Business Plan 2020-2025
Response to Ofwat's July 2019 Draft Determination for Slow-track Companies
Supporting information

an efficient Water Future

Securing Cost Efficiency

South West Water

Bournemouth Water

Contents

Executive Summary

1. Since the Initial Assessment of Plans (IAP) and South West Water's Draft Determination in April further assessments of enhanced expenditure and changes in the base modelling approach (to incorporate growth investment) have been undertaken, alongside additional information, representations and submissions from other companies. Ofwat's latest view of totex was published as part of the Draft Determinations for slow track and significant scrutiny companies in July.

2. Having accepted a number of challenges through the IAP process, we limited our Draft Determination representations on the presumption that as a fast-tracked company there would be minimal changes through to the Final Determination.

3. However, Ofwat's latest view of totex implies a further adjustment to South West Water's totex allowances for 2020-25:

    - £67m reduction at IAP and included within the fast-track Draft Determination
    - £38m further implied impact from the July Draft Determinations for slow-track companies
    - £20m adjustment for water growth expenditure

4. Overall this has reduced South West Water's implied totex allowance by c.6%, including retail, with further analysis in paragraph 11. As a result, we are updating our previous Draft Determination representations to encompass the aspects of Ofwat's latest view.

5. We are representing on a number of areas – giving further information and evidence to support our existing cost claims and items for consideration. The key areas are:

    - **Enhancement totex representations** – providing additional evidence to support our enhanced costs within the business plan, including those which were included within our special cost factor claims
    - **Special Totex claims** – three new totex claims associated with wastewater base modelling and growth modelling in both water and wastewater
    - **New additions to the business plan** – representations on the additional costs for the strategic regional water resources solution and the impact of water transfers to the South East.

6. These representations include the Isles of Scilly representations made at the fast-track Draft Determination for £6.9m of totex, reinstating the full claims made within our original business plan submission.

7. The totex representations we are making are summarised in the table below with the comprehensive supporting information and evidence included in this 'Securing Cost Efficiency' supporting information document:

	Total £m
Evidence for existing base and enhancement totex (including Isles of Scilly)	£93.1m
Special Totex claims (based and growth totex)	£42.4m
New additions to the business plan	£7.8m

Summary of Totex Adjustments

8. Since the business plan submission in September 2018 there have been a number of adjustments in both the totex allowances and the allocation of base and enhanced expenditure.

9. The base (and now growth) modelling completed and a review of enhanced expenditure through modelled allowances, industry comparisons and deep dives of key areas of expenditure, has resulted in changes in the totex allowances.

10. Following the initial assessment of plans, totex allowances reduced by £67m. The latest view following slow-track Draft Determinations implies a further reduction in totex of £38m plus an additional £20m of water new connections growth expenditure which was included within third party services in our business plan, but has been assessed in base + growth for the latest position.

11. The table below outlines these key movements:

	Business Plan £m	IAP totex Adjustment £m	**April Fast-track DD £m**	Growth Allocation £m	July totex Adjustment £m	**July implied view £m**	**Total Adjustment £m**	**Ref**
Water								
Base	**652**	70	**722**	47	(13)	**756**	**57**	**Para 18**
Enhanced	**254**	(74)	**180**	(47)	-	**134**	**(74)**	**Para 13**
TOTEX	**906**	(4)	**902**	-	(13)	**890**	**(17)**	
Wastewater								
Base	**716**	(28)	**688**	88	(18)	**758**	**(46)**	**Para 18**
Enhanced	**267**	(16)	**251**	(88)	(7)	**156**	**(23)**	**Para 14**
TOTEX	**983**	(44)	**939**	-	(25)	**914**	**(69)**	
Retail	**160**	(19)	**141**	-	-	**141**	**(19)**	**-**
Appointee TOTEX	**2,049**	(67)	**1,982**	-	(38)	**1,945**	**(105)**	
Third party costs	20	-	20	-	(20)	-	(20)	**Para 18**

Note: Rounding difference to total from July published 'Security Cost Efficiency Technical Appendix'

12. The movements in enhanced expenditure, when considered through shallow and deep dive assessments, were substantial within both the water and wastewater areas. The tables below set out the basis for these cost challenges – reflecting the individual activity outlined in our business plan and where these assessments were allocated and reviewed by Ofwat.

    - **Revised Representation** – reflects the value that we are including within our representation
    - **Implied Totex Adjustment** – is the total cost adjustment from the business plan to Ofwat's latest view of cost assessments identified through the enhanced feeder models.

13. The table below sets out the areas for the Water revenue controls where additional information and evidence has been provided to support these representations for enhanced expenditure.

Water

				OFWAT ASSESSMENT AREAS ALLOCATION					
SWW BUSINESS PLAN AREAS	Water Enhancement Totex (£m)	Revised Rep'n	Implied totex Adjustment	Raw water deter'n	Resilience	DW protection	Taste and odour	Other / Freeform	Enhanced Opex
	Knapp Mill/Alderney WTW	11.1	11.1	4.4	6.7				
	Catchment management	4.9	4.9	3.8		1.1			
	Resilient Service Improvement (RSI)	10.0	10.0		10.0				
	Leakage	8.4	11.2					7.2	4.0
	Isles of Scilly (IoS)	1.6	1.6					1.6	
	Q schemes - WTW	12.1	12.1	9.3					2.8
	Mains replacements	1.5	1.5				1.5		
	Valve maintenance	2.9	2.9					2.9	
	Meter replacements	5.0	6.4					6.4	
	Water treatment works improvements	7.3	7.3					7.3	
	Cullompton service reservoir	4.0	4.0					4.0	
	Other minor areas	-	1.1					0.1	
	TOTAL	**68.7**	**74.0**	**17.5**	**16.7**	**1.1**	**1.5**	**29.5**	**6.8**

- **Knapp Mill / Alderney** – as part of the business plan query process we included additional evidence to support the special totex claims for Knapp Mill and Alderney new water treatment works. We have reconfirmed this position and provided further evidence in this representation
- **Catchment Management** – we have provided additional information to support the full enhancement costs within this area, including evidence of our efficient costs
- **Resilient Service Improvement (RSI)** – we provide additional commentary on the activities associated with this programme and the basis for the enhanced cost assessments
- **Leakage** – whilst we recognise the standard approach taken within the modelling we have provided additional information and support for the small proportion of leakage totex included as enhanced expenditure
- **Isles of Scilly (IoS)** – a proportion of this investment was disallowed due to the perceived 'optimism bias' within the cost base. Since the business plan submission, we have continued engagement with our regulators on the expansion into the IoS and have already identified specific additional expenditure and requirements
- **Q Schemes** – we provide additional evidence to address Ofwat's concerns regarding 'best options for customers' and 'robustness and efficiency of costs'. Specifically, we demonstrate how we have evaluated options for resolving the issues of raw water deterioration, consistent with our engagement with the DWI, and that our costs are efficient
- **Mains Replacements** – we provide additional evidence to demonstrate that our investment is targeted at reducing discolouration remobilisation risk through mains replacement which is outside

of 'management control'. We also demonstrate that our costs are efficient by providing a bottom-up breakdown

- **Valve Maintenance** – we demonstrate that the enhancement investment is for new schemes and more advanced control equipment rather than base maintenance
- **Meter Replacements** – the majority of these costs were assumed to be within the base allowances, however the enhancement spend specifically relates to the investment and deployment of smart meters
- **Water Treatment Works Improvements** – we demonstrate this investment is enhancement as it is directly linked to the requirement to comply with the new Network & Information Systems (NIS) regulations
- **Cullompton Service Reservoir** – this investment was reallocated to 'New development and growth' and then subsequently considered within base modelling. We are providing additional information to support that the nature of these new developments, as part of the Governments Garden Village programme, are specific and therefore should be considered enhancement investment.

14. The table below sets out the areas for the wastewater revenue controls where additional information and evidence has been provided to support these representations for enhanced expenditure.

Wastewater

				OFWAT ASSESSMENT AREAS			
SWW BUSINESS PLAN AREAS	Wastewater Enhancement (£m)	Revised Rep'n	Implied totex Adjustment	Other / Freeform	Growth	Sludge	Enhanced Opex
	Isles of Scilly (IoS)	1.4	1.4	1.2			0.2
	Downstream Thinking	9.7	9.7		9.7		
	Sludge	1.5	5.2			5.2	
	Sewer pumping stations	7.9	7.9	7.9			
	Other minor areas	-	-0.9	-0.9			
	TOTAL	**20.5**	**23.3**	**8.2**	**9.7**	**5.2**	**0.2**

- **Isles of Scilly (IoS)** – a proportion of this investment was disallowed due to the perceived 'optimism bias' within the cost base. Since the business plan submission, we have continued engagement with our regulators on the expansion into the IoS and have already identified specific additional expenditure and requirements
- **Downstream Thinking** – the full enhancement expenditure has been allocated within the growth categorisation and considered under base modelling. We provide additional evidence on why this expenditure is enhancement rather than base and outline the activities in this area
- **Sludge** – we have recognised that a higher proportion of sludge expenditure was assessed within base modelling, however we have included additional evidence supporting an element of spend as enhancement, particularly costs relating to the new market requirements
- **Sewer Pumping Stations** – we have provided additional information and evidence to support the specific enhancement expenditure on sewer pumping stations (which differs from the majority of expenditure which is considered base maintenance) including the permit requirements for flow measurement in relation to the new Environment Agency flow policy and the impact of the new spill frequency measures for permits.

15. In addition to the Isles of Scilly enhancement representations above (Total £3.0m for water and wastewater) we are also including representations on £3.9m of base costs adjusted from the overall Isles of Scilly allowances where we have additional information to support the cost base.

16. Overall the total representation for specific enhancement and base totex schemes are:

	Representation £m
Water enhancement	68.7
Wastewater enhancement	20.5
Isles of Scilly base totex	3.9
Total Totex Representation	**93.1**

Special Totex Claims

17. In addition to the representations on specific enhanced areas of investment we have further considered the base and growth cost modelling within both water and wastewater.

18. Overall the base plus growth totex modelling has resulted in a £57m net increase for water, reflecting South West Water's continuing efficiency position, and a reduction of £46m in wastewater. In addition, there has been a £20m reduction for the impact of growth modelling on new connections third party reallocations.

19. Following a review of the latest modelling (including the impact of change in approach for growth expenditure) we have identified the following specific totex claims:

	Representation £m
Water	
Growth expenditure	8.7
Water Totex	**8.7**
Wastewater	
UV treatment	13.6
Growth expenditure	20.1
Wastewater Totex	**33.7**
Total Totex Representation	**42.4**

- **Water Growth Expenditure (including new connections)** – costs associated with new connections had been originally included within third party services for our business plan tables (WS1), however these were included within capital expenditure on the analysis of enhanced expenditure (WS2). We have identified that the updated approach to growth modelling (assuming the new connection costs are now reallocated) has resulted in a £20m reduction to South West Water's totex allowances. We have provided additional evidence to support the efficient cost base and special totex claim in this area
- **UV Treatment** – within our business plan submission we noted that South West Water's cost of treatment at our wastewater sites was significantly impacted by the high levels of UV facilities at our sites but did not make a cost adjustment claim on the presumption that this would be captured by Ofwat's modelling. However, it is clear that UV treatment is not accounted for in Ofwat's latest modelling. South West Water has 63 sites which have UV disinfectant facilities, which is driven by the large number of bathing waters in our region. This equates to 70.8% of our population equivalent having UV treatment, the highest level compared to any other company and we have to

operate these throughout the year in contrast to some other companies. We do not believe these drivers have been included within the base cost econometric modelling and therefore we have included a special cost factor claim in this area

- **Wastewater Growth Expenditure** – the change in approach to growth modelling has reduced the allowed expenditure by c.£27m within wastewater and we are making specific representations on the relative cost of growth within the South West Water region – particularly linked to the environmental regulations, additional permits and investment needed to support the growth assumptions. We have provided additional evidence to support the efficient cost base and special totex claim in this area.

New additions to the business plan

20. In addition to the representations on specific enhanced areas of investment and base plus growth modelling, we have identified two new areas included within slow-track Draft Determinations. A summary of these associated cost representations are noted below:

	Representation £m
Southern Water Transfer	5.5
Strategic Regional Water Resource Solution	2.3
Total Totex Representation	**7.8**

- **Southern Water Transfer** – South West Water's business plan included an expectation that c.20Ml/day would be required to be transferred to Southern Water. We have noted that the slow-track Draft Determination documents include the transfer of 30Ml/day – an increase of 10Ml/day. South West Water has considered the impact of this increase and has identified that this would require additional capacity at Knapp Mill water treatment works. Overall the estimated cost of this additional volume is £5.5m, and therefore we are representing on an increase in the costs of Knapp Mill (in addition to the representations made and additional evidence provided on enhancement costs)
- **Strategic Regional Water Resource Solution** – outside of the allowances within the latest view of totex, £1.3m of additional funding has been identified to promote collaboration between water companies to develop regional water resource solutions. We have reviewed the activity and considered the expected costs associated with this (alongside our partners at Wessex Water and Bristol Water) and have identified that the total cost of this for South West Water is expected to be £3.6m. As a result, we are representing on an additional £2.3m. Alongside a summary within our representation we are also submitting a separate joint proposal from the companies within the West Country Resources Group.

ENHANCEMENT COST REPRESENTATIONS

Knapp Mill / Alderney New Water Treatment Works (SWB.DD.CA1)

1. The total costs for Knapp Mill / Alderney enhancement included in the business plan was £55.4m. The deep dive into this cost area reduced the enhancement cost allowance by £11.1m. This was assessed under Ofwat's *Raw Water Deterioration and Resilience reviews*. The review identified the following reasons for the adjustment:
    - Need for investment – Pass
    - Management Control – Pass
    - **Best Options for Customers – Partial Pass**
    - **Robustness and efficiency of costs – Partial Pass**
    - Customer protection - Pass

Representation

A key factor in the deep dive feedback related to the evidence on the assessment of investment options and the overall efficiency of the scheme. As part of the business plan query process we included additional evidence to support the special totex claims for Knapp Mill and Alderney new water treatment works (WTW). We have reconfirmed this position and provided further evidence in this representation.

The additional evidence and information supports a **representation of £11.1m** for Knapp Mill / Alderney which reflects the 20% of the claim which was disallowed for lack of evidence.

Need for Investment

2. As a part of our business plan submission the assessment noted sufficient evidence was provided to justify the need from the perspective of DWI support. However, Ofwat suggested that "*evidence of deterioration in raw water, for example time-based trends to evidence Manganese, bacterial, DOC etc. would further support the case*".

3. This supporting evidence was provided to the DWI for each water treatment work's, specifically showing the long-term trend in raw water deterioration at each of our source waters. This information was provided within our Annex A submissions to the DWI, all of which are available for reference.

Table 1: DWI Supporting Information - Annex A

Site	Parameters	Document Name	Page
Knapp Mill	Risk of Cryptosporidium and increasing underlying levels of TOC and detections of pesticides.	11 Annex A Knapp Mill WTW (SWB-AnnexA-KNM-01)	4-9
Alderney	Risk of Cryptosporidium and increasing underlying levels of TOC and detections of pesticides.	13 Annex A Alderney WTW (SWB-AnnexA-ALD-01) v2	5-11

4. In addition, we had previously addressed the concerns around evidence of water quality deterioration specifically for Knapp Mill and Alderney in query response SWB-IAP-CA-021.

