is justified and conveys our assessment that the company's evidence on robustness of cost is lacking. We consider that a challenge of 20% incorporates an implicit allowance challenge and therefore we do not deduct our estimated implicit allowance from the cost of the claim for the purpose of calculating our allowed allowance.
Robustness and efficiency of costs: FAIL. The cost estimates use tendered unit costs for parts of the first two phases of the project but SRN does not provide any breakdown of the £32.9m nor explain how any efficiency challenge has been incorporated. This lack of visibility precludes any meaningful assessment of either the robustness of the cost estimate or how efficient it is. In particular, SRN does not provide any indication of the scale of on-costs or risk element, both of which gave us concern at PR14 and prompted a significant cost challenge. That said, we may derive some reassurance by the fact that: i. compared with Phase 2, unit costs look favourable, viz: Projected outturn cost of Phase 2 is £47.1m to rehabilitate sewers in 30.8km of adits. This compares with CAC for Phase 3 claiming £32.3m to rehabilitate sewers in 23.3km of adits. ii. Projected outturn costs for Phase 2 (£47.1m) are only slightly lower than estimate of £51.3m that SRN presented in its representation on our draft determination at PR14. iii. The scheme has undergone independent assurance (but we could not find any detail of this in Tech Annex 14.2). TA14.4 states that Jacobs "reviewed the cost evidence, cost curves, corporate overheads and on-costs information..." and concluded that "Generally... the approach developed and employed by the team is appropriate, managed and controlled." However, there is no statement regarding the cost efficiency of this scheme. As noted above, the overall lack of transparency hinders our assessment and results in the 'Fail' grading. **Customer protection: PARTIAL PASS**. Customer protection is principally afforded by SRN being at risk of regulatory enforcement in the event of non-delivery. However, SRN also proposes a penalty-only performance commitment whereby if the scheme is not delivered by 2024-25 the company will return all "of the cost allowance through this ODI, in combination with the totex sharing mechanism". This is slightly different from the AMP6 performance commitment, which provided for different penalties in the event of delay and non-delivery. The company will provide independent assurance of delivery but it is not immediately clear how protection works if SRN does not deliver the scheme but still spends all the £33m claimed.

Robustness and efficiency of costs: FAIL

- SRN does not provide any breakdown of the £32.9m
- SRN does not explain how any efficiency challenge has been incorporated, and there is no statement regarding the cost efficiency of this scheme

- SRN does not provide any indication of the scale of on-costs or risk element, both of which gave us concern at PR14 and prompted a significant cost challenge

Customer protection: PARTIAL PASS: explain how protection works if SRN does not deliver the scheme but still spends all the £33.0m claimed.

Cost breakdown

We commenced Phase 1 of the Thanet Groundwater Protection Scheme in AMP5 and are currently delivering Phase 2. We have used the insight gained from the previous two phases of this programme to improve our cost forecasting for Phase 3 and to build in efficiencies based on our lessons learned. By drawing upon our experience from previous phases we are able to present a cost-efficient proposal to deliver Phase 3 works and fully realise the benefits of the Thanet Groundwater Protection scheme.

Our costs have been developed in accordance with the principles described in *BP_TA.14.4 Bottom Up Cost Estimation* to ensure consistency and cost efficiency across our business plan. A summary of Phase 3 scope and cost is provided in *CE.A1.Table 22 – Breakdown of Thanet Groundwater Protection Scheme Phase 3 costs*.

CE.A1.Table 22 - Breakdown of Thanet Groundwater Protection Scheme Phase 3 costs

Our claim is for the full value of these works. We have not revised our claim to reflect an implicit allowance because we do not have sewer survey, sewer rehabilitation or adit sealing works planned in the Phase 3 area of Margate during AMP7.

Evidence of cost efficiency and cost robustness

The Phase 3 target area is the most complex covered by the three Phases because of the known condition of mapped assets (from PR19 surveys) and uncertainty around the condition of previously unmapped adits and sewers. Against this backdrop of complexity we have developed a cost efficient programme to deliver Phase 3 which will fully realise the benefits of the Thanet Groundwater Protection Scheme.
Mott McDonald have provided an independent review of the robustness and efficiency of Phase 3 costs (see IAP_TA11_CE_Mott MacDonald Cost Estimating Assurance). They have concluded that **our Phase 3 cost estimates are 14% below benchmark, therefore evidencing the efficiency of our costs.**

Below we provide the assumptions, which have informed our Phase 3 costing along with examples of how learning from Phase 2 learning has driven efficiency in Phase 3. It should be noted that Phase 2 costs themselves are a product of a programme of initiatives, which significantly enhanced Phase 2 efficiency including the application of value engineering during solution development, competitive procurement and efficient delivery techniques.

1. CCTV, monitoring and surveys

Our cost estimate for this scope item covers:

- CCTV Surveys. Quantity; 222004metres
- Manhole surveys. Quantity; 5841No.
- Groundwater Monitoring (£100k/year)
- Flow monitoring (modelling improvements). Modelling Surveys; flow monitoring (assumes 60 monitors for 12 weeks each)

We will achieve Phase 3 efficiency by deploying the investigation process which we have refined during Phase 2, and by using the insight into asset condition gained through Phase 2 delivery and our PR19 survey to inform our Phase 3 costing and efficient delivery.

At the beginning of Phase 2 we adopted a surveying methodology which used panoramic scanning equipment to verify adit status without requiring manual entry. During Phase 2 we have developed this into an established and efficient investigation process ready for deployment on Phase 3, enabling us to realise efficiencies during the investigation stage of Phase 3. This improved approach already been evidenced through our PR19 survey (carried out in March 2018), where we initially identified manholes with open adits (Stage A) and then used panoramic scanning equipment to verify adit status (Stage B).

This proactive activity means we have already collected valuable data on 3% of manholes across the network. This insight into asset condition will inform the planning and delivery of an efficient and representative programme of Phase 3 surveys. In addition, this insight has already helped us refine the variables on which Phase 3 costs are based and will inform our approach to Phase 3 delivery. Additional efficiencies will be realised during Phase 3 where possible by consolidating manhole, CCTV surveys and other planned and enabling work.

2. Adit sealing and storage

Compensatory storage and open adit sealing
Our cost estimate for this scope item covers:

- Offline upsizing - 375mm diameter pipe at 3.5m depth. Quantity; 63metres
- Offline upsizing - 1050mm diameter pipe at 3.5m depth. Quantity; 13metres
- Adits to close (5 adits, each closed at both ends). Quantity; 10No.
- Overpumping (adit storage works). Quantity; 70No.

CIPP lining in adits
Our cost estimate for this scope item covers:

- CIPP lining in adits. Quantity; 5751metres
- Lateral realignment. Quantity; 414No.
- Overpumping (adit storage works). Quantity; 70No.
- Replaced Manholes. Quantity; 53No.
- Refurbished Manholes. Quantity; 28No.
- New Manholes. Quantity; 23No.

Again, our learning from Phase 2 has informed our approach to scoping and costing an efficient Phase 3 programme. We have identified that the most cost beneficial approach is not achieved through the exclusive use of full contact liners. During Phase 2 we routinely encountered non-standard situations where sewer shape, sewer condition or number and orientation of laterals/conduits meant additional cost had to be incurred to fit full contact liners effectively. Phase 2 has shown us that similar levels of efficacy can be achieved with the use of circular liners, and this learning has enabled us to develop efficient Phase 3 costs.

3. Sewer rehabilitation

Sewer rehabilitation - CIPP repairs
Our cost estimate for this scope item covers:

- CIPP lining. Quantity; 2376metres.

Sewer rehabilitation - in adit local repairs
Our cost estimate for this scope item covers:

- Patch Repairs. Quantity; 153No.
- Adit seal breakout and reconstruction for in adit repairs. Quantity; 306No.
- Lateral repairs. Quantity; 742No.
- Adit preparation for sewer rehab. Quantity; 7945metres
- Manhole replacement for in adit repairs. Quantity; 48No.
- Manhole rehabilitation for in adit repairs. Quantity; 48No.

- Overpumping (Patch Repairs). Quantity; 153No.
- Overpumping (CIPP Repairs). Quantity; 29No.

Our Phase 2 experience has enabled us to refine our assumptions, variables and scope for these cost items, improving our confidence in both the efficiency of our estimate and deliverability of the programme. For example, in Phase 2 a greater number and greater length of in-adit repairs and patch repairs have been required than indicated through the initial survey. As a result our Phase 3 costing includes a specific line for in-adit repairs built upon AMP6 experience and informed by PR19 survey results.

Our PR19 survey has provided us with a basis for adjusting historical records to support a more accurate view of the works required in Phase 3. We have incorporated this learning into our costing to ensure our costs, whilst robust and efficient, ensure the programme is deliverable to realise the benefits of the programme.

4. Delivery efficiency enablers

Delivering our programme for the allocated allowance requires a suite of additional activities to be efficiently planned and executed. Our cost estimate includes the following scope items:

- Traffic management. Our Phase 2 experience has shown that a proportion of sections requiring rehabilitation will require traffic management. Our costing has been informed by Phase 2 learning and, once further survey work is completed, we will engage our supply chain to develop a plan for affected roads to minimise cost and disruption
- Site access and working patterns. Based on Phase 2 experience we know we can manage most access issues by accessing pipes from either end manhole. Some roads will require lane rental and opening notices, and Phase 2 has shown us how to balance the requirements for out-of-hours work with lane rental.
- Disposal of excavated material. Material excavated from repairs in adits will need to be removed, and based on AMP5 and AMP6 experience we expect 5% of this waste to be hazardous
- Third-party service diversions and imported fill requirements. Third party diversions are needed for laying new offline sewers and fill material will be required to bed-in new pipework

5. On cost and risk

The IAP expressed concern at the lack of an indication of the scale of on-costs or risk element in our CAC. Table 1 shows the project uplift and corporate overhead which has been applied to Thanet Groundwater Phase 3 costs. Mott McDonald have reviewed our overhead and concluded "*the On-Cost…appears low for complex network delivery solutions, such as Thanet Sewer Rehabilitation*" specifically noting:

- The allowance for Project Overheads is benchmarked low (46%) below the industry comparators
- Allowances for project risk, site specific complexities and tender-to-out turn ratios are benchmarked as comparable
- The SW Corporate Overhead element is benchmarked high above the industry comparator

To ensure our costs are efficient we removed all contingency items from our Phase 3 costs in our original submission. This decision was an acknowledgement of the requirement for costs to be efficient and challenging, but also served as recognition that we have used the insight gained during Phase 2 to ensure our Phase 3 programme can be delivered for the stated cost to realise the full benefits of the Thanet Groundwater scheme. The key variables driving our cost estimates have been provided above and any variation to these measures - such as km of sewer to be surveyed - is moderated through the 'Contractor Project Related Costs & Client Project On-Costs' component of the 'Project Uplift'.

[redacted]

The Phase 3 target area of Margate is the most complex of the areas covered by the Thanet Groundwater Protection scheme. We undertook a sample survey which reported in March 2018 which has informed our scope assumptions and cost estimating. The key assumptions underpinning our cost estimates have been provided in the previous section. These assumptions are subject to revision when new information is available and will be refined to reflect the findings of Phase 3 surveys. We have used our learning from Phase 2 delivery to ensure our Phase 3 proposal adequately reflects the scope, cost and risk of delivering this complex programme of work.

Customer protection

We have identified we need more robust customer protection for our ODI supporting this CAC. Therefore we have revised the ODI to mirror AMP6 in order to protect customer arrangement to protect customers in the event of non-delivery and delay.

Details of the ODI are as follows:

CE.A1.Table 23 – Details of ODI

	2020-21	2021-22	2022-23	2023-24	2024-25
PC					Delivered
					Not delivered

Incentive type	Incentive rate (£m)
Penalty (non-delivery)	16.474
Penalty (delay)	2.833

- If we do not deliver this scheme the amount will be paid back in full through the totex sharing rate and the ODI. Calibrating the ODI with the totex efficiency sharing rate of 50% means the non-delivery penalty is (£32.9m*50%) = £16.5m
- In the event we do not deliver the project by 2024/25 we will apply a delay penalty in each year until completion. This penalty will be equivalent to the return and run-off rates of the total spend of the project which is £32.9m* 2.4% (wacc) + £32.9m * 6.2% (run-off rate) = £2.8
- Performance will be measured following the expected scheme completion date on 31/03/2025. In the event of delay, performance will be measured as a pass/fail in each year until completion
- Penalties will be confirmed following the expected scheme competition date on 31/03/2025
- Incentives are to be determined at PR24 based on the extent of completion and, if relevant, expected date of completion. If improvements are not expected to be delivered by 31/03/2025 then timing delay penalties will apply for each year's delay until expected completion. If substantive progress towards a delivery date cannot be demonstrated at this point, the full non-delivery penalty will apply
- The penalty will be an RCV adjustment as per AMP6.