Management Control

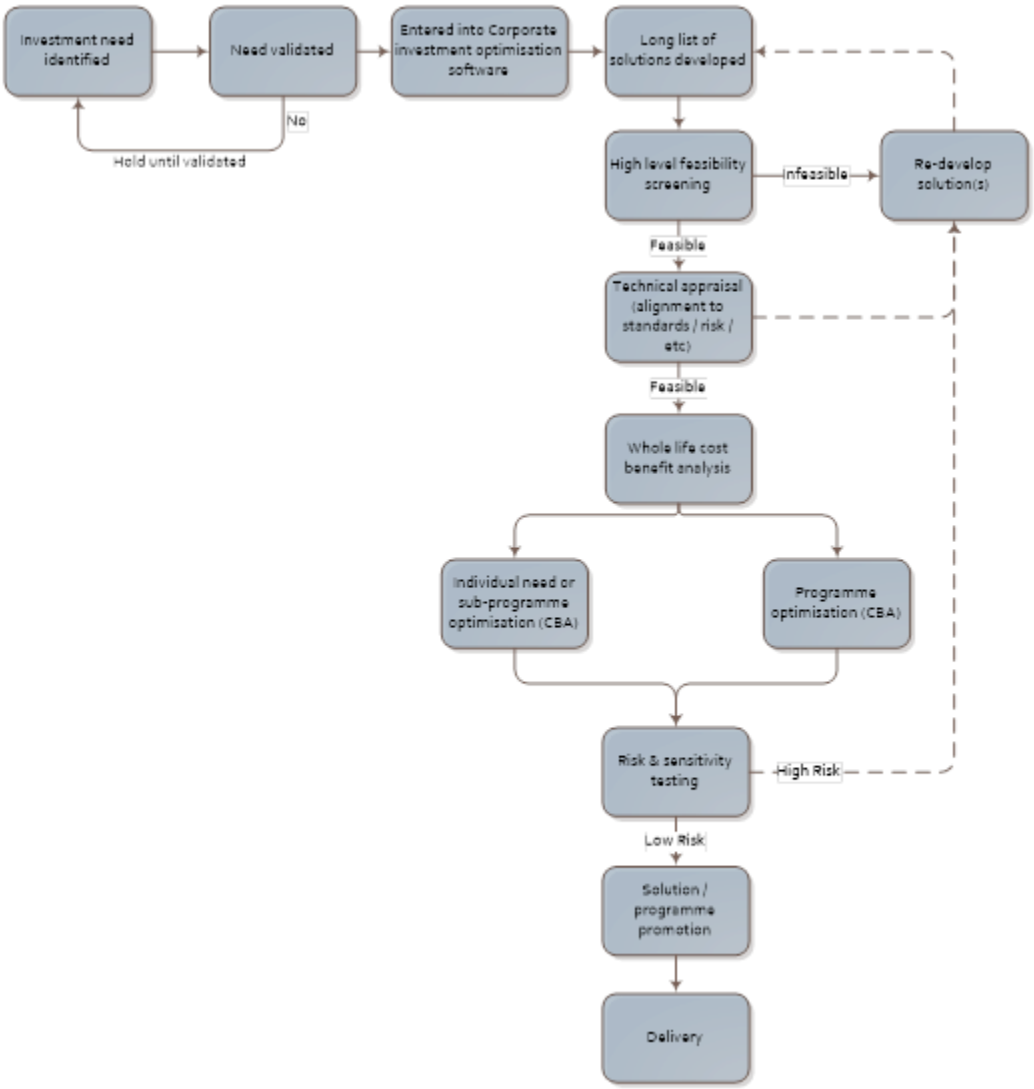
5. In both Ofwat's assessment at the IAP and latest view, Ofwat accepted that *"the Presence of Manganese, bacteria and DOCs in raw water sources is largely outside of management control."*

Best options for customers

6. In both Ofwat's assessments at the IAP and latest view of totex, Ofwat issued a "Partial Pass". As part the feedback it was noted that *"we find insufficient evidence that the company has fully evaluated all options for resolving the issues of raw water deterioration"* and a similar statement for resilience, whereby *"The company provided no evidence to demonstrate any other options have been assessed".*

7. SWW deploys a robust investment planning process, where, during the option development process, technically or financially infeasible options are discounted, and the most promising schemes promoted for detailed cost assessment, technical review and service benefit assessment. The final stage of the process is a full cost benefit analysis and optimisation of the proposed feasible options, thus helping to choose the most cost beneficial solution whilst taking into account all the other benefits of each option.

Figure 1: Investment Planning Process



8. These business processes associated with solution development, optioneering and prioritisation were audited and assured by Jacobs at PR19 in their Finance Assurance Report – referenced within our Securing Trust, Confidence & Assurance document.

"South West Water Limited (SWW) commissioned Jacobs to provide third-line independent technical assurance on its 2019 Business Plan submission to Ofwat.

The objective of the assurance activity was to provide the Company's Board with an independent opinion on the robustness of a number of PR19 information sets. The assurance covered the following 6 elements of SWW's plan:

- *Vision to 2050*
- *Bioresources RCV*
- *Water Resources RCV*
- *Engineering Estimating System / Cost Models*
- *Investment Manager & Business Cases*
- *PR19 Data Tables (non-financial)."*

9. With specific regard to WTW Quality investment, we reference this process in our long-term Drinking Water Quality strategy (Annex - 2 Long Term Water Quality Strategy), which was shared with the DWI as part of their requirements set out within their PR19 guidance on long term planning for drinking water quality, September 2017[1].

10. Within this document we explain how our detailed assessment is performed across our feasible options and specifically the considerations taken for our water treatment works investments to address raw water deterioration:
    - The ability of the process to remove or reduce the specific risk to an appropriate level and meet our water quality goals
    - The ability of one intervention to provide multiple benefits e.g. GAC reduces the risk of pesticides, reduces DBPs and certain T&O issues effectively
    - The requirement for additional future processes to mitigate changes in risk/farming practice e.g. the advance oxidation process requires a GAC process downstream
    - The impact of climate change
    - Our confidence and experience in the efficacy of the process
    - Minimum whole life total expenditure.

11. In our application for support from the DWI we produced a technical document for each investment that outlines the following information:
    - Details of the WTW and associated systems;
    - Hazard identification and risk characterisation; and
    - Control measures.

12. Within this final section, we discuss our short-term mitigations and longer term investment options. This includes an evaluation of options, costs and benefits.

[1] DWI, 2017. PR19 guidance on long term planning for drinking water quality. http://www.dwi.gov.uk/stakeholders/guidance-and-codes-of-practice/ltpg.pdf

13. These documents are set out to support the DWI in their evaluation of the scheme and ultimately their decision of whether or not sufficient evidence has been provided to warrant their support for the investment. In their planning guidance[2], the DWI acknowledges the following:

"Water companies seeking technical support for new improvement schemes from the Inspectorate will need to demonstrate the need for each proposal. The case for justification of need must be accompanied by the evidential information which justifies the need for action, and demonstration that the risk is significant enough to take action at this time, including

a. how the company has derived the most appropriate technical and cost effective options to mitigate each named hazard and thereby achieve compliance with the regulatory requirements;

b. summary details of the capital costs and the net additional operating costs, as part of the overall total expenditure (totex), of each of the options considered;

c. identification of the preferred option and the rationale for choosing that option and reasons for discounting all other possible options and

d. evidence that the preferred option will adequately mitigate the risk and deliver the required outcome within an appropriate timescale, and that the solution is sustainable, and improves resilience.

14. Prior to our business plan submission, we had received DWI support for all of the water quality schemes we promoted. We append our Annex A documents to this submission.

15. For your convenience we have referenced the pages containing the pertinent information showing the options considered for each site:

Table 2: DWI Supporting Information - Annex A

Site	Document Name	Page
Knapp Mill	11 Annex A Knapp Mill WTW (SWB-AnnexA-KNM-01)	10-11
Alderney	13 Annex A Alderney WTW (SWB-AnnexA-ALD-01) v2	14-15

16. A high-level summary of the feasible options, post screening of our long-list of options, is shown below for each WTW investment (along with our first-year capital costs). Our preferred option is shown in bold text. Please note this is not always lowest first year capital expenditure as a full 40-year whole life cost NPV is conducted for each scheme (which includes annualised operating costs and any additional or ongoing maintenance requirements). This 40-year NPV is also run with and without customer willingness to pay costs for the purposes of evaluating options for each scheme. For simplicity and as a point of reference to our enhancement costs allowances, we show only the first-year capital spend in our comparison of options below.

Site	Options considered
Knapp Mill[3]	Option A, £60.3m – Conventional treatment process replacement within the existing site boundary: inclusive of coagulation & flocculation, clarification, rapid gravity filtration, granular activated carbon, UV disinfection and residual chlorine dosing, together with ancillaries including interstage pumping, wash water recovery and sludge streams, operational buildings etc. Certain existing assets including inlet pumping, final water pumping and treated water storage are retained in the long term and are excluded from Capex cost modelling.

[2] DWI, 2017. PR19 guidance on long term planning for drinking water quality

[3] Please note the cost provided in our submission to the DWI were reviewed and updated by our cost consultants Chandler KBS prior to our business plan submission.

Site	Options considered
	Option B, £72.6m – 'Absolute Barrier' treatment process replacement within the existing site boundary, modelled on Mayflower WTW ceramic membrane process stream: inclusive of chemical dosing, selective ion exchange, inline coagulation, ceramic membrane micro-filtration, granular activated carbon, UV disinfection and residual chlorine dosing, together with ancillaries including interstage pumping, wash water recovery and sludge streams, operational buildings etc. Certain existing assets including inlet pumping, final water pumping and treated water storage are retained in the long term and are excluded from Capex cost modelling. Option C, £156.8m – Conventional treatment process replacement consolidated with Alderney at a new site. As per option A, including inlet works, enlarged treatment process, power supply, treated water storage and trunk mains etc. Option D, £173.6m – 'Absolute Barrier' treatment process replacement consolidated with Alderney at a new site. As per option B, including inlet works, enlarged treatment process, power supply, treated water storage and trunk mains etc. Option A was discounted for the following reasons: • Larger footprint required which places significant constructability risk and potential for increased costs • Our full cost benefit assessment preferred Option B, due to providing an absolute barrier to cryptosporidium and therefore reduced risk of water quality issues when customer willingness to pay is included in the assessment. • Please also refer back to our whole life costs modelling process.
Alderney	Option A, £54m – Conventional treatment process replacement within the existing site boundary: inclusive of coagulation & flocculation, clarification, rapid gravity filtration, granular activated carbon, Chlorine disinfection and residual dosing, together with ancillaries including inter-stage pumping, wash water recovery and sludge streams, operational buildings etc. Certain existing assets including inlet pumping, final water pumping and treated water storage are retained in the long term and are excluded from Capex cost modelling. **Option B, £65.9m – 'Absolute Barrier' treatment process replacement within the existing site boundary, modelled on Mayflower WTW ceramic membrane process stream: inclusive of chemical dosing, selective ion exchange, inline coagulation, ceramic membrane micro-filtration, granular activated carbon, Chlorine disinfection and residual dosing, together with ancillaries including inter-stage pumping, wash water recovery and sludge streams, operational buildings etc. Certain existing assets including inlet pumping, final water pumping and treated water storage are retained in the long term and are excluded from Capex cost modelling.** Option C, £156.8m – Conventional treatment process replacement consolidated with Knapp Mill at a new site. As per option A, including inlet works, enlarged treatment process, power supply, treated water storage and trunk mains etc. Option D, £173.6m – 'Absolute Barrier' treatment process replacement consolidated with Knapp Mill at a new site. As per option B, including inlet works, enlarged treatment process, power supply, treated water storage and trunk mains etc. Option A was discounted for the same reason as Knapp Mill: • Larger footprint required which places significant constructability risk and potential for increased costs • Our full cost benefit assessment preferred Option B, due to providing an absolute

Site	Options considered
	barrier to cryptosporidium and therefore reduced risk of water quality issues when customer willingness to pay is included in the assessment. • Please also refer back to our whole life costs modelling process.

17. A summary of the costs and options analysis is shown below. For these two schemes, we acknowledge the necessity to construct a highly resilient solution considering the need to supply water to the South East which could be required under all raw water conditions. This is justification for our selection of a treatment solution that provides an absolute barrier to Cryptosporidium and other contaminants from further raw water deterioration such as iron and manganese, Option 2.

Table 3: Analysis of enhancement costs

Strategic Option	Component	Current Value Capex Investment*	Current Value First Year Opex	Net Present Value 40 Year Capex	Net Present Value 40 Year Opex	Net Present Value 40 Year Totex
Baseline:	Non Infra Alderney/ Longham	44,318	1,510	43,295	26,326	69,621
Maintain Existing Processes	Non Infra Knapp Mill	52,101	1,350	56,619	23,529	80,148
	Infra	0	0	0	0	0
	OPTION TOTAL	96,419	2,860	99,914	49,855	149,769
Option 1:	Non Infra Alderney/ Longham	53,998	1,514	49,159	26,366	75,525
Conventional Process Replacement: Separate Sites	Non Infra Knapp Mill	60,292	1,364	60,750	23,698	84,448
	Infra	£0	0	0	0	0
	OPTION TOTAL	114,290	2,878	109,909	50,064	159,973
Option 2:	Non Infra Alderney/ Longham	65,870	1,594	65,039	27,222	92,261
Membrane Process Replacement: Separate Sites	Non Infra Knapp Mill	72,565	1,421	72,113	24,386	96,499
	Infra	0	0	0	0	0
	OPTION TOTAL	138,435	3,015	137,152	51,609	188,761
Option 3:	Non Infra	133,116	4,233	129,883	63,626	193,509
Conventional Process New Regional Works	Infra	23,665				
	OPTION TOTAL	156,782	4,233	129,883	63,626	193,509
Option 4:	Non Infra	149,934	4,307	154,469	64,373	218,842
Membrane Process New Regional Works	Infra	23,665				
	OPTION TOTAL	173,599	4,307	154,469	64,373	218,842

18. With respect to cost allocation in our business plan, we allocated costs to enhancement where raw water deterioration resulted in the need for additional treatment processes/stages (providing of course that the raw water deterioration cannot be managed acceptably into the future through process optimisation and maintenance improvements alone). For all our proposed WTW's schemes, we have reviewed the potential to manage raw water deterioration via these means, as

commented in our Annex A's. It can be seen that short-term options have been implemented to manage our current situation, however, it is now acknowledged that a long-term investment solution is required.

19. For Knapp Mill and Alderney WTW, as these are full treatment works upgrades/replacements, unlike our other WTW's schemes, we have allocated 50.32% to enhancement costs, based on a comparison of delivering isolated water quality improvement schemes at both water treatment works. This analysis was shared in our response to Query SWB-IAP-CA-021, and was undertaken on the total scheme costs, as follows.

Table 3: Analysis of enhancement costs

Item	Knapp Mill	Alderney
Total proposed scheme cost	£72,566,604	£65,870,810
Chemical dosing, pressure filters and inter-stage pumping	£28,630,740	£22,635,969
Increased treatment capacity	14.3% £10,366,658	12.2% £8,033,026
Total enhancement cost	£38,997,398	£30,668,995
Enhancement % of Total	53.74%	46.56%
Weighted average by cost	50.32%	

20. We believe that we have appropriately evidenced the work we have undertaken to ensure that we have evaluated options and selected the most cost beneficial investment for our customers.

Robustness and efficiency of costs

21. Alderney and Knapp Mill are based on the cost models used as the basis for the Mayflower water treatment works included in our PR14 business plan. We are in the final stages of commissioning Mayflower water treatment works, our largest single capital investment over 2015-20. Pleasingly this flagship project, and one of only three water treatment works in the world (and first in the UK) to use ceramic membrane technology, has been delivered to time and cost and we are therefore confident that the costs included in our business plan submission for Alderney and Knapp Mill are robust.

22. In both Ofwat's assessment at the IAP and latest view, Ofwat issued a "Partial Pass" and stated that the *"inclusion of independent reports [Chandlers KBS and Aqua Consultants] would support claims for cost efficiency".* We have provided a copy of our independent report by Aqua Consultants and Chandler KBS (SWW PR19 Cost Models and Cost Data Jun 18 (002)) to demonstrate the robustness and efficiency of our costs alongside this representation.

23. To evidence this point, we have plotted the data points used in the cost build up for the new treatment processes and inter-process pumping against other benchmarked water companies, where applicable. Specifically, for Knapp Mill and Alderney WTW we have refined our own cost model for membrane technologies which cannot be benchmarked as we are the first UK Water Company to deploy this innovative technology. However, during our optioneering process, traditional treatment technologies were compared and contrasted for 40-year whole life NPV.

24. For traditional new WTW replacements, these models are used for typically 50% (+/-10%) of the overall cost estimate for these schemes addressing raw water deterioration through the addition of new processes.

25. Please note, cost models from TR61 are shown as a reference point. TR61 is a cost modelling platform managed by WRc and updated annually. It is independently audited and reported by WRc to be certified for use in Business Planning purposes.

26. WRc acknowledge that TR61 is a suite of capital cost, operational cost and carbon models derived statistically from final account project data released to WRc from multiple water companies across the UK. These data are reviewed by a team of cost, process and network engineers to ensure that the integrity of the outputs is maintained. We appreciate these costs are not necessarily selected to demonstrate efficiency but they serve as a good marker for industry norms which we can evidence we far exceed.