2. SRN.CE.A2

Ofwat action	How we have responded
There is significant investment proposed in the delivery of internal interconnections and long-term supply-demand benefits (benefits delivered after 2024-25) and therefore the company is required to propose an outcome delivery incentive in order to ensure customer protection for efficient delivery. The company should provide evidence to justify the level of the performance commitment and the outcome delivery incentive rates proposed, in line with our Final Methodology. We expect to receive evidence of customer support for outperformance payments, where proposed, and that the incentive rates proposed are reflective of customer valuations.	Plan updated

Our detailed response

There is significant investment proposed in the delivery of long-term supply-demand schemes (including internal interconnections) which deliver benefits after 2024-25. Therefore we propose an Outcome Delivery Incentive (ODI) in order to ensure customer protection for efficient delivery and some uncertainties in the supply/demand need (see supporting evidence for details of the ODI *IAP_TA11_Securing Cost Efficiency _SRN.CE.A2 Long Term Supply Demand Schemes ODI*.

3.SRN.CE.A3

Ofwat action	How we have responded
Strategic regional solution development - We have identified from the plans that at least one strategic supply solution is required over the next 5-15 years to secure drought resilience in the south-east. The strategic regional solution development allocation is to allow the delivery of consistent and transparent investigations, planning and development of strategic options with the overall aim of optimum solutions being construction ready by 2025. The company's allocation is made on the basis of having clear deliverables and customer protection for the gated delivery of the development of [redacted] reservoir, a regional transfer from Thames Water, and [redacted] [redacted]/local transfer schemes. The following actions are required to ensure the efficient delivery of this development programme. - In conjunction with the other companies involved, jointly propose methods for collaborative working including setting up the joint working group for individual schemes, and how consistent assumptions and decisions will be made within these groups and between them. Provide more detail on the gated process, the deliverables, timings and expenditure allocations at each gate - Propose ODI-type mechanisms to allow allocated funding to be recovered by customers in the event of the scheme not progressing through each gate and for the non-delivery or late delivery of outputs.	Fully accepted. We have worked with the group of six companies to develop the approach to strategic water resource options in the south east, and submit the agreed joint response. We also set our specific issues for Southern Water.

Our detailed response

Our response is in two parts. Part 1 is a response from Southern Water on our specific issues. Part 2 is a joint response by the six companies asked by Ofwat to participate in the collaborative exercise, which specifically addresses the actions given to all six companies. A copy of the collaboration statement and the executive summary from the joint statement on strategic regional solution development is repeated in Part 2. See 'Supporting docs for the full document *IAP_TA11_CE_WRSE_IAP_Summary_v10_Final*.

Part 1 – Issues specific to Southern Water

This activity is part of our proposed 'four-point' approach to close collaborative working with neighbouring companies and to ensure significantly improved inter-regional co-operation, which is described further in *IAP Annex 5_SRN.CMI.A9*. The components of this approach are:

1. Building a framework to review strategic water resources options identified in the IAP process with Thames Water, Affinity, and Anglian Water to align with OFWATs proposed gateway approach See Part 2 of this action. We are also engaging with all of the Water and Sewerage Companies (WaSCs) and Water Only Companies (WOCs) in our region
2. Building a framework to share/transfer knowledge between companies with a particular emphasis on Demand Management
3. Regional Resilience Plans. Co-ordinating the development of the south east Regional Resilience Plan and ensuring a single unified approach agreed by all companies in the south-east
4. Developing the capability, usability and visibility of the water resource market in the south-east including engaging customers, major industries and the agricultural sectors

We are currently in the process of sharing this approach with the WRSE group, Anglian Water, United Utilities, Severn Trent, major industries and agricultural users. In addition, we make the following response for our specific circumstances in the west of our region.

1. Our abstraction licence changes are now in place

[redacted]

On 15 March 2019 we received revised abstraction licences from the EA, giving effect to substantial sustainability reductions. The revised licences impact our ability to extract water in drought conditions from the rivers [redacted] important to the supply of water for our customers in the West Hampshire area including Southampton, Winchester and Andover. The population serviced in the areas affected is c.890,000

On the [redacted] three licences are changed reducing our rights to abstract surface and ground water and on the [redacted] one licence is changed reducing our rights to abstract water at our West Southampton site, Testwood. These changes will reduce our rights to abstract water in all drought scenarios.

When coupled with the impacts of climate change, these changes will reduce our dry year critical period capacity in Hampshire by 188 Ml/d. This equates to a loss of approximately two-thirds of the current 248 Ml/d capacity. The abstraction changes are effective immediately, i.e. they are already in place.

We will have an increased dependence on drought permits and drought orders until long term solutions are implemented. The intended permanent solutions that are set out in the draft 2019 WRMP include:

- Further bulk supplies from Portsmouth Water
- The requirement for the [redacted] reservoir
- A [redacted] plant [redacted]
- Local effluent reuse schemes
- A supply from Bournemouth Water
- Making the Isle of Wight more self-sufficient
- A new 'regional grid' supply network for Hampshire
- Targeted demand reduction and leakage measures.

2. Our timetable for [redacted] or any alternative is driven by our obligations

As a result of the 2018 public enquiry on the abstraction reductions, we have a legally binding agreement with the EA[34]. This agreement states:

"The Company will use all best endeavours to implement the long-term scheme for alternative water resources ("the Long-term Water Resources Scheme") set out in its Final Water Resources Management Plan ("WRMP") 2019, as may be revised by future water resource management plans. For the avoidance of doubt the Long-term Water Resources Scheme will be Strategy A in the Company's draft WRMP 2019, in which the company is statutorily required to engage. Strategy A as set out in Annex 9 to the Draft WRMP 2019. One of the objectives of Strategy A as currently proposed is for the Company not to require the [redacted] and [redacted] Surface Water Drought Order or Permit after 2027 and only to require the [redacted] Surface Water Drought Order or Permit after 2027 in extreme drought events (1 in 500 year drought severity)."

The long term schemes referred to in the agreement are those in our Draft WRMP, which shows all the schemes being delivered by March 2027. In our revised draft WRMP the final new supply from Portsmouth of 21 Ml/day is due to be delivered by March 2029 but this is not finalised.

[34] Agreement under Section 20 of the Water Resources Act 1991 between Southern Water Services Limited and the Environment Agency, dated 29 March 2018. This agreement is included as supporting information to our response. A copy is supplied as supporting information to this response.

[redacted]

We accept the issues identified in the IAP on the need to identify the right strategic water resource solutions in the south east, while we and all other companies have statutory obligations under the WRMP. We will fully participate in the collaboration with 5 other companies, and other third parties as appropriate, and will use common approaches to identifying options, applying the proposed gateway process, and any mechanisms that result to provide development funding on an individual company or joint company basis.

Ofwat's wording in the IAP decisions directed to each company was that having been through a commonly agreed gateway process, the preferred solutions would be "construction ready by 2025". As a result of the binding nature of our agreement with the EA to remove the need for drought permits and orders by 2027, we have no choice but to go faster than this. We need one or more solutions that are ready to deliver water by April 2028, and we consider it very unlikely that significant new assets could be built and commissioned in the time between the start of AMP8 and our deadline.

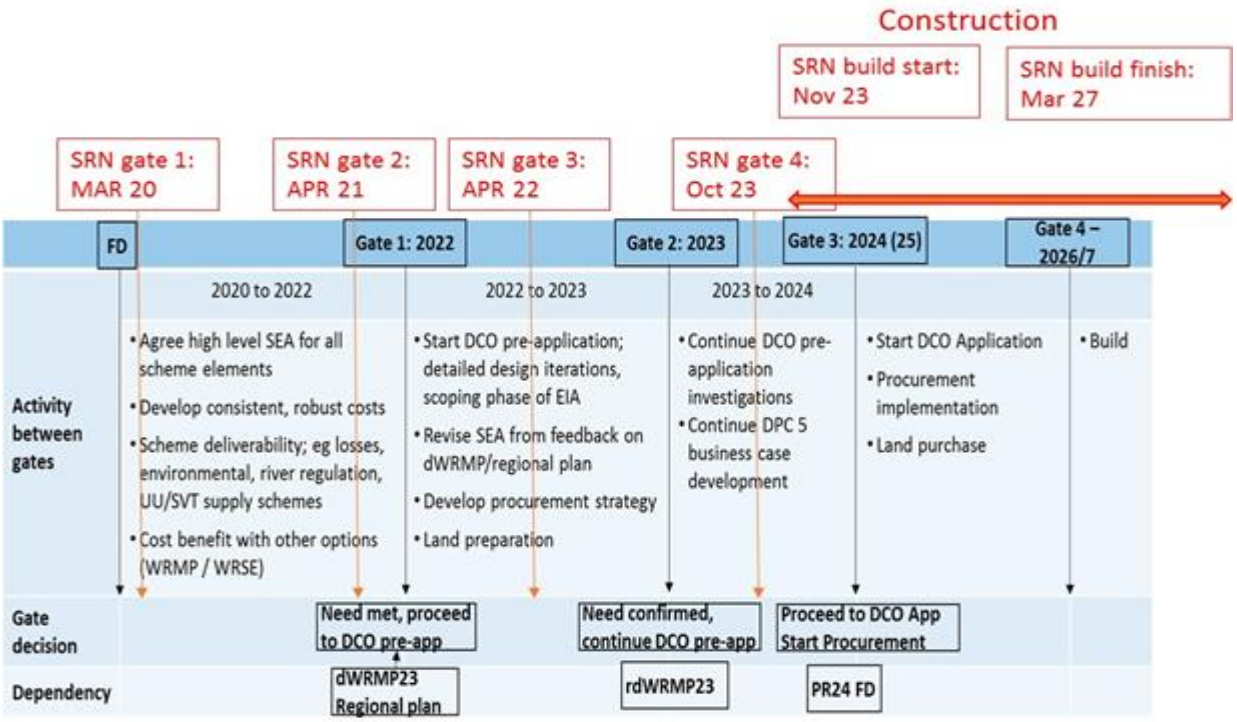
In addition, our understanding of the timing of the [redacted] reservoir development is that there is no possibility that it would be available in time to help meet our deadline.

3. We need to be construction ready by 2023

We have followed the approach to gateways developed by the joint group, and show the [redacted] timetable using the proposed gateway structure via a DCO and non-DCO route.

The diagrams below set out how we see the [redacted] project, as currently planned, would fit in to the common gateway timetable described in the joint response, albeit working to different timescales. We are using the [redacted] option as currently planned because the collaborative process, and the actions described in 4 below, have not been in operation long enough to identify any viable alternative.

CE.A3.Figure 1 – Potential Gateways for [redacted] using a Development Consent Order route



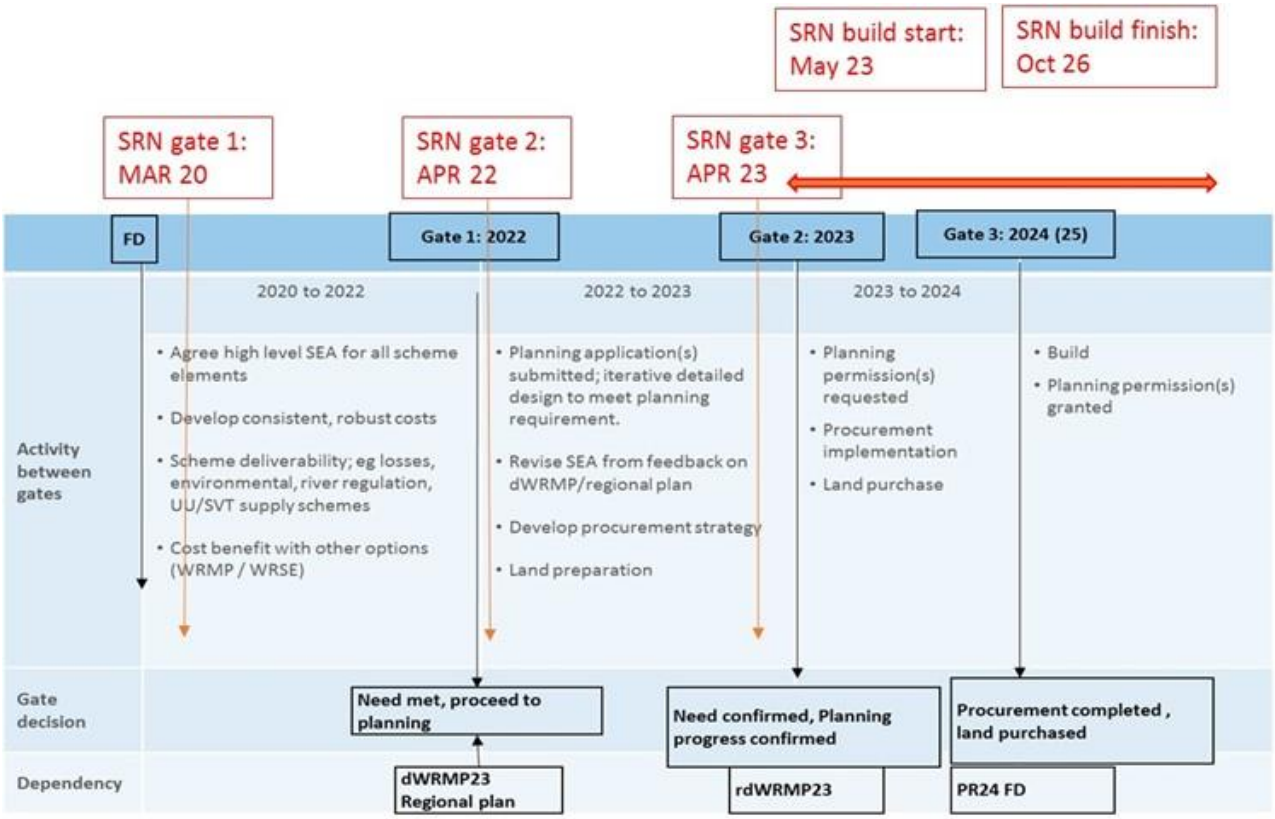
[1] A Development Consent Order (DCO) is the means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects (NSIP)