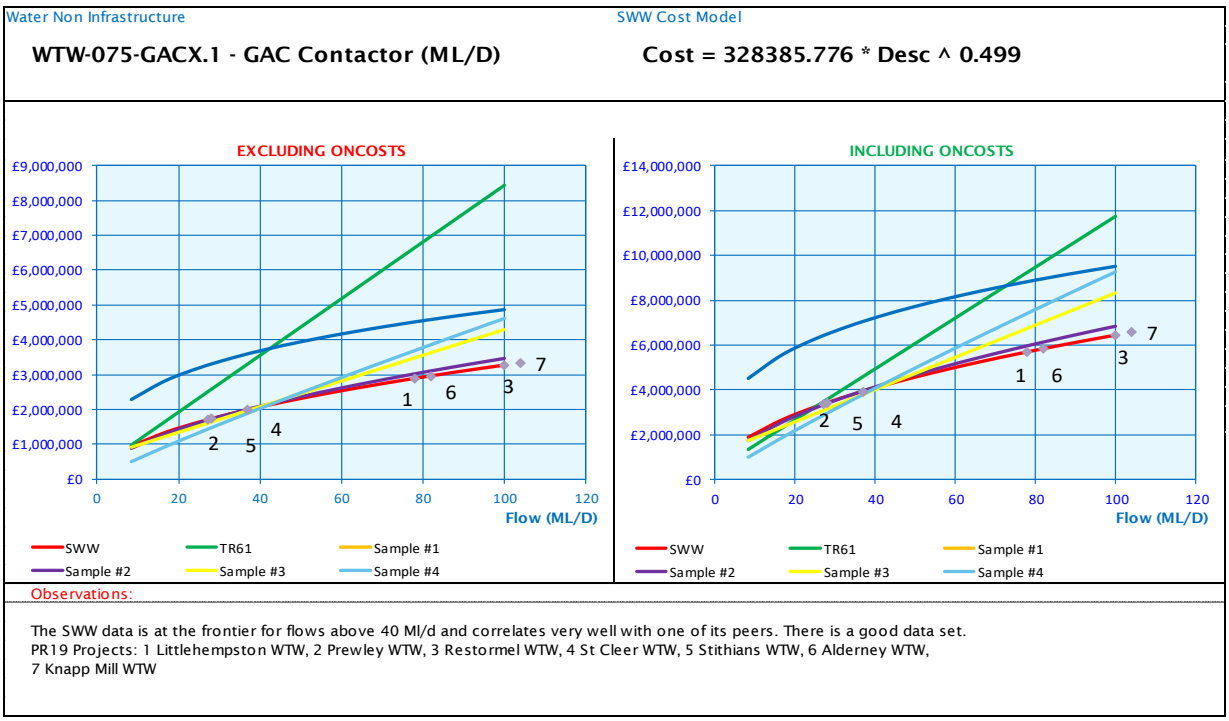
27. Of note, our WTW non-infrastructure cost models have been assessed as setting the industry frontier for many of the cost models used to benchmark our costs for these schemes in our business plan. This is true for:

    - New processes (GAC) >40Ml/d = frontier
    - Inter-process pumping 0 to 80kW = frontier.

28. The above are the core components used to establish costs for our New Water Treatment Works schemes.

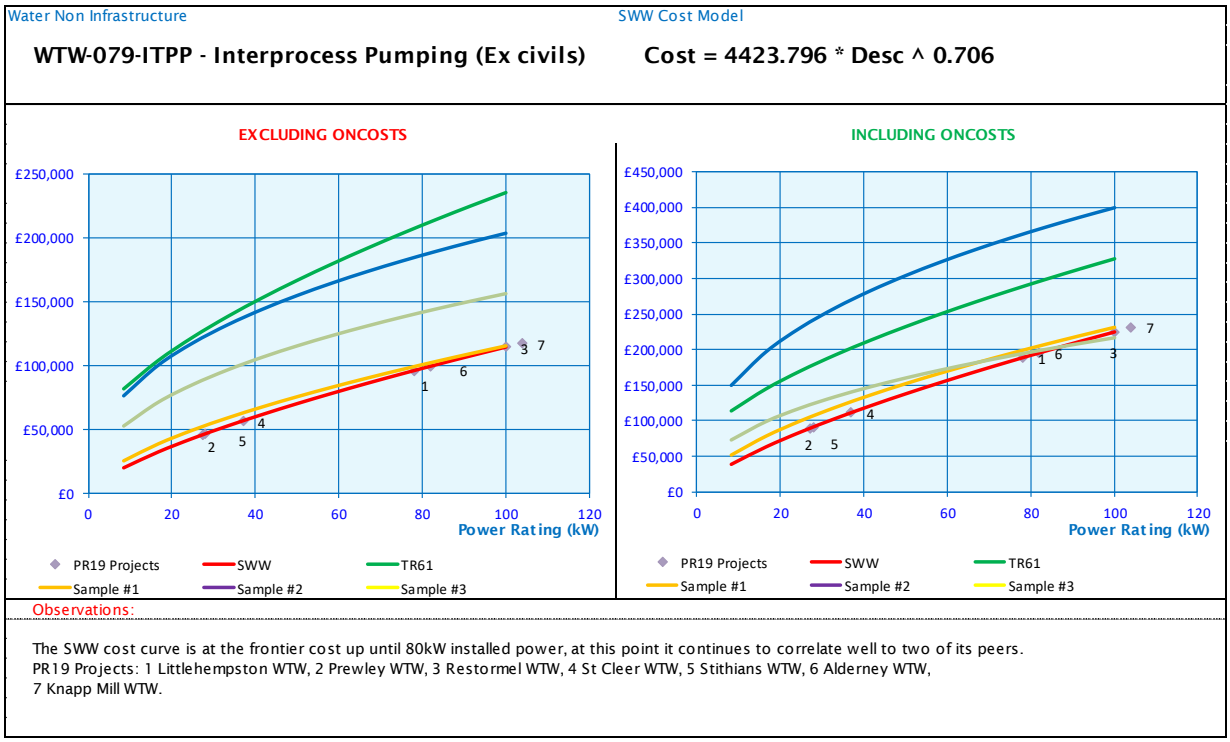
29. It can be seen that four of our seven schemes set the industry frontier in the cost model benchmarking evaluations for the addition of a new process. The other three schemes are typically lower value and are within the Upper Quartile.

Figure 2: Water non-infra new process cost model benchmarking



30. Similarly, for the seven schemes involving inter-process pumping, all costs set the industry frontier.

Figure 3: Water non-infra new inter-process pumping cost model benchmarking



31. In addition, we note that in the shallow and deep dives for some enhancement spend areas, Ofwat uses companies' efficiency on base expenditure to apply an efficiency challenge on enhancement expenditure.[4] We note that our Business Plan base costs, excluding enhancement operating costs, are estimated by Ofwat to be 13.6% better than the upper quartile for water services.[5] As such, Ofwat applies no efficiency challenge in shallow dives, but arbitrarily inflates this to 5% for deep dives. Given the above evidence from the Chandlers KBS and Aqua Consultants report on our efficiency in this area and our efficiency on base expenditure, it is clear that our costs are efficient.

32. We would therefore consider that our proposed costs for these projects are economic and efficient and are close to the efficiency frontier and this should be considered when evaluating the Robustness and Efficiency of Costs for our investments associated with raw water deterioration.

Customer Protection

33. In both Ofwat's assessment at the IAP and Draft Determination stage, Ofwat issued a "Pass". In particular, we have agreed to specific delivery ODI's for Alderney and Knapp Mill WTW's which we believe provides a guaranteed level of protection for customers.

[4] See: https://www.ofwat.gov.uk/wp-content/uploads/2019/07/Company-efficiency-factor_ST_DD.xlsx
[5] See: https://www.ofwat.gov.uk/wp-content/uploads/2019/07/Company-efficiency-factor_ST_DD.xlsx

Catchment Management (SWB.DD.CA2)

1. The deep dive into this cost area reduced the cost allowance by £4.9m. This was assessed under Ofwat's *Raw Water Deterioration and drinking water protection categorisation*. Given this was linked to the raw water deterioration category this identified the following reasons for the adjustment:
   - Need for investment – Pass
   - Management Control – Pass
   - **Best Options for Customers – Partial Pass**
   - **Robustness and efficiency of costs – Partial Pass**
   - Customer protection - Pass

2. The commentary for catchment management focuses on the specific Ofwat challenge on the efficiency of costs (the other aspects are covered in the commentary for Quality schemes.

Representation

The additional evidence and information supports the **representations of £4.9m** for catchment management as enhancement spend.

The key area of additional information focuses on new areas of activity within the programme and nature of the expenditure compared to the current regulatory period, supporting the robustness of costs and efficiency.

Robustness and efficiency of costs (Upstream Thinking)

3. As part of Draft Determination for our Upstream Thinking programme Ofwat has set an allowance for catchment management activities in AMP7 based on investment levels for AMP6 and increased these by CPIH. We assume this has been done because you consider that the AMP7 programme for Upstream Thinking is similar in nature to the AMP6 programme and therefore should be funded to a similar level.

4. The AMP7 programme is a larger programme of activity than the current AMP6 programme because it includes work in a number of new catchments driven by the requirements of the WINEP. These represent c.48% of the total costs. For these new catchments, driven by the WINEP, we believe our costs should be considered outside of this deep-dive.

5. We provided information about our ambitious programme of Upstream Thinking (catchment management) in our Water Resources revenue control submission. Our technical submission[6] to the DWI seeking support for the programme also outlined our programme in more detail, including a detail breakdown of costs.

6. Specifically, we describe how our programme has evolved from AMP6 to AMP7.

   New (AMP7) proposal
   Upstream Thinking 3 is an ambitious new programme that includes 10 new catchments or areas of innovative activity, including for the first-time specific schemes for total catchment nutrient reduction (waste water outcomes) and flood risk management as well as continuing the current schemes in 11 Drinking Water Protected Area (DWPA) catchments.

[6] 10 UST Summary for DWI (SWB-UST-Strategy-01)

The programme will also deliver new WINEP investigations by April 2022, including Drinking Water Protected Areas (DWPA) at risk investigations into new in-catchment challenges such as Geosmin and increasing DOC levels.

7. An example where the application of CPIH to our AMP6 programme does not appropriately consider our AMP7 activity is that our programme in AMP6 did not include our Bournemouth Water region. Similarly, uplifting by inflation does not account for the fact that delivery gets progressively more difficult as our coverage increases in the catchments we are already working in.

8. We have summarised the programme, showing our new interventions in our catchments (Table 1), and new commitments from the WINEP (Table 2) below.

Table 1: Analysis of enhancement costs – existing schemes

	Catchment	2015-20 (AMP 6)			2020-25 (AMP 7)		
		Cost £000	Output* Ha	Rate £/ha	Cost £000	Output Ha	Rate £/ha
Schemes	Tamar (DWT/WRT)	2,379	15,000	159	1,400	14,000	155
	Fernworthy (DWT)	295	263	1,122	145	500	243
	Exe (DWT/WRT/EMP)	2,341	12,500	187	1,650	8,000	153
	Dart (DWT/WRT)	1,447	10,500	138	800	8,000	142
	Otter (DWT/WRT)	569	11,000	52	450	5,000	173
	Yeo (DWT)	220	3,000	73	200	2,000	155
	Fowey (WRT)	561	4,500	125	450	3,000	170
	Cober (CWT)	909	1,495	608	950	1,450	590
	College (CWT	547	345	1,586	520	400	1,083
	Drift (CWT)	559	2,500	224	550	1,250	423
	Scheme Total	**9,827**	**63,209**	**155**	**7,115**	**43,600**	**163**
Investigations	UST impact at abstraction investigations	506			650		
	UST Mire restoration monitoring & investigation	793			650		
	Investigation Total	**1,299**			**1,300**		

** AMP6 Farm plans and acres converted to AMP7 target (ha) as forecast in PR19 plan*

9. In addition to the schemes and investigations there are a number of new activities which were not part of the AMP 6 programme, including Bournemouth Water, as outlined in Table 2 which are driven by the targets within the WINEP and discussions on biodiversity.

Table 2: Catchment Management new commitments from the WINEP

	Catchment	2020-25 (AMP 7)		
		Cost £000	Output Ha	Rate £/ha
New Schemes	Roadford (DWT/WRT/Entrade)	750	1,000	610
	Wistlandpound (DWT/Pioneer)	350	500	510
	Upland boundary ditches NFM work in Exe Headwaters	500	500	1,000
	Exmoor Mires Sphagnum re-introduction	1,500	500	3,000
	Burrator catchment work (SWW mires team)	2,000	1,000	2,000
	Stithians (CWT)	750	750	1,000
	Catchment wide INNS (invasive non-natives species) scheme	400	1,000	400
	Bournemouth - Dorset Stour (metaldehyde)	350	1,500	233
	Scheme Total	**6,600**	**6,750**	**8,753**
New Investigations	Avon (DWPA at risk)	200		
	Colliford (DWPA at risk)	200		
	Meldon (DWPA at risk)	200		
	Tavy (DWPA at risk)	200		
	Burrator (NERC)	200		
	Investigation Total	**1,000**		

10. Programme management costs are in addition to the above, currently assessed at £835,000, around 5% of total costs.

11. Key points to note:

- Investment on new interventions in current catchments has increased (per ha) as more difficult areas are pursued. The overall (total new AMP7) outputs from these current catchments has also decreased for the same reason, for example the WINEP schemes that are targeted around our reservoirs which require significant intervention but deliver relatively low hectares managed for their investments
- For the new AMP7 WINEP driven commitments the cost of delivery in these small catchments is relatively high due to the overheads and intensive nature of the schemes. Therefore the ODI outputs are relatively small for these catchments
- The Dorset Stour scheme was not included in SWW AMP6 UST as it was funded from BW budget so the new interventions in this catchment appear as additional for our AMP7 programme
- For the monitoring of Upstream Thinking (UST) Mire restoration and the monitoring and reporting on the benefits of the UST programme to SWW at WTW assets the investment continues at the same level due to the importance of the evidence of water quality over the long-term, but it delivers no hectare outputs
- Where we have new AMP7 WINEP investigations these have no ODI hectare output. No similar investigations were on the AMP6 NEP, so this is an additional / new commitment cost
- It should also be noted that the programme delivery costs have increased modestly in line with the larger and more widespread programme to be delivered.

Resilient Service Improvement (RSI) (SWB.DD.CA3)

1. The deep dive into this cost area reduced the cost allowance by £10.0m. This was assessed under Ofwat's *Resilience categorisation*. The assessment noted that "*we consider that the investment allocated to this line relating to the PUROS and iOPS opex reduction, and RSI (Resilience and Service Improvement) (£9.96m) would be best assessed as base expenditure as it appears to relate to updating IT control systems.*"

Representation

The additional evidence and information supports the **representations of £10.0m** for the Resilient Service Improvement (RSI) programme as enhancement spend.

The key area of additional information focuses on the areas of activity within the programme and nature of the expenditure as enhancement – reflecting our recently published resilience action plan.

Of the £15m total investment (with £10m assumed as enhancement) the split of investment between IS and non-IS related expenditure is around 50:50. Physical assets and telemetry for deployment on the network, programme management, new infrastructure to accommodate the incident room and data centre make up the non-IS investment. IS related expenditure comprises new software and systems to provide the information and data to the data centre for analysis and central decision making.

Overview

2. Our PR19 investment programme included £15m of water expenditure for a Resilient Service Improvement project. This investment is a customer service transformation programme aimed at driving service improvements in areas that matter most to our customers, namely pollutions, supply interruptions and leakage.

3. As part of our resilience plan submitted alongside our business plan we undertook an assessment of our resilience which was validated independently by PA Consulting. The 'securing long-term resilience' supporting document we submitted outlined the resilience assessment and areas that needed to be strengthened. This resilience investment is aligned to addressing these improvement areas which also feature in our resilience action plan submitted as one of our fast-track actions on 22 August 2019.

4. This programme of work builds on the investments made over the last two price reviews, specifically PUROS (Phased Utilisation of Remote Operating Systems in PR09) and iOps (Intelligent Operations in PR14). Supporting other planned investment and innovative ways of working these investments have been successful in enhancing the resilience of the business and improving service levels during the last ten years.

5. The service enhancement components of the RSI programme comprise internal scheduling and business intelligence investment and associated improvements to the central control room and data centre.

6. Completion of these projects will take place from 2020 and technology solutions and business processes will progressively be rolled out to enable early benefits to be realised.

Need for the Claims

7. As part of our resilience plan submitted alongside our business plan we undertook an assessment of our resilience which was validated independently by PA Consulting. The 'securing long-term resilience' supporting document we submitted outlined the resilience assessment and areas that needed to be strengthened.

8. Ofwat's initial assessment highlighted that South West Water was ***'setting the standard for others to meet'*** in terms of resilience but we needed to '*demonstrate an integrated and systems-based approach to resilience*'. We recognise that in order to ensure long-term resilience we need to continue to improve and our Resilience Action Plan was published in August 2019.

9. This sets out the actions and milestones we are targeting not just during the next regulatory period but out to 2030 and the enhancement investment we are including within our Resilient Service Improvement Programme (RSI) covers a range of areas, including IT control systems but also innovation in how we provide improvements for customers.

10. The specific enhancement activities (outlined in our business plan) include:
    - New data centre and data analytics capability
    - New jeopardy management system
    - New incident room
    - Additional telemetry capable of giving greater visibility of network and operation
    - Automation software for network optimisation.

11. Key to this is using innovation to drive improvements, with our aim being to share these across the industry. We have collaborated with the University of Exeter for two years to develop an Innovation and Resilience Centre for Water and Waste. In July 2019, this collaboration was successful in its bid to Research England to develop innovative solutions designed to solve some of the most pressing global environmental challenges of our time. Central to its focus will be how to manage natural resources to ensure there is sufficient water to cope with population growth, the pressures of climate change, and improving resilience to the potentially devastating impacts of flood, drought and emerging pollutants. The new Centre will accommodate state of the art, specialist laboratory facilities, and designated space to encourage collaborative research between academics and experts from the water industry.

12. Our investment in RSI provides the platform for many of the activities in this exciting venture with the University of Exeter that will be shared with the rest of the industry.

Robustness and efficiency of costs

13. Alongside a more resilient long-term service for customers and RSI programme is targeting sustainable cost reductions as well as transforming our service provision.

14. The RSI programme will start to generate operating cost savings from 2020 onwards and will continue to grow beyond 2025 as the full benefit of the investment and improved ways of working are realised. This level of investment will ensure an efficient service to customers into the long-term and these savings have already been assumed in our business plan submissions (based on the enhancement expenditure to facilitate these improvements).

15. In terms of the investments we are making we recognise that some of the investment relates to the ongoing operation of base service levels and therefore only the new assets and investments (£10m) delivering enhanced service levels has been allocated as enhancement with the remaining expenditure (£5m) allocated to base maintenance. This allocation is consistent with the approach in previous price determinations for similar investments.

16. Initial cost benefit analysis was undertaken for different options within the RSI programme and it was concluded that the £15m scenario submitted provided the best value and outcome for customers – other options were discounted because they were considered too risky or costly. The £15m scenario (£10m enhanced and £5m in base) was selected to deliver the required step change in performance with a balanced portfolio of cost and risk. This approach cost analysis was also consistent with the funding for our previous transformational projects.

Leakage (SWB.DD.CA4)

1. In the slow-track Draft Determination Ofwat has removed the 15% leakage reduction target as a threshold for allowing enhancement costs. The threshold has been set at the 2024-25 forecast industry upper quartile leakage performance.

2. Ofwat has presented a new methodology for assessing these costs as part of the latest cost assessment view. This methodology is different to that applied to the fast-track company Draft Determinations.

3. None of the £11.2m leakage enhancement costs requested within our business plan has been allowed as part of the cost analysis in July.

Representation

The additional evidence and information supports the **representations of £8.4m** for leakage as enhancement spend.

The investment planned for leakage reflects our innovative new plans to transform the historic baseline in leakage and focuses on how innovation can be shared. In addition, we are providing representations on the approach taken for allowance enhanced totex for leakage.

The approach is a frontier assessment rather than an upper quartile appraisal (17% percentile). There is little challenge from Ofwat around the unit costs applied in the methodology and we do not consider that the outcomes are economic and efficient for all customers.

We have suggested an alternative methodology which is documented in this submission. As part of this methodology, we consider the performance of all companies across each of the quartile performance positions and place all companies on a RAG status matrix, with different levels of funding allocated to each company dependent upon the RAG status.

Overview – Innovation approach

4. Our enhancement programme is aimed at transforming historic baseline leak detection and repair performance that has reached a plateau over the last decade (as a result of reaching the economic level of leakage). In order to deliver the best value to customers, at an affordable cost, this transformation requires investment in new technologies and innovation to keep detection costs as low as possible.

5. Our enhancement investment is focused on improving the effectiveness and approach to the targeting of leak detection. We have developed a plan that involves the significant purchase of 'lift and shift' acoustic loggers and also fixed-point network acoustic loggers that enable much more precise targeting of leaks. This approach has been piloted this year and had proved incredibly effective in detecting leaks compared to more traditional methods used until now.

6. Our approach to fixed network monitoring means deploying thousands of loggers permanently where needed in our water distribution network, so that we continuously collect information about the pipe network. Alarms are then automatically triggered to send leak alarms to our 24-hour control centre for investigation and repair as appropriate.

7. Supplementing the fixed network monitoring, our enhancement investment also requires the purchase of lift and shift acoustic loggers to locate leaks on pressurised pipes, where the rough location of the

leak is unknown and the distances are relatively high. Two (or more) sensors are placed in contact with the pipe on both sides of the suspected leak. Those sensors record and transmit the sound by radio to the processing unit. Mathematical algorithms are used to determine the location of certain noise profiles (such as a hissing leak sound) on the pipe, by correlating the noises that reach both sensors and measuring the difference it takes to travel on the pipe from the leak location to each sensor.

8. Widescale deployment of this technology means that leak detection becomes far more efficient and effective. Logger deployment can be undertaken 24/7 and will generate quality points of interest which can be followed up by Leakage Technicians who will confirm the location, size and scale of the leak and arrange for its repair. We are finding that the quality of leaks identified is better than those identified when using traditional methods, such as listening for noise on fittings using a listening stick. The prospects for the deployment of this new technology and innovation is encouraging.

9. As part of our on-going sharing of best practice with the industry we have already started sharing our ideas with our regional colleagues (Wessex Water and Bristol Water). Collectively with these companies we have set up a working group to help all of us exchange new ideas and ways of meeting similar industry challenges. This group will continue to share as we invest and adopt new ways of working to meet the significant challenges we all face with leakage reductions.

10. This approach to investment is innovative and highlights the collaborative approach to improving service for customers both in the South West and other regions.

Need for Investment

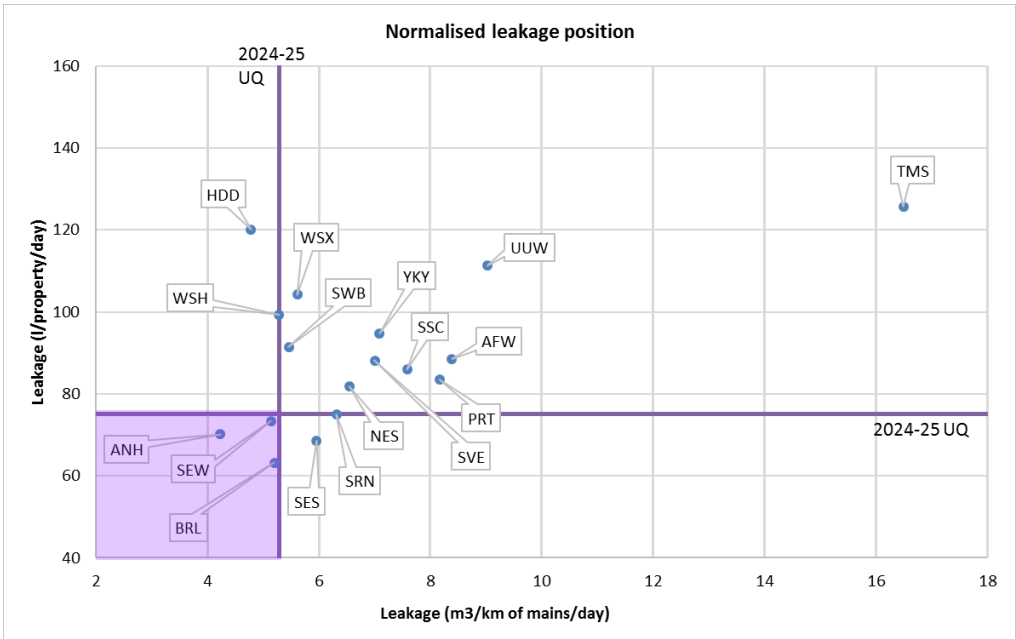
11. In the slow-track Draft Determination Ofwat has removed the 15% leakage reduction target as a threshold for allowing enhancement costs. The threshold has been set at the 2024-25 forecast industry upper quartile leakage performance.

12. For leakage, Ofwat still expect companies to achieve 2024-25 industry upper quartile from our base allowance. In the PR19 methodology Ofwat challenged companies to reduce leakage by at least 15% over the period 2020-25. Most companies responded to this challenge submitting stretching targets in business plans. The Ofwat common performance commitment in leakage is not set at the forward looking upper quartile level of leakage but is based on Ofwat's assessment of whether a company's proposed performance commitment levels are stretching for that company and whether the levels can be delivered under base cost allowances. As a result, there may be companies whose performance commitment takes them beyond the forward looking upper quartile. Such companies will receive outperformance payments only if they exceed their performance commitment.

13. Therefore, Ofwat only consider it appropriate to allow enhancement funding for any leakage reduction above the forward looking upper quartile level and up to their performance commitment.

14. Company forecast leakage performance for 2024-25 for both normalised measures (leakage per kilometre of mains and leakage per property), alongside the upper quartile level is shown below. The purple box represents a performance above upper quartile level for both normalised measures. For the three companies that forecast their leakage performance to be in this region, we make an enhancement allowance up to their performance commitment, as we consider that this is an enhancement to base service. We provide more detail in the supply-demand balance enhancement section how we calculate our allowances for leakage reduction.

Figure 1: Company forecast leakage performance (per km of mains and per property) for 2024-25 post-draft determination intervention



15. Within our business plan submission South West Water included two elements of expenditure as leakage enhancement, which represented a small proportion of the total leakage spend (the majority of which is included in base maintenance).

	2020/21 £m	2021/22 £m	2022/23 £m	2023/24 £m	2024/25 £m	TOTAL £m
Leakage Capex (27%)	1.458	1.457	1.458	1.458	1.458	7.289
Leakage enhancement Opex	0.780	0.780	0.780	0.780	0.780	3.9
Business Plan Totex	**2.238**	**2.237**	**2.238**	**2.238**	**2.238**	**11.189**

16. Ofwat's assessment of these costs as part of the draft determination for slow track companies is set out in *Table 12 of the Securing Cost Efficiency technical appendix (P53)*.

Table 12: Draft determination allowances by supply-demand balance component (£ million of 2017-18)[1]

Company	2020-25 SDB enhancement		Long-term SDB enhancement		Leakage enhancement		Internal interconnector		Investigations/ future planning	
	Requested	Allowed	Requested	Allowed	Requested	Allowed	Requested	Allowed	Requested	Allowed
Anglian Water[2]	56.4	40.7	5.7	2.9	76.9	69.2	336.5	241.8	3.1	-
Dŵr Cymru	23.6	21.1	8.5	6.2	52.9	-	5.8	5.5	3.7	-
Hafren Dyfrdwy	-	-	-	-	-	-	-	-	-	-
Northumbrian Water	-	-	-	-	-	-	-	-	-	-
Severn Trent Water	117.9	84.7	3.3	3.3	30.4	-	-	-	-	-
South West Water	3.9	3.9	-	-	11.2	-	-	-	-	-
Southern Water	53.2	53.2	76.6	69.5	33.1	-	56.6	52.6	7.7	-
Thames Water	74.3	74.3	4.9	4.9	157.0	-	-	-	14.3	-
United Utilities	1.2	-	-	-	40.0	-	10.0	9.5	-	-
Wessex Water	2.9	2.9	-	-	25.3	-	-	-	-	-
Yorkshire Water	0.3	-	-	-	136.5	-	-	-	-	-
Affinity Water	53.9	41.1	24.1	21.6	48.2	-	-	-	-	-
Bristol Water	-	-	-	-	4.2	2.4	-	-	-	-
Portsmouth Water	2.7	2.7	-	-	1.5	-	-	-	-	-
South East Water	37.8	37.8	4.6	4.3	29.6	4.6	2.4	2.2	1.7	-
South Staffs Water	5.8	5.9	-	-	10.3	-	-	-	-	-
SES Water	2.6	2.6	-	-	17.4	-	-	-	-	-
Total	**436.4**	**370.7**	**127.7**	**112.7**	**674.7**	**76.3**	**411.3**	**311.6**	**30.3**	**-**

1. Requested costs in this table are after any reallocations that we may have made to or from other enhancement lines.

2. We have removed the costs of schemes that we consider suitable for delivery by direct procurement for customers from the Anglian Water internal interconnections and 2020-25 SDB enhancement (both requested and allowed).

Need for adjustment

17. We have undertaken a detailed review of the approach undertaken by Ofwat to determine the upper quartile position and to consider whether an alternative methodology would be more appropriate.

18. The Ofwat approach to determining the upper quartile has applied the following approach;

- Ofwat have used two normalised measures to compare leakage performance between companies
  - Leakage per property per day in litres per property per day (l/prop/d)
  - Leakage per kilometre of mains per day in cubic metres per kilometre per day (m3/km/d)
- Ofwat expect an efficient company to achieve sector forecast upper quartile (UQ) performance by 2024-25 (in both normalised measures of per property and per kilometre of main) within base service
- Ofwat allow enhancement costs only where a company's performance goes beyond the forecast upper quartile in both measures
- Ofwat use leakage figures the companies submit for the common leakage performance commitment at draft determination in table App 1, to calculate UQ position

- Ofwat make an enhancement allowance for the leakage reduction volume in megalitre per day (Ml/d) beyond the 2024-25 UQ position based upon the 3-year average leakage position the company forecasts to achieve at 2024-25 in table App 1 or the revised 3-year average leakage position for 2024-25 where we make an intervention in our assessment of a company's performance commitment. Ofwat provide no leakage allowance beyond this stretching level because from this point the company is incentivised to reduce leakage further through outperformance payments
- Ofwat have determined the leakage reduction volume that is used to calculate the allowance based on the average position beyond UQ in the two normalised measures
- Ofwat cap the leakage reduction volume at the volume we identify in cell C24 of the deep dive tab. We derive this volume from the evidence the company provides because leakage reductions associated with metering are benefits of the metering model allowance
- Ofwat generate the allowance from the identified volume by applying the unit cost for leakage reduction the company identifies with an adjustment for efficiency if necessary
- Ofwat company specific deep dive efficiency factor adjustments are made for companies with unit costs above the industry median for leakage enhancement.

19. We have closely considered the analysis Ofwat have undertaken and have reviewed the submitted information and the impact of data quality and assumptions on the upper quartile analysis.

Impact of urban/rural areas

20. The upper quartile analysis for leakage is measured against both the litres/property/day and m3/km/day and places a very high bar for the application of enhancement investment, even though there is a very wide range of leakage unit costs and scale of investment assessed as enhancement by the water companies. We consider that this is quite an onerous position and goes well beyond an upper quartile analysis (17% percentile) and is more akin to a frontier analysis. This methodology produces a binary in/out view within the draft determination for inclusion of enhancement investment even though many companies are upper quartile on one measure and have upper quartile or better unit costs for leakage delivery.

21. Only £76.3m was allowed within the slow-track Draft Determinations representing only 11% of the costs proposed. We consider that the position set out within the draft determinations is more akin to a frontier analysis rather than an upper quartile view and removes enhancement investment for companies who may be operating at or close to the upper quartile position.

22. In particular the impact of achieving both a litres/property/day and m3/km/day criteria is challenging for companies given that the property and km factors of the analysis are relatively fixed ratios for each company. Whilst South West Water is close to the upper quartile analysis for m3/km/day (we would need to reduce leakage by a further 3MLD or 3%) we would have to reduce our leakage value by a further 18MLD (a further 18% beyond the 15% delivered) for the l/prop/day measure. The difference between these measures is disproportionately high and therefore represents an unrealistic aspiration.

23. We consider that the modelling undertaken is distorted by the ratio between km of main and properties served, this ratio is relatively fixed and therefore the outcome is influenced by the rural/urban nature of the company structure, which is outside management control. For companies in sparse/rural regions, it is not appropriate to also use a l/prop/day-based metric, which is heavily influenced by companies in more rural/dense areas. While Ofwat accounts for sparsity when assessing its base expenditure modelling, it does not account for sparsity when assessing leakage enhancement costs. This is inconsistent.