[redacted]

Assumptions we have made for the DCO timetable:

- Key decision required on DCO in March 2020 to keep 31st March 2027 viable for the DCO route.
- We are assuming 18 months for a DCO decision (could be 24 months)
- No programme float
- This is a best case view, without having assessed a detailed programme build

CE.A3.Figure 2 – Potential Gateways for [redacted] using a NON-Development Consent Order route



Assumptions we have made for the non-DCO timetable:

- Key decision required on DCO in March 2020, this is where the DCO/Planning routes completely diverge for [redacted]. Hence Planning Gate 2 (submit planning applications) and Gate 3 for DCO (submit DCO application) are analogous
- Assumes no planning enquiries which could add 6-12 months
- This is a best case view without having assessed detailed programme build

Our conclusion is that we need to go faster than the timing proposed for the other schemes in the strategic resources collaboration. We need an option that is “construction ready” by 2023.

4. What else we are doing

[redacted]

Since receiving the feedback on the IAP on 31 January 2019, we have written to the 5 other companies[35] submitting a joint response to see if they could identify one or more alternatives to [redacted] covering both supply and demand that could be in place within our timeframe. We asked for responses prior to 1 April if possible.

To date we have received Reponses from United Utilities and Thames Water. In the event that these requests for information identify alternatives that could be viable, it is our intention to use the process created by the group of six companies to establish it (or them) as alternatives to [redacted] as currently identified in the collaborative model.

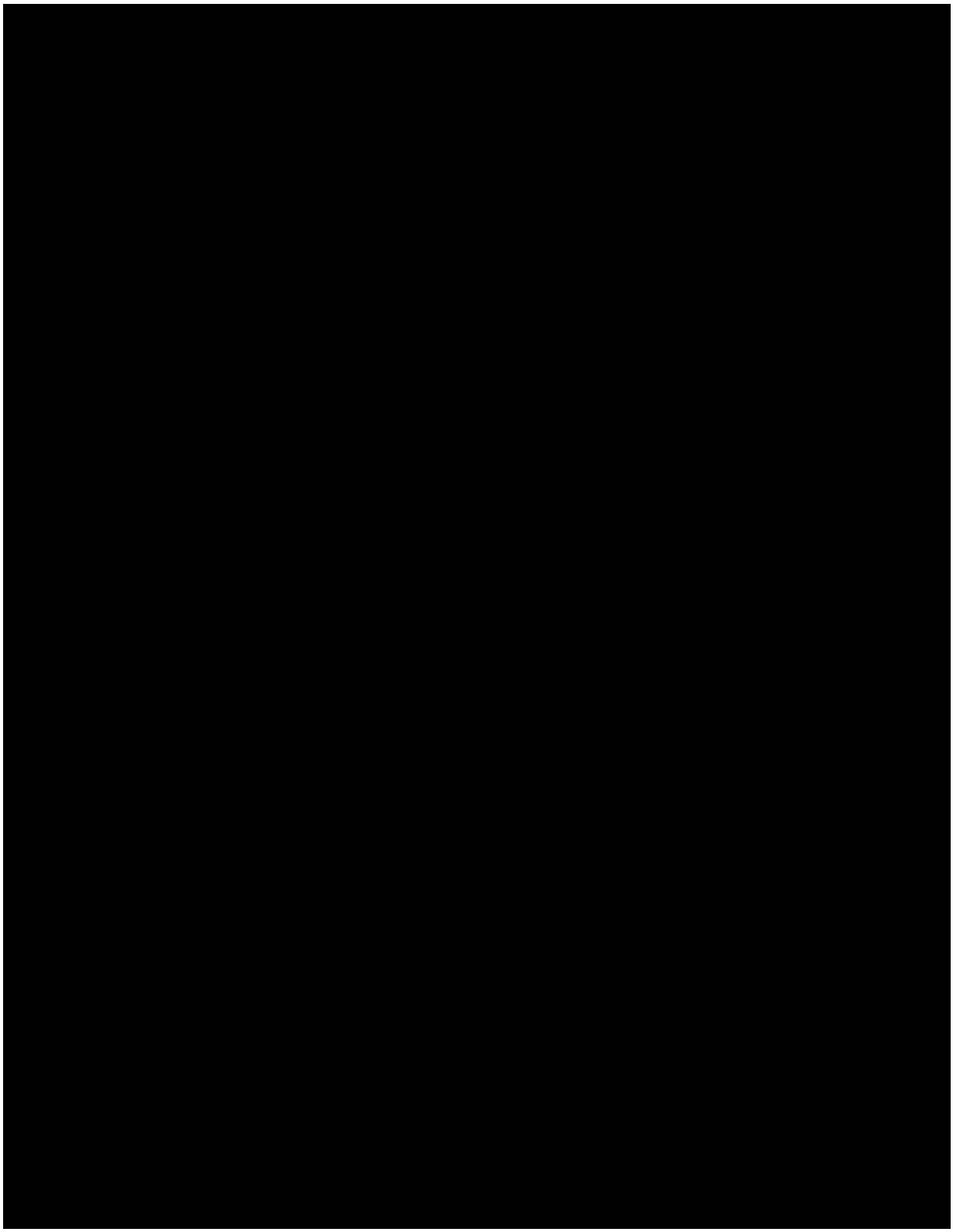
We have also written to all our neighbours with a similar request, to see if they could supply water that would meet the same needs and to the same timeframe as the proposed [redacted] plant. These companies are: South West (including Bournemouth Water), Wessex, Portsmouth, Sutton and East Surrey, and South East. We have also written to an organisation that is not a water undertaker that wishes to remain anonymous for now. We may extend the request to other groups and stakeholders that are not water undertakers.