Inconsistencies in the leakage metrics

24. There remains a level of uncertainty around a number of potential distortion effects which we consider will have an impact on the analysis and the determination of the upper quartile position and subsequent analysis:

    - The impact of the rolling three-year average – some companies have chosen a forward-looking analysis of the rolling three-year average which provides a more beneficial view to their 2024/25 position as it includes benefits from 2025/26 and 2026/27 outside the period for which the price control is based. We do not consider that this is appropriate as they are being rewarded for performance not delivered in the period. This distorts the frontier analysis and could be seen that rewards are being provided to companies who present an overly optimistic view of their projected performance rather than their absolute reduction over the period
    - For instance, whilst SWW's backward looking, three-year rolling forecast for 2024/25 is 101.5 Ml/d our absolute value in 2024/25 is 95.9 Ml/d delivering a 17.5% reduction in absolute terms. This benefit is masked and under reported by the backward-looking rolling three-year average. For some companies who undertake a forward looking rolling average this value is inflated presenting a potentially misleading position for any upper quartile assessment and a potential distortion of the analysis undertaken by Ofwat
    - It is unclear whether the leakage targets shown within the analysis are based upon current leakage reporting methodologies or on the WaterUK/Ofwat agreed consistency methodology. (in particular - it is not clear that the frontier companies identified have applied this)
    - Even where companies could have applied the Water UK/Ofwat agreed consistency methodology the estimation of the future 2024/25 leakage position could be distorted where a company has yet to complete the consistency reporting actions and is not fully reporting in accordance with the consistency methodology. Not all of the frontier companies identified in the analysis are reporting completion of the many leakage measures (i.e. green RAG status). One company in particular has a high level of Red measures, and we therefore consider that there remains uncertainty with the forward projection of leakage performance. Such uncertainty should be assessed as part of the process and where possible either weighted or discounted as appropriate.

25. We consider that there is a risk that as a result of the above factors that there are potential distortions to the frontier analysis undertaken. We consider that it is essential that Ofwat considers these factors in their analysis and puts measures in place to reduce the impact of any distortion effects ahead of the final determination.

Best options for customers

26. As stated above, we consider that it is critical to take some account of: (a) inconsistencies in the leakage metrics; and (b) external factors that impact upon leakage measures, in the same way that Ofwat's base expenditure modelling takes account of such factors. In particular,

    a. With regards to inconsistencies in the leakage metrics, it is essential that Ofwat ensure that the data used for the final determinations is consistent

    b. There are several ways that the impact of external factors on leakage could be taken account of. In this representation, we offer an alternative analysis and approach which could be adopted to adapt the draft determination methodology position and provide a more realistic approach. We consider that this more effectively supports an upper quartile position rather than the frontier analysis presented within the slow tracked draft determinations.

27. We have reviewed the various leakage metrics and unit cost information, in particular where value can be delivered. We have assessed both the upper quartile, median and lower quartile values for both the m3/km metric and the l/p/d metric and have allocated a Red, , Yellow, Amber and Green status to each company dependent upon whether this was:

- at/or lower than the upper quartile value (Green)
- between the UQ and Median (yellow)
- between median and lower quartile (Amber)
- below the lower quartile (Red).

28. We have attempted to determine a similar analysis to the unit cost information.

Table 2: Assessment of RAG status against Upper Quartile (Green), Median (Yellow), Median to Lower Quartile (Amber) and below lower quartile (Red)

Company	App1 Leakage forecast 3-year average position in 2024-25 (Ml/d)	Leakage Enhancement requested £m	Leakage m3/km mains	Leakage l/p/d
AFW	142.8	£ 48.20	8.386	88.557
ANH	169.6	£ 76.90	4.223	70.185
BRL	36.5	£ 4.20	5.207	63.233
HDD	12.91	£ -	4.779	120.060
NES	175.7	£ -	6.551	81.897
PRT	27.9	£ 1.50	8.167	83.408
SES	21.1	£ 17.40	5.954	68.498
SEW	79.1	£ 29.60	5.142	73.308
SRN	89.6	£ 33.10	6.317	75.024
SSC	68.4	£ 10.30	7.586	86.060
SVE	332.1	£ 30.40	7.010	88.130
SWB	101.5	£ 11.20	5.459	91.446
TMS	535.5	£ 157.00	16.494	125.628
NWT	386.9	£ 40.00	9.031	111.322
WSH	148.2	£ 52.90	5.286	99.295
WSX	68.8	£ 25.30	5.616	104.211
YKY	229.97	£ 136.50	7.090	94.668
Total	**2626.58**	**£ 674.50**		

29. There is a wide range of different positions of companies within this analysis as shown on the following 4x4 matrix within Table 3. Overall this represents a normal distribution across the overall company RAYG status (5 companies in green, 5 companies in Yellow, 4 in Amber and 3 companies in Red).

Table 3: Matrix application of leakage position to determine company overall RAYG status

m3/km \ l/p/d	G	Y	A	R
R		PRT	AFW	TMS,UU
A		SSC,SVE	YKY	
Y	SES,SRN	NES	SWB	WSX
G	ANH, BRL,SEW		WSH	HDD

5	Above or equal to UQ
5	> UQ but <=Median
4	> Median and <=LQ
3	> LQ to max

Robustness and efficiency of costs

30. Ofwat's approach on unit costs applies the unit cost for leakage reduction that the company identifies with an adjustment for efficiency if necessary. This is a significant assumption and does little to challenge companies to be economic and efficient at the upper quartile in the delivery of leakage reduction. Whilst the unit costs range from £0.329 to £4.771 £/Ml/d with an upper quartile of £0.633 £/Ml/d and a median of £2.030 £/Ml/d costs have been allowed for one company up to £2.966 £/Ml/d. This is nearly five times the upper quartile value and we do not consider that this is an economic and efficient position.

Company	Company unit cost for leakage reduction (£/Ml/d) including efficiency adjustment where necessary	Overall matrix position
AFW	£ 1.607	R
ANH	£ 2.966	G
BRL	£ 0.651	G
HDD	£ 2.030	A
NES	£ 2.030	Y
PRT	£ 0.329	A
SES	£ 4.771	G
SEW	£ 2.284	G
SRN	£ 1.948	G
SSC	£ 0.525	Y
SVE	£ 0.475	Y
SWB	£ 0.633	Y
TMS	£ 3.330	R
NWT	£ 0.595	R
WSH	£ 2.035	Y
WSX	£ 2.415	A
YKY	£ 2.030	R
Total		

31. It can be argued that the unit cost for leakage delivery increases as you approach the delivery frontier, whilst this is probably true, to a degree, but only if the same historic leakage detection and repair techniques are deployed by the companies at the frontier. The expectation would be that innovation and new technology are being used differently to change the delivery mechanism and that these are offsetting some of the increased unit costs.

32. Unit costs per £/Ml/d vary significantly, an average unit cost for each of the four overall RAYG status bands on the above 4x4 matrix has been calculated in an attempt to understand how the unit cost varies across the performance bands.

Table 4: Unit cost assessment based upon average of companies within Overall RAG status.

Unit Cost Analysis	£/Ml/d				All companies
Average	£ 2.524	£ 1.140	£ 1.701	£ 1.844	£ 1.803
UQ	£ 1.948	£ 0.525	£ 1.605	£ 1.101	£ 0.633
Allowed sum %	100	75	50	0	

33. These selected unit costs represent the average unit cost across all companies in the Green, Yellow, Amber and Red bands on the matrix. Whilst we have undertaken an upper quartile analysis, it is difficult to apply this data due to the small numbers of companies in each band. This analysis is based upon each company proposed unit cost and reflects a comparative efficiency position rather than each individual company position. Unit costs vary across each of the bands and show no obvious trend. As a result we have applied the overall Upper Quartile value of £0.633 £/Ml/d to the analysis, this value is based upon the SWW unit cost.

Calculating the cost allowance for each company

34. The cost allowance for each company has been calculated based upon the following rules.

- Each company is classified as Green, Yellow, Amber or Red based upon the upper quartile analysis for both m3/km and l/p/d (Table 2)
- Each of the RAYG status outcomes for both m3/km and l/p/d is plotted against the 4x4 matrix (Table 3) with the company being allocated an overall company RAYG status. (Red, Amber, Yellow, Green)
- Companies with an overall company status of Green have a 100% cost allowance at the average unit cost for that band, Yellow have 75%, Amber have a 50% cost with, Red having no cost allowance
- Unit cost information is based upon the Upper Quartile unit cost of £0.633m.
- Should the calculated cost allowance be greater than the value included by the company then the cost allowance is capped at the company value.

35. The overall industry calculation for this approach is shown in Table 5 below.

36. The proposed methodology has a number of advantages;

- Represents a 30-percentile inclusion of 100% cost allowance at an average unit cost for the green banded companies (5 companies)
- Does not allow any cost inclusion for red banded companies (3 companies)
- Applies an upper quartile unit cost for each of the banded companies
- The analysis is capped at the value requested by the company.

37. Overall, the analysis supports the inclusion of £128m of the £675m sought by the industry representing 19% of the overall cost.

Table 5: Overall industry calculation based on proposed approach

Company	Leakage forecast 3 year ave 2024-25 (Ml/d)	Leakage enhanced costs requested (£m)	Leakage m3/km mains	Leakage l/p/d	Company unit cost for leakage reduction (£/Ml/d)	Overall matrix position	Ml/d included	% Allowed	Assessed value (£m)
AFW	142.80	48.20	8.386	88.557	1.61	R	30.0	0	0.00
ANH	169.60	76.90	4.223	70.185	2.97	G	25.9	100	16.41
BRL	36.50	4.20	5.207	63.233	0.65	G	6.5	100	4.08
HDD	12.91	0.00	4.779	120.060	2.03	A	0.0	50	0.00
NES	175.70	0.00	6.551	81.897	2.03	Y	0.0	75	0.00
PRT	27.90	1.50	8.167	83.408	0.33	A	4.6	50	1.44
SES	21.10	17.40	5.954	68.498	4.77	G	3.6	100	2.31
SEW	79.10	29.60	5.142	73.308	2.28	G	13.0	100	8.20
SRN	89.60	33.10	6.317	75.024	1.95	G	17.0	100	10.76
SSC	68.40	10.30	7.586	86.060	0.53	Y	19.6	75	9.31
SVE	332.10	30.40	7.010	88.130	0.48	Y	64.0	75	30.38
SWB	101.50	11.20	5.459	91.446	0.63	Y	17.7	75	8.40
TMS	535.50	157.00	16.494	125.628	3.33	R	47.1	0	0.00
NWT	386.90	40.00	9.031	111.322	0.60	R	67.2	0	0.00
WSH	148.20	52.90	5.286	99.295	2.04	Y	26.0	75	12.34
WSX	68.80	25.30	5.616	104.211	2.42	A	10.5	50	3.32
YKY	229.97	136.50	7.090	94.668	2.03	R	67.2	50	21.28
Total	**2,626.58**	**674.50**					419.9		**128.24**

Q Schemes – Water Treatment Works (SWB.DD.CA5)

1. The deep dive into this cost area reduced the cost allowance by £12.1m. This was assessed under Ofwat's *Raw Water Deterioration categorisation*. The review identified the following reasons for the adjustment:
    - Need for investment – Pass
    - Management Control – Pass
    - **Best Options for Customers – Partial Pass**
    - **Robustness and efficiency of costs – Partial Pass**
    - Customer protection - Pass

2. This commentary excludes Knapp Mill and Alderney water treatment works as these have been previously considered in this representation, however the rationale, approach and evidence for these investments are similar.

> **Representation**
>
> The additional evidence and information supports the **representations of £12.1m** for water treatment works quality schemes as enhancement spend.
>
> The key area of additional information focuses on the significant consideration and review undertaken of the preferred options for these investments and provides evidence for the efficiency of the schemes.

Need for investment

3. As a part of our business plan submission the assessment noted sufficient evidence was provided to justify the need from the perspective of DWI support. However, Ofwat suggested that *"evidence of deterioration in raw water for example time-based trends to evidence Manganese, bacterial, DOC etc. would further support the case".*

4. This supporting evidence was provided to the DWI for each WTW's, specifically showing the long-term trend in raw water deterioration at each of our source waters. The detail of each proposed investment was provided within our Annex A submissions to the DWI which are available for reference.

Table 1: DWI Supporting Information - Annex A

Site	Parameters	Document Name	Page
Restormel	Increasing underlying levels of Manganese in raw water (26µg/l ave.) + challenging spate conditions	3 Annex A Restormel Mn (SWB-AnnexA-RSM-01)	2-3, 6-13
St Cleer	Increasing underlying levels of Manganese in raw water (17µg/l ave.) + challenging spate conditions.	4 Annex A St Cleer Mn (SWB-AnnexA-STC-01)	2-3, 6-18
Littlehempston	Pesticide and micropollutants in the source water. Disinfection by-products with risk of TTHM failure and taste & odour issues.	5 Annex A Littlehempston (SWB-AnnexA-LTH-01)	2-13, 16-31
Prewley	Increasing underlying levels of Manganese in raw water (37µg/l ave.) + challenging spate conditions.	6 Annex A Prewley Mn (SWB-AnnexA-PRW-01)	2-4, 6-11
Stithians	Disinfection by-products (DBP), with a significant risk of failing TTHM. Plus, Taste & Odour issues.	8 Annex A Stithians DBP T+O (SWB-AnnexA-STI-01)	2-3, 6-16

Management control

5. In both Ofwat's assessment at the IAP and Draft Determination stage, Ofwat issued a "Pass". As part of the feedback in the Draft Determination, Ofwat supported that this position that *"the Presence of Manganese, bacteria and DOCs in raw water sources is largely outside of management control."*

Best options for customers

6. In both Ofwat's assessment, options for customers was issued a "Partial pass". As part of the feedback in the Draft Determination Ofwat states that *"we find insufficient evidence that the company has fully evaluated all options for resolving the issues of raw water deterioration."* In response, we provide the following evidence.

7. SWW deploys a robust investment planning process, where during the option development process, technically or financially infeasible options are discounted, and the most promising schemes promoted for detailed cost assessment, technical review and service benefit assessment. The final stage of the process is a full cost benefit analysis and optimisation of the proposed feasible options, thus helping to choose the most cost beneficial solution whilst taking into account all the other benefits of each option. (The detailed process map was included within the Knapp Mill and Alderney commentary).

8. These business processes associated with solution development, optioneering and prioritisation were audited and assured by Jacobs at PR19 in their Finance Assurance Report – referenced within our Securing Trust, Confidence & Assurance document.

   "South West Water Limited (SWW) commissioned Jacobs to provide third-line independent technical assurance on its 2019 Business Plan submission to Ofwat.

   The objective of the assurance activity was to provide the Company's Board with an independent opinion on the robustness of a number of PR19 information sets. The assurance covered the following 6 elements of SWW's plan:

   - *Vision to 2050*
   - *Bioresources RCV*
   - *Water Resources RCV*
   - *Engineering Estimating System / Cost Models*
   - *Investment Manager & Business Cases*
   - *PR19 Data Tables (non-financial)."*

9. With specific regard to WTW Quality investment, we reference this process in our long-term Drinking Water Quality strategy (Annex - 2 Long Term Water Quality Strategy), which was shared with the DWI as part of their requirements set out within their PR19 guidance on long term planning for drinking water quality, September 2017[7].

10. Within this document we explain how our detailed assessment is performed across our feasible options and specifically the considerations taken for our water treatment works investments to address raw water deterioration:

    - The ability of the process to remove or reduce the specific risk to an appropriate level and meet our water quality goals

[7] DWI, 2017. PR19 guidance on long term planning for drinking water quality. http://www.dwi.gov.uk/stakeholders/guidance-and-codes-of-practice/ltpg.pdf

- The ability of one intervention to provide multiple benefits e.g. GAC reduces the risk of pesticides, reduces DBPs and certain T&O issues effectively
- The requirement for additional future processes to mitigate changes in risk/farming practice e.g. the advance oxidation process requires a GAC process downstream
- The impact of climate change
- Our confidence and experience in the efficacy of the process
- Minimum whole life total expenditure.

11. In our application for support from the DWI we produced a technical document for each investment that outlines the following information:
    - Details of the WTW and associated systems;
    - Hazard identification and risk characterisation; and
    - Control measures.

12. Within this final section, we discuss our short term mitigations and longer term investment options. This includes an evaluation of options, costs and benefits.

13. These documents are set out to support the DWI in their evaluation of the scheme and ultimately their decision of whether or not sufficient evidence has been provided to warrant their support for the investment. In their planning guidance[8], the DWI acknowledges the following:

    "Water companies seeking technical support for new improvement schemes from the Inspectorate will need to demonstrate the need for each proposal. The case for justification of need must be accompanied by the evidential information which justifies the need for action, and demonstration that the risk is significant enough to take action at this time, including

    a. how the company has derived the most appropriate technical and cost-effective options to mitigate each named hazard and thereby achieve compliance with the regulatory requirements;

    b. summary details of the capital costs and the net additional operating costs, as part of the overall total expenditure (totex), of each of the options considered;

    c. identification of the preferred option and the rationale for choosing that option and reasons for discounting all other possible options and

    d. evidence that the preferred option will adequately mitigate the risk and deliver the required outcome within an appropriate timescale, and that the solution is sustainable, and improves resilience

14. Prior to our business plan submission, we had received DWI support for all of our water quality schemes we promoted. We append our Annex A documents to this submission.