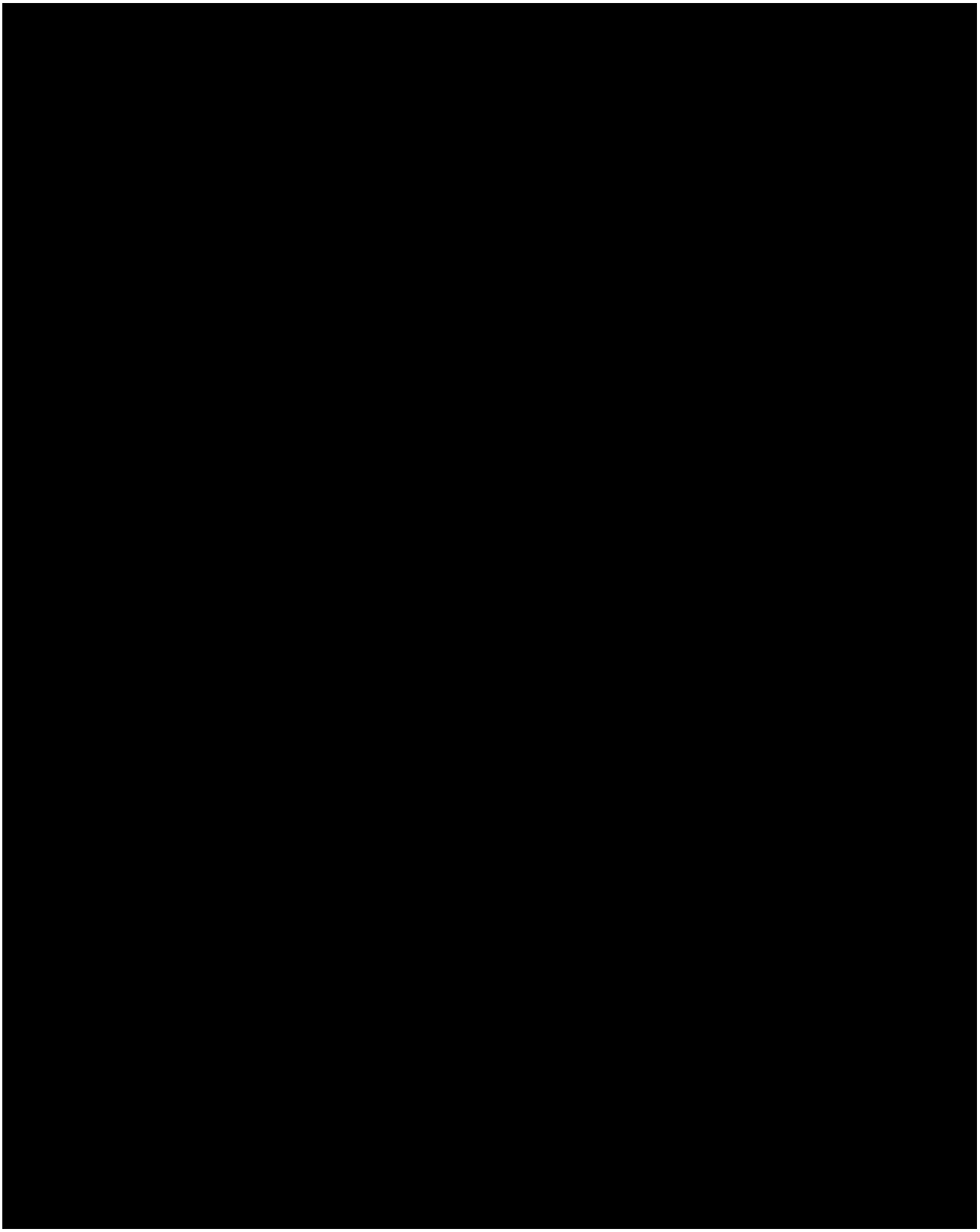
An example of the letter that was sent to the first five companies is shown below in *CE.A3.Figure 3 – Specimen of the letter sent to potential water suppliers*. The letter that went to the other companies was similar, but made some variations to allow for less familiarity with the process set out in the IAP, and a different timetable for responses.

[35] Thames, Anglian, Severn Trent, United Utilities, Affinity.

[redacted]

CE.A3.Figure 3 – Specimen of the letter sent to potential water suppliers





Part 2 – Joint statement on strategic regional solution development

Below is a copy of the collaboration statement and the executive summary from the joint statement on strategic regional solution development. See 'Supporting docs for the full document *IAP_TA11_CE_WRSE_IAP_Summary_v10_Final.pdf.*

Affinity Water, Anglian Water, Severn Trent Water, Southern Water, Thames Water, United Utilities and Water Resources South East

During February and March, Affinity Water, Anglian Water, Severn Trent Water, Southern Water, Thames Water and United Utilities have worked together to develop a set of proposals that seek to address the potential challenges associated with the promotion of strategic regional solutions as set out in Ofwat's initial assessment of plans.

The group of companies have collaborated to develop a set of principles, working documents and discussion papers which demonstrate how the gated process would work for the promotion of a regional scheme.

Further work has been identified which the companies will continue to work together to address.

1 Executive summary

This document sets out the work that has been jointly undertaken by the six water companies. These companies are Affinity Water, Anglian Water, Severn Trent Water, Southern Water, Thames Water, and United Utilities, with the support of Water Resources South East (WRSE). We have jointly assessed, reviewed and provided constructive comments back on the proposal for developing regional strategic solutions as set out by Ofwat in its initial assessment of companies' business plans ("IAP").

The companies have worked together over the last two months, observed and supported by Ofwat and the Environment Agency, to develop the following aspects:

- In conjunction with the other companies involved, jointly propose methods for collaborative working including setting up the joint working group for individual schemes, and how consistent assumptions and decisions will be made within these groups and between them:
  - A terms of reference for working collaboratively across all of the companies;
  - The principle of the scheme working groups, the requirement for specific Terms of Reference.
- Provide more detail on the gated process, the deliverables, timings and expenditure allocations at each gate.
  - A proposal to modify the timing of the gateways based on whether the schemes are required to obtain a development consent order (DCO);
  - Increased detail of the work between the proposed gates to allow an improved understanding of the funding required per stage to be undertaken, and to confirm the overall sum to complete all gates;
  - The requirement and principles of a change protocol to manage specific changes to schemes in the proposal and to change the current list of schemes when required;
  - Gateway acceptance criteria to be confirmed using the improved detail per gate.
- Propose ODI-type mechanisms to allow allocated funding to be recovered by customers in the event of the scheme not progressing through each gate and for the non-delivery or late delivery of outputs
  - Development of the principles of an ODI type mechanism.

The group have also agreed a forward-looking plan for further work.

This document covers the joint understanding between the 6 water companies of the above subjects. Each company may also submit further information building on this work in response to their individual IAP feedback from Ofwat.

Whilst the companies have worked through a lot of detail in a relatively short period of time, a forward-looking plan has also been incorporated into the document which sets out the additional information that will be worked on by the companies, for submission to Ofwat by the middle of May 2019 to allow it to take account of these proposals in its draft determination process.

We hope that Ofwat, and other regulators, will collaborate with the water companies and contribute to the ongoing development of the strategic water resource programme.

4. SRN.CE.A4

Ofwat action	How we have responded
We note the company's proposal that for Bathing and Shellfish requirements any changes to the environmental requirements are treated on a bespoke basis (even though there are no company-driven Amber schemes in WINEP3). The company should confirm our assumption that this means that any changes would be dealt with in the same way as Chiddingfold and Buriton. The company should clarify its proposals for Amber schemes in WINEP3 with the following drivers: INNS_ND, NERC_INV1,SSSI_INV and WFD_IMP-WRFlow. The company should provide the total cost included for Amber WINEP requirements in its business plan and the breakdown of this cost between the relevant lines in tables WS2 and WWS2 (capex and opex).	Further information provided

Our detailed response

Summary of our approach to cost changes

Following the IAP, we have reviewed our costs using the IAP Cost Review Process, described in *CE.A1*.

This review process has resulted in cost changes across the environment programme, leading to a need to update our cost change mechanisms. To align with our revised costs, we are proposing three approaches for the costing of amber and 'water company only' schemes listed in WINEP3:

1. **Ofwat model:** Where we are confident that our costs align with those derived from the IAP Ofwat models. Then we propose to use these to account for future schemes.
2. **SRN Cost curve:** Where we have assessed that the costs from the Ofwat model do not completely reflect our company drivers for different costs and the schemes proposed are of a nature that allows the use of a cost curve (e.g. sizing of tanks or chemical dosing), we will use our own cost curves.
3. **Bespoke approach:** Where an Ofwat cost model is not available (e.g. U-IMP4) and or the nature of the solution required will not fit a cost curve (i.e. the work required to improve bathing water quality will vary from location to location), we will use a bespoke bottom up approach to costing changes to these schemes

1. Our approach for Chiddingfold and Buriton

We have interpreted this query as referring to the stated approach to managing any changes to WFD_Ammonia and Biochemical oxygen demand drivers in WINEP. Currently we only have one scheme for each driver (Chiddingfold and Buriton), the costs we submitted for these schemes was derived using a bottom-up **bespoke approach.**

Our stated approach for responding to any changes to the requirements of these drivers in subsequent version of WINEP, is to use **Ofwat's cost model** for sanitary determinants. We previously proposed using our own SRN cost curve but following IAP review process, are confident we can deliver these schemes efficiently to Ofwat's model.

The solutions for Shellfish Water and Bathing Waters are more site specific than those for WFD_IMP Ammonia and Biochemical Oxygen Demand. We are therefore proposing to treat any changes to the requirement for these drivers in a different approach to that for Buriton and Chiddingfold and have set this approach out below.

2. Bathing water schemes

Bathing water schemes are required to improve the quality of a specific bathing water. These costs are highly location specific and do not lend themselves to a cost curve approach. We propose that changes to requirements of these schemes are treated in a **bespoke approach** rather than using a cost curve which could either under or overestimate the costs required. For example, schemes to improve bathing water quality in AMP6 included remediation of structural deficits in assets, mis-connection studies and advice, CSO modifications, storage and catchment management. These interventions are very different in their nature and costs.

3. Shellfish water schemes

Shellfish water schemes are required to improve the quality of shellfish waters, as measured by shellfish flesh quality. The solutions for these schemes are slightly different to Bathing Water in that the application of cost curves is more appropriate. Due to the standard nature of interventions, costs are more closely related to the size of the scheme.

There are two broad types of schemes (ultraviolet disinfection and storage schemes). The type of scheme required would normally be defined in WINEP, however for Southern Water, shellfish schemes are a "water company only" line in WINEP3. We anticipate that further clarity will be provided upon secretary sign off RBMPs on the 31st of December 2021.

Therefore, for changes to shellfish water schemes we are proposing to adopt two approaches based on the type solution:

- **Ofwat** model will be used for UV disinfection solution costs, as our revised costs now align to this model (as per Approach 1 above).
- **SRN cost curves** will be used for Storm tank storage solution costs. This is to be consistent with our approach to storm tanks under the IMP_6 driver (as per Approach 2 above).

4. Assurance and approval

We expect costs to be provided no later than 31st December 2021 to Ofwat. This will align with Secretary of State approval of the revised RBMPs that feed into WINEP. We will obtain assurance from an independent third party to ensure that our approach aligns with the appropriate methods and are efficient.

5. Confirmation of Amber WINEP requirements and costs

CE.A4.Table 1 – Wastewater WINEP Schemes

WINEP 3 Driver Code	No. Schemes	Capex (£m)		Opex (£m)	
		Revised Business Plan	WWS2	Revised Business Plan	WWS2
SSSI_INV	1	n/a	-	£0.1	Line 63
WFD_IMPg/m	66 In Total (64-Phosphorus, 1-Ammonia, 1-BOD)	£213.8	Line 18 £55 Line 19 £155 Line 20 £2.6	£22.4	Line 65 £3.8 Line 66 £18.5 Line 67 £0.06
WFD_IMP_Chem	1	£2.7	Line 12	£0.04	Line 59
Total	**68**	**£216.5**		**£22.5**	

CE.A4.Table 2 – Water WINEP Schemes

WINEP 3 Driver Code	No. Schemes	Capex	Opex (£m)	
		Revised Business Plan (Net)	Revised Business Plan	WS2
WFD_IMP_WRFlow	3	n/a	£0.4	Line 58
NERC_INV1	2	n/a	£0.3	Line 58
INNS_ND	1	n/a	£0.1	Line 58
Total	**6**		**£0.8**	

6. Updated cost adjustment approach

The table below summaries the approach that we are proposing to take for cost adjustment for all wastewater and water amber and "water company only" schemes. Of the fifteen drivers that this applies to:

- For seven of the drivers, we are using Ofwat's model to provide all or most of the costs.
- Ten of the drivers require a bespoke costing approach, as these are typically single sites and the nature of the required solutions are not compatible with a cost curve approach
- We have proposed to use our own cost curves for only one driver – storm tank storage (U_IMP6). As our post IAP revised least cost programme leaves a significant gap of £17.4m to the OFWAT model benchmark.