15. For convenience we have referenced the pages containing the pertinent information showing the options considered for each site:

Table 2: DWI Supporting Information - Annex A

Site	Document Name	Page
Restormel	3 Annex A Restormel Mn (SWB-AnnexA-RSM-01)	14-18
St Cleer	4 Annex A St Cleer Mn (SWB-AnnexA-STC-01)	20-22
Littlehempston	5 Annex A Littlehempston (SWB-AnnexA-LTH-01)	39-43

[8] DWI, 2017. PR19 guidance on long term planning for drinking water quality

Site	Document Name	Page
Prewley	6 Annex A Prewley Mn (SWB-AnnexA-PRW-01)	15-18
Stithians	8 Annex A Stithians DBP TandO (SWB-AnnexA-STI-01)	20-23

16. A high-level summary of the feasible options, post screening of our long-list of options, is shown below for each WTW investment. Our preferred option is shown in bold text. Please note this is not always lowest first year capital expenditure as a full 40-year whole life cost NPV is conducted for each scheme (which includes annualised operating costs and any additional or ongoing maintenance requirements). This 40-year NPV is also run with and without customer willingness to pay costs for the purposes of evaluating options for each scheme. For simplicity and as a point of reference to our enhancement costs allowances, we show only the first-year capital spend in our comparison of options below.

Site	Options considered
Restormel	Option A, £2.65m – The utilisation of the existing GAC contactors with pH correction and additional chlorine addition to reduce final manganese concentrations. This option also requires an addition pH correction stage prior to disinfection. Option B, £8.76m – Dedicated pressure filters with pH correction and additional chlorine addition to reduce final manganese concentrations sized for the works design maximum. **Option C, £7.45m – Dedicated pressure filters with pH correction and additional chlorine addition to reduce final manganese concentrations sized 110% of the typical peak summer output, with a by-pass to allow for additional flows up to the works maximum design flow.** Option D, £6.86m – Dedicated pressure filters with pH correction and additional chlorine addition to reduce final manganese concentrations sized for 95th percentile flow, with a by-pass to allow for additional flows up to the works maximum design flow. NB. Option A and D were discounted for the following reasons: • Option A is less robust and resilient solution. It provides minimal reduction in DBP formation risk and a high risk of failing to meet the Mn target reduction. • The option is also at risk of negatively impacting GAC performance/re-generation. • Options D was discounted as this would not support known growth in the area. • Please also refer back to paragraph 28 describing how we consider whole life costs over a 40 year NPV.
St Cleer	**Option A, £3.25m – Manganese reduction within secondary pressure filters located after the chlorine contact tank. The existing chlorine dosing system would be used, and pH correction made with lime water.** Option B, £5.79m – Manganese reduction on GAC contactors (10mins Empty Bed Contact Time (EBCT) and 3m bed depth) located before the contact tank.
Littlehempston	**Option A, £16.5m – The addition of GAC contactors for pesticide, T&O, and TTHM reduction. Chlorine addition and pH correction will occur upstream of the GAC contactors to improve Mn removal. UV will provide primary disinfection, negating the need for pH correction before the contact tank.** Option B, £13.7m – As option A but with a reduced EBCT of 10 mins at n-1. Option C, £23.6m – As option A with the addition of new dedicated secondary filters for manganese reduction.

Site	Options considered
	NB. Option B was discounted for the following reasons: • It is a less robust solution against the range of risks due to lower EBCT. • GAC will provide some additional benefits in reducing the risks associated with THMs and pesticides within final water. It should be noted that the reduced contact time will have a less recognised benefit for THM precursor removal. • Reduced sludge production by eliminating the use of PAC dosing. • UV will provide additional protection against a broader range of water pathogens • Permits optimisation of manganese removal by significantly increasing pH beyond current limitations • More frequent GAC regeneration requirement • Please also refer back to paragraph 28 describing how we consider whole life costs over a 40year NPV.
Prewley	Option A, £4.97m – Manganese reduction on GAC contactors (10mins EBCT and 3m bed depth) located before the contact tank. The pH would be marginally increased but be limited by the need to maintain the appropriate ECT. Chlorine doing would be relocated to before the GAC and stopped before the primary filters. Alkalinity dosing to be included to support improved floc formation. Option B, £6.22m - Manganese reduction on GAC contactors (10mins EBCT but at shallower depth based on a higher hydraulic loading) located before the contact tank. The pH would be marginally increased but be limited by the need to maintain an appropriate ECT. Chlorine dosing would be relocated to before the GAC and stopped before the primary filters. Alkalinity dosing to be included to support improved floc formation. **Option C, £3.52m – Manganese reduction within secondary pressure filters located after the chlorine contact tank. The existing chlorine dosing system would be used, and pH correction made with lime water. Alkalinity dosing to be included to support improved floc formation and solids capture within clarification and filtration.**
Stithians	Option A, £12.8m – GAC contactors (20mins EBCT N-1) to reduce risks from DBPs, T&O and pesticides. New dedicated secondary rapid gravity filters for manganese reduction with pre-chlorine dosing and pH correction, UV reactors to provide the means of primary disinfection. **Option B, £9.47m – GAC contactors (20mins EBCT N-1) to reduce the risk of DBPs, pesticides and T&O compounds with pH correction and chlorine addition to promote manganese reduction on the GAC. UV reactors to provide the means of primary disinfection.** Option C, £11.99m - The addition of GAC contactors (20mins EBCT N-1) to reduce the risk of DBPs, pesticides and T&O compounds. Secondary pressure filters with pH correction and chlorine addition for manganese reduction. UV reactors to provide the means of primary disinfection Option D, £8.91m – GAC contactors (15mins EBCT N-1) to reduce the risk of DBPs, pesticides and T&O compounds with pH correction and chlorine addition to promote manganese reduction on the GAC. UV reactors to provide the means of primary disinfection. Option E, £11.43m - The addition of GAC contactors (15mins EBCT N-1) to reduce the risk of DBPs, pesticides and T&O compounds. Secondary pressure filters with pH correction and chlorine addition for manganese reduction. UV reactors to provide the

Site	Options considered
	means of primary disinfection NB. Option D was discounted for the following reasons: • The option would secure compliance with TTHM and T&O standards but it would require more frequent regeneration of GAC and is less robust than 20min EBCT options. • Please also refer back to paragraph 28 describing how we consider whole life costs over a 40 year NPV.

17. With respect to cost allocation in our business plan, we allocated costs to enhancement where raw water deterioration resulted in the need for additional treatment processes/stages (providing of course that the raw water deterioration cannot be managed acceptably into the future through process optimisation and maintenance improvements alone). For all our proposed schemes, we have reviewed the potential to manage raw water deterioration via these means, as commented in our Annex A's. It can be seen that short-term options have been implemented to manage our current situation, however, it is now acknowledged that a long-term investment solution is required.

18. In the majority of our Quality programme (excluding only Knapp Mill and Alderney WTW), all of the proposed costs have been allocated to enhancement as additional treatment processes/stages are the proposed solutions. Any required capital maintenance of existing processes, in addition to this, has not been included in our cost assessment and will be undertaken as part of base maintenance where appropriate.

19. For clarity, the following sites and process additions are proposed against the expenditure requested.

Table 3: New process additions and costs

Site	Process additions		Cost £m
Restormel	New Pressure filters	Dedicated pressure filters with pH correction and additional chlorine addition to reduce final manganese concentrations	7.45
St Cleer	New pressure filters	Manganese reduction within new secondary pressure filters located after the chlorine contact tank. The existing chlorine dosing system would be used, and pH correction made with lime water	3.25
Littlehempston	New GAC & UV	New GAC contactors for pesticide, T&O, and TTHM reduction. Chlorine addition and pH correction will occur upstream of the GAC contactors to improve Mn removal. UV will provide primary disinfection, negating the need for pH correction before the contact tank.	16.5
Prewley	New pressure filters	Manganese reduction within secondary pressure filters located after the chlorine contact tank. The existing chlorine dosing system would be used, and pH correction made with lime water.	3.52
Stithians	New GAC + UV	GAC contactors (20mins EBCT N-1) to reduce the risk of DBPs, pesticides and T&O compounds with pH correction and chlorine addition to promote manganese reduction on the GAC. UV reactors to provide the means of primary disinfection.	9.47
Total			40.2

20. We believe that we have appropriately evidenced the work undertaken by SWW to ensure that we have evaluated options and selected the most cost beneficial investment for our customers.

Robustness and efficiency of costs

21. In both Ofwat's assessments a "Partial pass" was issued and it states that the *"inclusion of independent reports [Chandlers KBS and Aqua Consultants] would support claims for cost efficiency".* We have provided in a separate supporting document a copy of our independent report by Aqua Consultants and Chandler KBS (SWW PR19 Cost Models and Cost Data Jun 18 (002)) to demonstrate the robustness and efficiency of our costs alongside this representation.

22. To evidence this point, we have plotted the data points used in the cost build up for the new treatment processes and inter-process pumping against other benchmarked water companies, where applicable.

23. The detailed assessment for efficiency was included in the Knapp Mill / Alderney evidence and therefore has not been repeated here.

24. We would therefore consider that our proposed costs for these projects are economic and efficient and are close to the efficiency frontier, which should be considered when evaluating the Robustness and Efficiency of Costs for our investments associated with raw water deterioration.

Mains Replacements (SWB.DD.CA6)

1. The deep dive into this cost area reduced the cost allowance by £1.5m. This was assessed under Ofwat's *Taste, Odour and Colour categorisation*. The review identified the following reasons for the adjustment:
    - Need for investment = Pass
    - **Management control = Partial Pass**
    - Best option for customers = Pass
    - **Robustness and efficiency of costs = Fail**
    - Customer protection = Pass

Representation

The additional evidence and information supports the **representations of £1.5m** for mains replacement enhancement spend.

The additional information focuses on the aspects outside management control and evidence of the build-up of costs reflecting the efficient costs of this activity.

Need for investment

2. The DWI supported the suite of activities as part of the overall Taste, Odour and Colour, including consideration of intrusive cleaning or mains rehabilitation 'where flushing is found to be ineffective in application or outcome' and this was recognised in Ofwat's review.

3. Our bespoke discolouration propensity modelling analysis (DPM) has identified mains which, owing to their position in the network, create extensive hydraulic disruption and hence discolouration should they burst. The rehabilitation of such mains where they also have high predicted burst rate is therefore an important part of our programme regardless of flushing effectiveness.

Management control

4. The review of this cost area noted that *'Presence of manganese in source water is outside of* management *control, however sedimentation build up in networks may be due inadequate historical flushing regimes'*.

5. We agree that a flushing regime plays an import part of overall Taste, Odour and Colour control and have included a robust flushing programme to clean our distribution systems on a prioritised basis. However, our modelling analyses have also identified that remobilisation of accumulated material is the principal cause of discolouration contacts.

6. We therefore consider that rehabilitation of mains that present the greatest risk of causing remobilisation through bursting is a key part of a balanced quality enhancement programme for effective management and control of Taste, Odour and Colour, with a particular focus on mains which owing to their poor condition (for example because of tuberculation), have proved difficult to flush effectively.

Best options for customers

7. Our balanced approach to managing Taste, Odour and Colour in the South West networks is based on evaluation of synergies of all interventions that have a mitigating impact including mains renewals, pressure management, trunk main conditioning and DMA flushing.

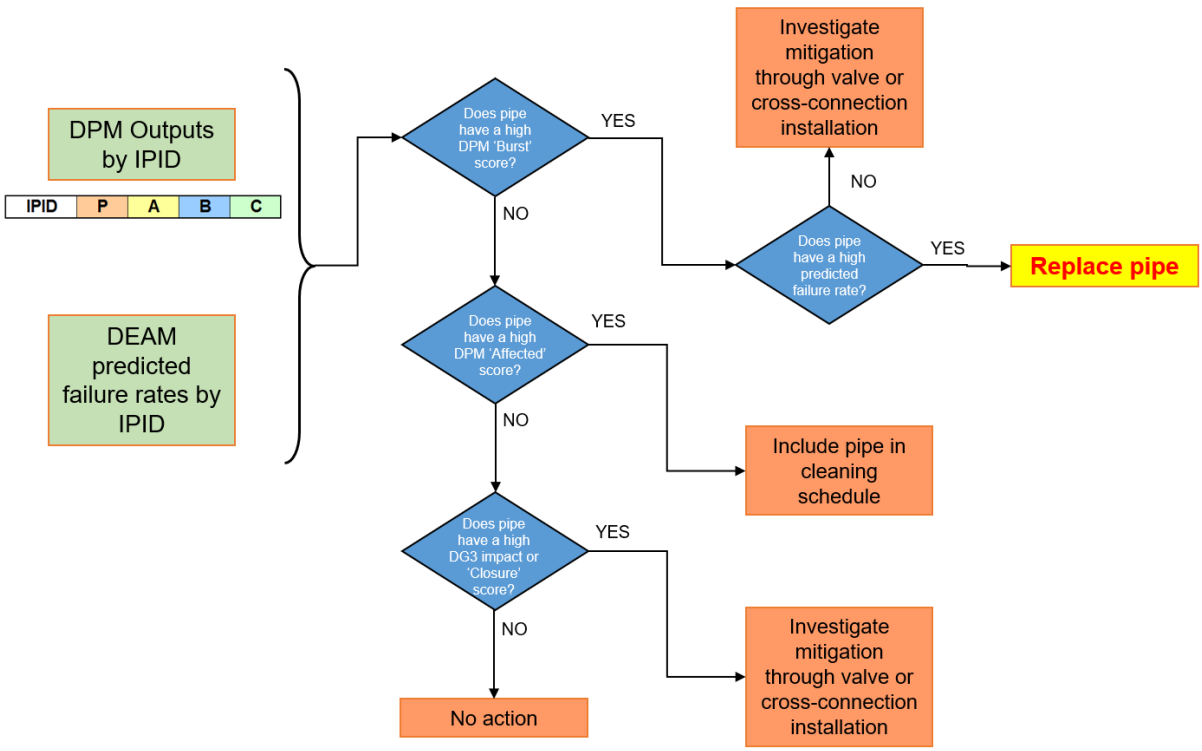
8. The investment programme we have put forward has been developed through a triangulation process that converged on the optimal balance of intervention types. It includes rehabilitation of only those mains with the highest discolouration consequence risk (as informed by our discolouration propensity modelling).

9. The investment programme and budget that has been presented were developed using a bottom-up approach from robust and well-proven modelling techniques.

10. Specific mains were provisionally identified for renewal where they were categorised as being of 'high risk' both (a) from a discolouration risk perspective, such that, were they to fail, a significant discolouration impact would be highly likely owing to hydraulic changes in the system; and (b) from a predicted burst rate risk perspective within an area which has proved operationally difficult to flush effectively.

11. The provisional mains selections were based on prioritisation by discolouration risk and lie within a Water Quality Zone (WQZ) which is under a DWI improvement notice (ZE9), in the St Thomas area of Exeter - a known hotspot area for discolouration issues which flushing has not been able to overcome effectively.

Figure 1: Modelling process and logic for precision targeting quality-driven mains rehabilitation



Robustness and efficiency of costs

12. Ofwat has challenged whether there is sufficient 'evidence of a build-up of this expenditure to be able to calculate a unit rate or identify target locations', in respect of the proposed enhancement expenditure on mains renewals.

13. The replacement cost for each selected main was based on water infrastructure cost models derived purely from South West Water data, through analysis of 1,074 data points taken from approximately 200 projects over the last 10 years, so the data is both contemporary and relevant. The cost models are developed from data that is delivered partly through competitive one-off tenders and partly through competitively tendered frameworks, with proportions in the region of 5% and 95% respectively. A further cost element to reflect the transfer of services was added to reflect the number of properties connected to each selected main, derived using the same empirical analysis approach.

14. The total mains rehabilitation length and budget were determined by summing the lengths and replacement costs for individual mains selected for replacement following the Taste, Odour and Colour relevance review. We therefore regard these values as being highly robust and with a high degree of confidence.

15. A detailed breakdown of these mains which have been identified for replacement by our targeted approach listed in Table 1 and provides the detailed evidence based build-up of expenditure from unit rates and the satisfactory identification of target locations.

Table 1: Quality-driven mains replacement

Logical Pipe ID	DMA Ref	Water Quality Zone (WQZ)	DWI Notice WQZ?	Pipe Age (years)	Material	Diameter (mm)	Surface Type	Length (m)	Cost £000
159038	603AD04	ZE9	Yes	59	CI	152.4	Urban	374	169
210906	603AD04	ZE9	Yes	59	CI	152.4	Urban	173	71
183307	603AD04	ZE9	Yes	59	CI	127	Urban	241	79
209515	603AD04	ZE9	Yes	59	CI	101.6	Suburban/ rural	249	61
200142	603AD04	ZE9	Yes	59	CI	152.4	Urban	1,034	522
210288	603AD04	ZE9	Yes	59	CI	152.4	Urban	317	129
210426	603AD04	ZE9	Yes	59	CI	101.6	Suburban/ rural	116	21
210223	603AD04	ZE9	Yes	59	CI	101.6	Urban	615	228
177997	603AD04	ZE9	Yes	59	CI	101.6	Urban	416	143
200123	603AD04	ZE9	Yes	89	CI	76.2	Urban	173	50
							TOTAL Cost		**1,473**

Valve Maintenance (SWB.DD.CA7)

1. The deep dive into this cost area reduced the cost allowance by £2.9m. This was assessed under Ofwat's *Water Freeform Categorisation*. The review identified the following reasons for the adjustment:
    - **Need for investment = Partial pass**
    - **Need for adjustment = Fail**
    - **Best option for customers = Fail**
    - **Robustness and efficiency of costs = Fail**

Representation

The additional evidence and information supports the **representations of £2.9m** for valve maintenance enhancement spend.

The additional information highlights the need for investment in pressure management and alignment with our commitments. It also sets out the options considered to ensure the best solution and efficient costs.

Need for investment

2. This part of our investment programme is for further implementation of New Pressure Management Schemes and the upgrading of existing PRV's by adding remote/optimising controllers to existing PRV's across our network. This activity therefore reflects enhancements to our network. The maintenance of existing PRV's has been allocated entirely to base maintenance expenditure.

3. It is widely accepted that the provision of new Pressure Management schemes or the upgrading of existing assets with remote/self-optimising controllers provides enhanced services for our customers by:
    - Reducing mains repairs,
    - Reducing taste, smell and colour events,
    - Lowering background levels of leakage; and
    - Providing improved control of our network which can be utilisation to resolve and respond to incidents across the network.

4. For South West Water, the introduction of new pressure management schemes across our network is an essential investment that is necessary to reduce the average operating pressure across our network which is currently one of the highest in the industry. This is due to our local topography and dendritic nature of our network – so it is particularly important that we make this investment in new pressure management schemes.

5. All of our business plan modelling and investment optimisation identifies that New Pressure Management Schemes represent a highly cost-effective and sustainable means of improving our service to our customers.

6. Pressure management has been applied within both the South West and Bournemouth areas. The schemes are increasingly being equipped with optimising 'Pegasus' controllers which communicate details of their performance via a SIM card. This prevents undetected failures which greatly improves effectiveness and efficiency and makes this equipment a key component within a 'smart network' environment.

Need for adjustment

7. This element of the Valve Maintenance programme represents £2.875m of 'enhancement' investment as it will be used for the purchase and instalment of new equipment (PRV's and PRV controllers), rather than for the maintenance of existing assets. This will deliver incremental improvements in the service provided to our customers.

8. The additional mitigation that will be delivered by this enhancement investment has been taken into consideration in the development of our AMP7 (2020-25) ODI forecasts and is the most cost-effective investment to achieve these targets.

9. Further evidence supporting the allocation of this investment to enhancement is our committed performance improvement for mains repairs. South West Water has committed to the second highest performance improvement in the industry across the period and we are one of only seven companies showing an enhanced level of service being delivered for this measure.

Table 1: Industry comparison of mains repairs performance commitments

Company	2020-21	2021-22	2022-23	2023-24	2024-25	Enhancement
SRN	119.6	111.1	102.6	94.1	85.6	-28%
SWB	**141.0**	**138.0**	**135.0**	**132.0**	**129.0**	**-9%**
NES	131.4	128.8	126.1	123.5	121.0	-8%
SES	61.6	60.7	59.7	58.8	57.8	-6%
HDD	112.1	111.6	111.2	110.7	110.3	-2%
ANH	125.3	124.9	124.4	124.0	123.6	-1%
PRT	68.3	68.0	67.8	67.6	67.3	-1%
SVE	112.0	112.0	112.0	112.0	112.0	0%
UU	110.0	110.0	110.0	110.0	110.0	0%
AFW	133.5	133.5	133.5	133.5	133.5	0%
BRL	121.7	121.7	121.7	121.7	121.7	0%
DWR	126.7	126.7	126.7	126.7	126.7	0%
SEW	152.6	152.6	152.6	152.6	152.6	0%
SSC	120.0	120.0	120.0	120.0	120.0	0%
TMS	231.3	231.3	231.3	231.3	231.3	0%
WSX	145.7	145.7	145.7	145.7	145.7	0%
YKY	164.1	164.1	164.1	164.1	164.1	0%

Best options for customers

10. This Valve Maintenance enhancement programme forms part of the assembly of a balanced programme of interventions which reflects synergies and overall benefits. The preferred plan has been optimised to achieve what we believe will be acceptable outcomes to customers at a very affordable level of cost.

11. Our well-established business planning process is utilised in the selection of the best investment option for customers.

12. For Pressure Management investment activity, the following process steps have been used to identify the best option for this investment. These steps sit within our wider investment planning processes:

    - **Long list and feasibility screening** – process developed to identify where there is potential scope for pressure management based on District Metered Area (DMA) and/or Pressure Managed Area (PMA) Average Zonal Night Pressure (AZNP) relative to customer heights within each area. The 'Hour to Day' (HTOD) factor is used to derive an average daily zone pressure, from which the maximum customer height within each area is deducted. Criteria are applied regarding the minimum target service level (with a safety margin included) and the minimum reduction in pressure that would be implemented. It is then inferred from the net difference whether there is apparent scope to reduce pressure in each DMA or PMA and by how much

      The amount of pressure reduction is translated into benefits in terms of reduction in leakage and burst numbers, using relationships derived from industry research or historical analysis. Burst reductions are translated to consequential impact mitigation (including supply interruptions and discoloured water contacts) as informed by our deterioration modelling, taking into account the number of properties within each area. The financial benefits of these collective mitigations are compared with the cost of implementing a scheme in the form of a cost: benefit ratio. The provisional programme is drawn up by prioritising DMAs and PMAs by cost: benefit ratio.

    - **Programme optimisation** - Our Programme Optimisation process is used to determine the appropriate level of investment. We have used a 'triangulation' process that considers a range of planning objectives and converges on solutions that are economically efficient and effective in terms of delivering service performance improvements that are valued by customers

      Given the nature of this asset area, the overall strategy depends on the collective impact of several different programmes, with synergy benefits in respect of the relevant measures. Identifying the optimal balance of investment in each programme has been achieved through the application of a number of innovative analytical processes which maximise the synergies to deliver target outcomes for customers in a highly cost-effective way

      The triangulation processes described above have been used to inform the portfolio options that will provide the inputs to the overall optimisation process. The scenario investment selections have been assembled at DMA level (of which there are approximately 1,050 across the South West and Bournemouth regions) and the portfolio optimisation tool is given the freedom to select from four shortlisted scenarios for each individual DMA. This includes the ability to select different scenarios across different DMAs in order to maximise economic and service benefits, or to meet particular constraints.

13. This robust approach ensures that the most appropriate option for customers has been included for this investment.

Robustness and efficiency of costs

14. The costs were based on an analysis of recent out-turn costs of similar installations. They are based on averages for actual schemes irrespective of location, local difficulties, ground conditions, planning conditions and distance from major suppliers. Each new pressure managed scheme comprises a range of components including chamber, meter, PRV, bypass, strainer, Pegasus controller and power supply. Analysis of the past scheme out-turn costs indicates that, depending on size and complexity, the average cost per scheme is £20,000 (of which the cost of a Pegasus controller is £2,725) which is the unit cost that has been adopted for our strategic modelling. All costs were re-based to the RPI/CPIH index used for the PR19 business plan submission.

15. Our submission is based on the installation of around 120 new PRV's and 175 new remote/optimising controllers added to existing PRV's. The final selection of PRVs will be identified by coupling hydraulic models with a dedicated hydraulic modelling optimisation engine (provided by Optimatics), to determine where the most benefit can be realised across the network through the addition of new PRV's or smarter controls.

16. Our hydraulic modelling programme across the entire region is due for completion in early 2020 and this optimisation engine will be applied across our entire network when determining specific locations for new PRV investment – these will take account of individual site locations, ground conditions and planning requirement of each installation. This approach will ensure that we obtain the most value from our investment.

Meter Replacements (SWB.DD.CA8)

1. The deep dive into this cost area reduced the enhancement cost allowance by £6.4m for Meter Replacements. This was assessed under Ofwat's *Water Freeform Categorisation*. The review identified the following reasons for the adjustment:
    - **Need for investment = Partial pass**
    - **Need for adjustment = Fail**
    - **Best option for customers = Fail**
    - **Robustness and efficiency of costs = Fail**

Representation

This enhancement allocation proportion was allowed by Ofwat under the Metering Enhancement Feeder model for Optants and meters introduced by the company. Therefore we would expect this to be the case for meter replacements where these are smart meters reflecting enhancements in the assets.

The additional evidence and information supports a **representation of £5.0m** for meter replacements which represents 39% of the total exchange/replacement programme of £12.9m – the representation value is below the level of the total adjustment reflecting our assessment of efficient costs.

The additional information addresses the need for the adjustment and approach to optimising the options as well as ensuring efficient costs. Overall our enhancement allowance for meters is less than the Ofwat modelled allowance in this area.

Need for investment

2. Smart metering (AMR or AMI) is an effective mechanism to engage with customers on water efficiency and demand reduction. We are able to utilise this technology to support the reduction of customer bills and to drive down overall water demand in our region.

3. In addition, we are actively using existing smart meter data to better understand where water is being used in the network including consumption at each individual property which is helping to identify and resolve customer-side leakage.

4. In our 2017 customer survey, smart metering was ranked as a top 20 priority. This reflects customers growing awareness of the benefits of smart technology in terms of understanding their own water consumption, billing and feeling generally more involved in their water supply.

5. The department for Environment Food and Rural Affairs published their *'Charging guidance to Ofwat'* in January 2016. This outlines the following four overarching objectives:

    - **Fairness and affordability:** the Government is acutely aware of the range of pressures on household budgets and the need to keep costs down for businesses
    - **Environmental protection**: charging can play a key role in securing the economically and environmentally efficient use of resources; encouraging innovation and ensuring that environmental goods are costed appropriately
    - **Stability and predictability**: customers strongly value stable and predictable bills. The Government expects Ofwat to take action to ensure that any changes in the charges faced by customers from year-to-year (where water usage does not change markedly) are proportionate

- **Transparency and customer focused service**: Ofwat's *Charges Rules* should seek to ensure that all charges are appropriately simple and presented in a way that customers find relevant and easy to understand.

6. Smart metering is a mechanism to support progression against all of these objectives.

Need for adjustment

7. Our strategy has revolved around four mains goals for AMP7, these include:
    - Making substantial headway in our vision of managing a smarter water network by promoting significant investment in AMR (automated meter read) meters
    - Effectively maintaining our existing meter stock to ensure fair charging by reducing meter under registration, leakage and per capita consumption (PCC)
    - Addressing problematic properties such as those in hazardous locations, where existing meters are difficult to read, and for unmetered high usage properties
    - Delivering a dual billing initiative to encourage optants by demonstrating the benefits of metering (i.e. a reduced bill).

8. To facilitate our strategy, we are proposing to install AMR metering technology for all exchanges and replacements as well as Meter Optants and other selective metering.

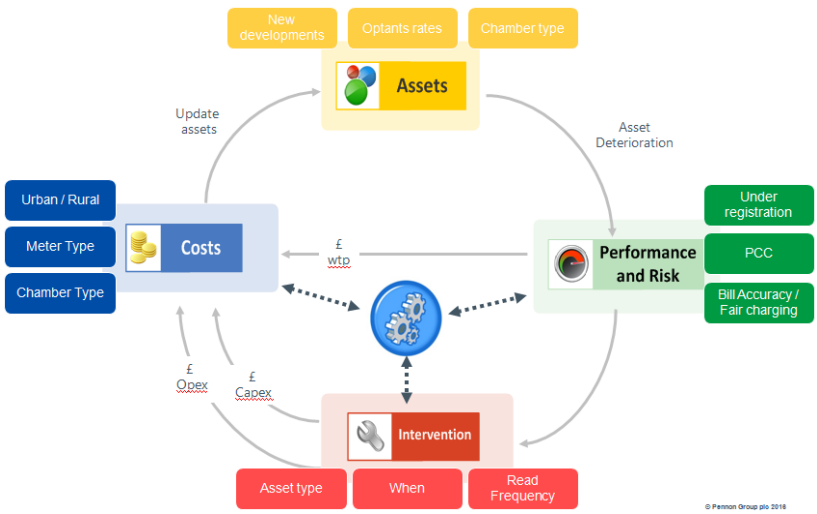
9. For meter optants and selective metering, we proposed that a consistent enhancement element comprising (39%) of investment in our metering costs is included, due to the advanced technological component - with the remainder being accounted for under capital maintenance.

10. We propose that the above allocation is repeated for meter replacements, whereby our overall cost allocation for this activity of work is £12.864m, resulting in an enhancement allocation of £5.02m.

Best option for customers

11. Our meter replacement programme has been determined by considering the programme as a whole within our specifically developed metering optimisation model. This modelling environment is visualised below:

Figure 1: Metering optimisation modelling approach



12. The key operators include:
    - **Deterioration** – represented by the aging of the assets which eventually leads to under-registration or meter failure
    - **Performance** – under-registration impacts upon bill accuracy and therefore on fair charging. Metering also links with customer-side leakage and per capita consumption
    - **Interventions** – costs are driven by several factors including when meters should be replaced (linked to an age threshold); what type of replacement meter should be installed (which affects reading cost and resolution of performance awareness); and meter reading frequency
    - **Costs** – meter renewal costs are influenced by location (unit costs are typically higher in rural locations), meter type (AMR meters are more expensive) and chamber type.

13. Within this modelling framework we evaluated an array of different options before focusing down on three primary options:
    - **Early replacement (16 Year Replacement Age All AMR):** this scenario would prevent all meters from under registering by replacing them as soon as they reach the end of their serviceable life with AMR meters. The policy would also be to install AMR meters for optants and new connections
    - **Baseline (20-year Replacement Age All Standard)**: we would expect this scenario to be the most affordable option. It replaces meters at the very end of their serviceable life (20 years) with standard meters. It would install standard meters for optants and new connections
    - **Optimised (Minimise Under Registration All AMR):** this scenario seeks to minimise under registration each year and will install AMR meters for replacements, optants and new connections. The key difference with this scenario is that it will not enforce a strict replacement age but instead replace meters based on a cost benefit (replacement cost vs under-registration). This enables cost constraints to be put in place.

14. Our modelling showed the following:
    - Both a 16 year and 20-year replacement age resulted in an uneven investment profile over the next 25 years. The spikes coincide with the years within which the bulk of our meter stock reaches the end of their serviceable life
    - A younger replacement age results in more spikes as meters reach the end of their life more frequently, hence creating higher replacement costs
    - An optimised option has a much flatter investment profile although it will store up replacement demand from AMP 9 onwards.

15. The clear choice was to pursue an optimised option (minimise under registration all AMR) as it delivered better performance in leakage and comparable performance on consumption but at a much lower cost than the other scenarios.