Where we are using Ofwat's current enhancement models to derive costs for removal or addition of schemes, we recognise that these models will be revised at both the draft and final determination steps. All references to use of the Ofwat enhancement model should be read as referring to the model provided to SRN by Ofwat at IAP.

A summary of our new proposed approach is set out below, this includes clarity on both amber schemes plus schemes defined as "water company only" in WINEP3.

			Cost adjustment method (for removal and addition of schemes)			
WINEP Driver	Reason for uncertainty	WWS2/ WS2 Line	Ofwat enhancement model	SRN Cost curve	Bespoke approach	Rationale
WFD_IMPg/m Phosphorous [P-removal]	Amber schemes	18/65 & 19/66	P-removal model (previously SRN Curve)	n/a	n/a	We now propose to adopt the (more challenging) industry benchmark as per Ofwat's current enhancement model.
U_IMP5 [Flow to full schemes]	Water company only line	9/56	Flow to full treatment model (with exception of ad hoc efficiency challenge and Buddsfarm) (previously SRN Curve)	n/a	Buddsfarm treated in a bespoke approach	Removing costs for a single site (Budds Farm WwTW), the costs for the remaining Flow schemes under this driver then meet the OFWAT model (excluding the efficiency challenge). Subsequent changes to schemes and needs under this driver will be applied to the model based on a total capacity required rather than on a total number of scheme basis. We propose the Buddsfarm scheme is subjected to a deep dive review by Ofwat. The ad-hoc efficiency adjustment applied by Ofwat in this driver disproportionately affects SRN and is not adequately backed by evidence.
U_IMP6 [Storm tank capacity]	Water company only line	10/66	n/a	SRN Storm tank curve (previously SRN curve)	n/a	The revised least cost programme will require £88.1m capex to deliver. This is a reduction of £40.5m from our Business Plan. This leaves a gap of £17.4m to the OFWAT model benchmark. We, therefore, challenge the cost efficiency applied in the Ofwat model and believe our revised costs are now more efficient than previously stated.
WFD_IMPg/m Biochemical Oxygen Demand [Sanitary parameters]	Amber scheme	20/67	Sanitary parameters model (used for addition of schemes) (Previously bespoke)	n/a	Bespoke approach used if Buriton is removed	We now propose to adopt the (more challenging) industry benchmark as per Ofwat's current enhancement model.
WFD_IMPg/m Ammonia [Sanitary parameters]	Amber scheme	20/67	Sanitary parameters model (used for addition of schemes) (Previously bespoke)	n/a	Bespoke approach used if Chiddingfold is removed	We now propose to adopt the (more challenging) industry benchmark as per Ofwat's current enhancement model.
SW_IMP, SW_ND [Ultraviolet disinfection , Conservation drivers (non UV SW schemes)]	Water company only line	4/51 (non UV schemes) 21/68 (UV Schemes)	Ultraviolet disinfection model (Previously bespoke approach)	SRN Storm tank curve (previously SRN curve)	n/a	Our UV schemes are efficient based on the Ofwat model, so the use of the model is appropriate. Storm tank schemes (including network storage) under this driver should be treated consistently with our IMP_6 approach.

BW_IMP(1,2, 3) , BW ND [n/a]	Water company only line	37/84	n/a	n/a	Bespoke approach used for all schemes	Due to the complex and varying nature of bathing Water solutions a bespoke approach is required.
U_Mon (3,4) BW_Mon, SW_Mon [Event duration monitoring]	Water company only line	6/53	Event duration monitoring model (Unit costing approach used previously)	n/a	n/a	We now propose to adopt the (more challenging) industry benchmark as per Ofwat's current enhancement model.
U_IMP4	Water company only line	11/58	n/a	n/a	Bespoke approach used for all schemes (Bespoke approach used previously)	Due to the complexity of solutions required, these schemes will be treated in a bespoke approach
INNS_ND	Water company only line	52	n/a	n/a	Bespoke approach used for all schemes (Bespoke approach used previously)	Due to the complexity of solutions required, these schemes will be treated in a bespoke approach
WFD_IMP_ Chem [Chemicals removal]	Amber	12/59	Chemicals removal model (Bespoke approach used previously)	n/a	n/a	Following our cost review post IAP we can deliver new schemes at the model efficiency
SSSI_Inv	Amber	63	n/a	n/a	Bespoke approach used for all schemes (Bespoke approach used previously)	Due to the complexity of solutions required, these schemes will be treated in a bespoke approach
WFD_IMP_W RFlow	Amber	WS2 58	n/a	n/a	Bespoke approach used for all schemes (Bespoke approach used previously)	Due to the complexity of solutions required, these schemes will be treated in a bespoke approach
NERC_INV1	Amber	WS2 58	n/a	n/a	Bespoke approach used for all schemes (Bespoke approach used previously)	Due to the complexity of solutions required, these schemes will be treated in a bespoke approach
INNS_ND	Amber	WS2 58	n/a	n/a	Bespoke approach used for all schemes (Bespoke approach used previously)	Due to the complexity of solutions required, these schemes will be treated in a bespoke approach

5.SRN.CE.A5

Ofwat action	How we have responded
There may be significant impacts in terms of investment or type of investment as a result of the metaldehyde ban. The company should investigate and agree with the DWI the scale and timing of any potential changes compared to its submitted plans. Significant changes and uncertainty may require an outcome delivery incentive to protect customers in the instance of expenditure not being required. Should the company propose a performance commitment and outcome delivery incentive, the company should provide evidence to justify the level of the performance commitment and the outcome delivery incentive incentive rates proposed, in line with our Final Methodology. We expect to receive evidence of customer support for outperformance payments, where proposed, and that the incentive rates proposed are reflective of customer valuations.	Further information provided

Our detailed response

Our current undertakings cover the following pesticides: glyphosate, mecoprop, MCPA, 2,4-D and metaldehyde and are not constrained to metaldehyde only. To reduce the raw water concentrations of the named pesticides we will be carrying out catchment management in 6 of our river water abstraction catchments during AMP7. We have confirmed with the DWI, that following implementation of the metaldehyde ban, we will still need to carry out catchment management in these catchments, the costs within this area of our plan will therefore not change.

Further information was provided in our September business plan *BP_TA 11.WR03 Catchment Management Solutions_Section 6.*

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