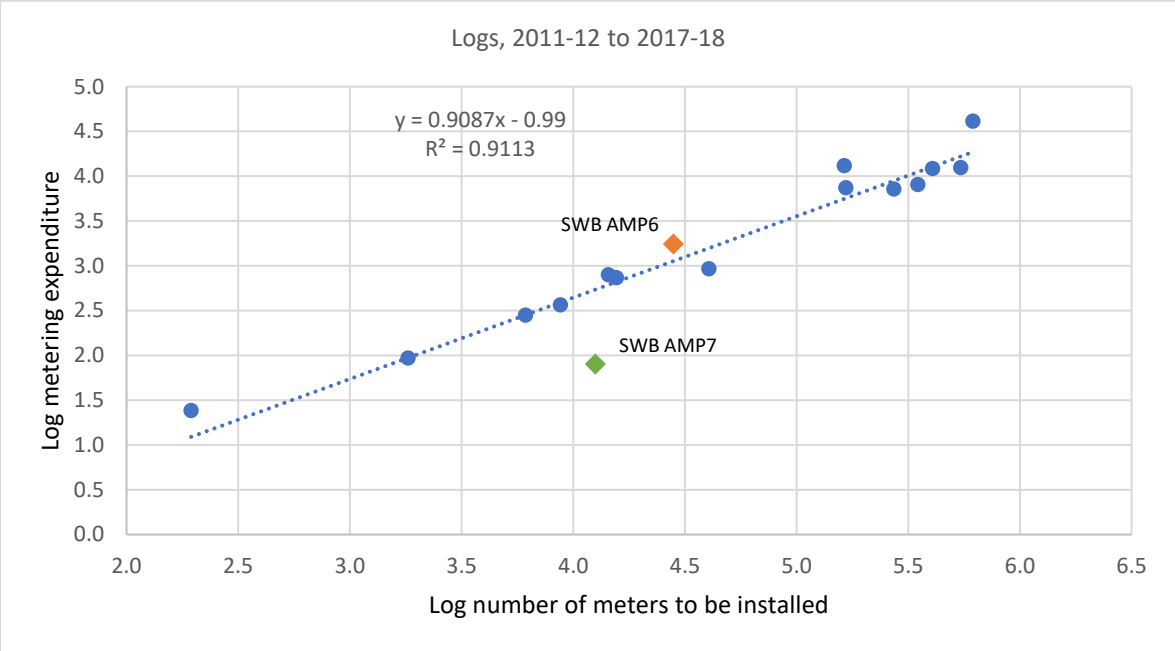
16. However, to avoid the high replacement demand on AMP 9 and beyond which is associated with the optimised option, we decided to run the model again with an even profile and with the introduction of our dual billing initiative which will encourage optants by presenting customers with an unmetered and a metered bill. We also introduced an allocation for installing meters on properties that are difficult to read, in hazardous locations or have a high unmetered debt or usage.

Robustness and efficiency of costs

17. Ofwat's IAP Feeder model compares metering costs across companies for five years of historic data (2011/12 to 2017/18). Against this analysis we have highlighted our AMP6 and AMP7 position. This

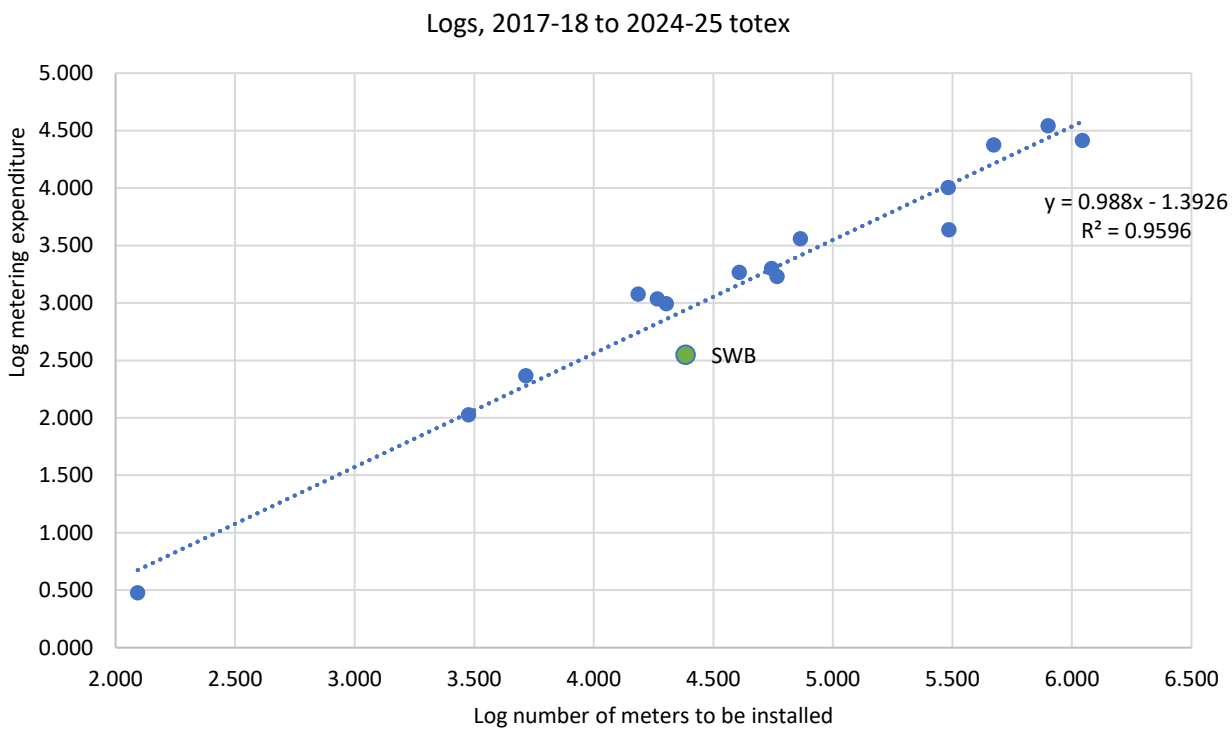
demonstrates that we shift from slightly above the trend analysis, which is unfavourable in-terms of efficiency, to considerably below the industry trend, which is efficient and industry frontier. This is particularly true for the Log model which Ofwat acknowledges to be higher quality and originally proposed a 2/3 weighting. However, the same also remains true for the level model.

Figure 2: Ofwat IAP log regression modelling with SWB AMP 7 data point



18. Ofwat's slow-track Draft Determination feeder model has been updated to included seven years of data from 2017/18 to 2024/24. This modelling supports our cost efficiency and demonstrates our frontier position when the log model is considered. Again, the level model also supports this assessment.

Figure 3: Ofwat DD log regression modelling



Water Treatment Works Improvements (SWB.DD.CA9)

1. The deep dive into this cost area reduced the cost allowance by £7.3m. This was assessed under Ofwat's *Water Freeform Categorisation*. The review identified the following reasons for the adjustment:
    - **Need for investment = Partial pass**
    - **Need for adjustment = Fail**
    - **Best option for customers = Fail**
    - **Robustness and efficiency of costs = Fail**

Representation

The additional evidence and information supports a **representation of £7.3m** for treatment works improvements – the representation value is below the level of costs identified for this investment reflecting an efficient cost base.

Our representation fundamentally focuses on the investment associated with improving the overall security and resilience of our operational control instrumentation in line with the new Network Information Systems (NIS) regulations introduced in 2018, which emphasises the need for this investment and enhanced adjustment as well as the approach and options for investment.

As an operator of essential service, as defined by the regulations, we recognise the need to increase investment above base maintenance levels to effectively manage security risks.

Need for investment

2. In assessing our long-term compliance and adherence with the new NIS regulations, we identify a need to address obsolete Instrumentation, Control and Automation technologies deployed over the last 20 years.

3. This assessment was made based on a detailed review of all of our Programme Logic Controllers (PLCs) at our WTW's, summarised below.

Table 1: PLC summary of survey investigations

Product status	Total	%
Active sale product	128	29.6%
End of commercialisation - product and/or support offering is no longer sold. Service will continue beyond this period until the expected date for end of active service	167	38.6%
End of service - the product and/or support offering is no longer supported by service	138	31.9%

4. Our enhancement investment programme therefore seeks to address the Operational Technology at our WTW's. Refer to best option for customers for detail of our risk assessment process.

Need for adjustment

5. We have a new duty to comply with the Network Information Systems, (NIS), Regulations 2018 enforced by the DWI. While we have consistently invested in the replacement and improvement of our Operational Technology systems this duty has undoubtedly driven a need for additional investment above and beyond baseline levels of maintenance/replacement.

6. This class of asset is difficult to model via classic deterioration models as risk is driven by obsolescence, criticality, resilience and the lack of support rather than failure rate. Product life cycles are typically less than ten years, but assets, when replaced, have enhanced functionality delivering improved reliability and improved process control.

7. Our approach has therefore been to evaluate each site individually when determining the risk to Operational Technology and associated investment to mitigate this risk. Our investment at each WTW is broken down into Enhancement (Operational Technology) and Base maintenance (network control and instrumental layer), shown in Table 1.

Best options for customers

8. The level of investment for compliance with this new regulation in AMP7 was determined by completing a risk assessment across each of our WTW sites. Consideration was given within the risk assessment to the level of 'site manning' and remote monitoring at each WTW's as well as known operational issues and population served.

Table 1: WTW risk assessment

Site	PLC Replacement need	Props Supplied 000's	Con-sequence	Risk ranking	PLC Cost (Enh) £	Network Cost (Base + Resilience) £
Restormel	30	119.4	6	36	634,182	887,855
Pynes	18	78.0	4	16	417,248	584,147
Littlehempston	12	76.3	4	12	308,780	432,292
Northcombe	16	48.8	3	12	381,092	533,529
Prewley	20	35.6	3	12	453,403	634,765
Allers	24	31.1	2	10	507,637	710,692
St Cleer	11	40.6	3	9	290,702	406,983
Dotton	7	38.3	3	6	218,391	305,747
De Lank	9	13.4	2	6	254,547	356,365
Drift	12	18.1	2	6	308,780	432,292
Avon	14	16.4	2	6	344,936	482,911
Dousland	11	33.0	2	6	290,702	406,983
Stithians	13	24.3	2	6	326,858	457,602
Venford	10	15.3	2	6	272,625	381,674
Tottiford	3	31.7	2	4	146,079	204,511
Wendron	7	14.6	2	4	218,391	305,747
Bratton Fleming	7	14.2	2	4	218,391	305,747
Bastreet	9	9.9	1	3	254,547	356,365
Lowermoor	12	7.8	1	3	308,780	432,292
College	9	10.8	1	3	254,547	356,365
Tamar Lakes	3	5.9	1	2	146,079	204,511
Wilmington	6	1.8	1	2	200,313	280,438

Site	PLC Replacement need	Props Supplied 000's	Con-sequence	Risk ranking	PLC Cost (Enh) £	Network Cost (Base + Resilience) £
Burrows	6	4.2	1	2	200,313	280,438
Hook	4	3.9	1	2	164,157	229,820
Hore Down	6	3.7	1	2	200,313	280,438
Kersbrook	1	2.9	1	1	109,924	153,893
Programme management					18,078	7,785
			Total		**7,449,796**	**10,412,190**

9. The costs we are proposing are assigned to enhancement do not include network and instrumentation investment which we plan to address through capital maintenance. The overall cost has also increased marginally from £7.289m to £7.450m as further site-specific costs have been obtained since our business plan submission. However, we have capped our representation at our previously estimated costs.

Robustness and efficiency of costs

10. As a new requirement, the investment was assessed outside of our normal programme optimisation process for WTW's investment, as described above.

11. We have undertaken a detailed evaluation and bottom up assessment for many of the WTW's identified for these upgrades.

12. The works control network and instrumentation layer, that supports this data driven approach, which is addressed under base maintenance and resilience, will be supported by the development of a larger, OT and Technical Operational team to allow the efficient "direct in house" delivery of these programmes of work.

Service Reservoirs (SWB.DD.CA10)

1. The deep dive into this cost area reduced the enhancement cost allowance by £4.0m for service reservoirs. This was assessed under Ofwat's *Water Freeform Categorisation*. The review identified the following reasons for the adjustment:
    - **Need for investment = Partial pass**
    - **Need for adjustment = Fail**
    - **Best option for customers = Fail**
    - **Robustness and efficiency of costs = Fail**

Representation

The additional evidence and information supports a **representation of £4.0m** for service reservoirs and we believe has met Ofwat's requirements.

Fundamentally this investment is necessary to support the development of two new garden villages in our region; Culm Garden Village and West Carclaze Garden Village. Garden Villages are a Government initiative of new communities that sit on the edge of existing villages or towns. Due to their location and the extent of these developments, they will place considerable strain on the existing distribution network and in the cases above, require new infrastructure to support their build out, e.g., Service Reservoirs.

We deem development of this magnitude, but more specifically their location at the extremities of our network, to warrant enhancement expenditure.

The additional information highlights how our cost models for service reservoirs are efficient and the third party review for the options taken.

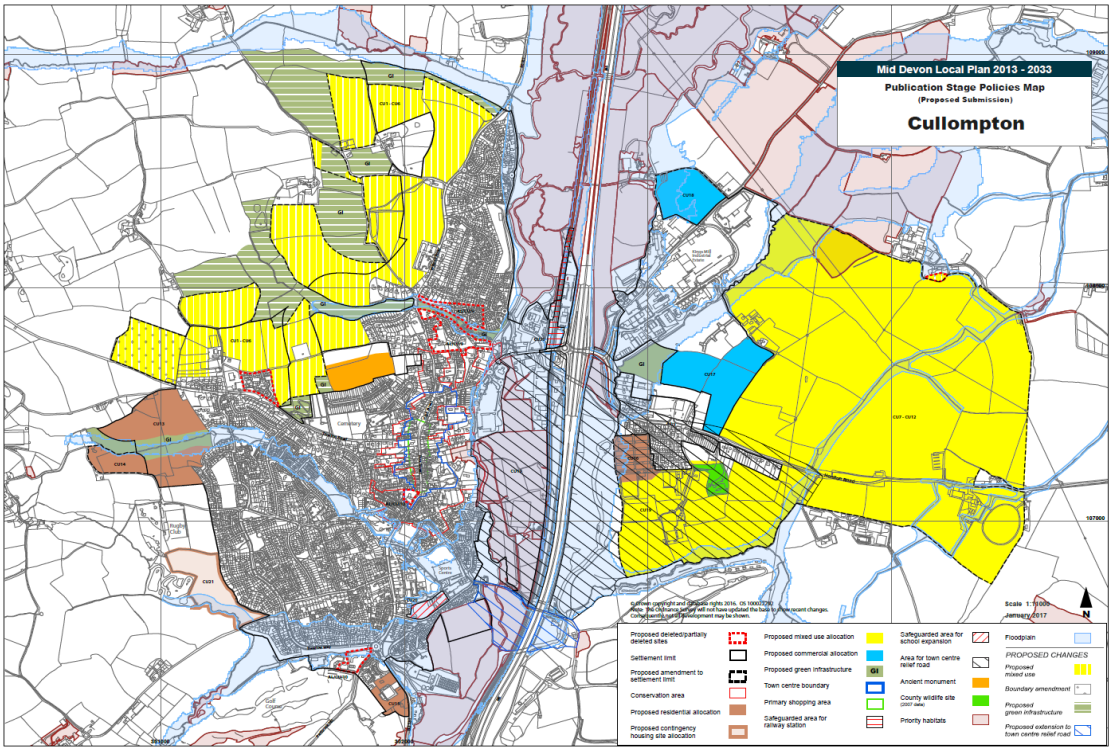
Since the time of writing our business plan submission, we have observed a faster than expected development rate, particularly for West Carclaze (St Austell). Designs for the development have been received by our Developer Services team with an anticipated construction start date in 2020.

Need for investment

2. On 2nd January 2017, the Government announced plans for a number of new Garden Villages and Towns across the country. These new settlements are to provide a modern take on the traditional Garden Cities movement that has its roots in the late 19th Century. Garden villages are meant to be different.

3. In the South West region, two sites have been granted 'garden village' status by the Government:
    - **Cullompton:** the long-term plans for the garden village are to deliver up to 5,000 new homes (2,100 before 2033), as well as employment, shops, schools, healthcare facilities and leisure opportunities including the potential for new sports facilities and country park

Figure 1: Cullompton Garden Village Development



- **St Austell,** West Carclaze: the long-term plans for this garden village are to deliver around 1,500 new homes, as well as a new primary school, health care facilities, community centre and local shops/retail facilities.

Figure 2: West Carclaze Garden Village Development

Need for adjustment

4. The nature of these two new garden villages mean they are new communities rather than just housing developments on the edge of existing communities. As such, their location and extent of development will place considerable strain on the existing distribution network and in some cases require significant new infrastructure all together.

5. We have evaluated the new infrastructure requirements associated with each development (refer to best option for customers) and we have associated only these costs to this investment line, i.e., normal network reinforcement is assumed in base modelling.

Best option for customers

6. Both new sites have undergone a technical evaluation to determine the new infrastructure requirements. Due to the heightened interested in West Carclaze we asked Atkins to undertake an independent study to identify potential network reinforcement or operational management options, to accommodate the proposed development

7. The Atkins study concluded:

> *The review of the historic model has shown that there has been little change in the network since the original strategy report was produced in 2011, the conclusions of the original strategy report are therefore still valid:*
>
> ***Carclaze and Baal Full Development –*** *new reservoir and pumping main; the existing system has insufficient capacity to supply the proposed development at Carclaze and Baal. To provide adequate supply to the developments, the following system reinforcement is required;*
>
> - *New reservoir at Penwithick site with an estimated capacity of 2.5Ml*
> - *New pumping main from the Resugga Green pumps to the new reservoir; 1.7km of 200mm ID pipe*
> - *A small localised pump to supply an unknown number of properties in the new development which will have ground levels within 15m of the new reservoir TWL.*

8. Similarly, for Culm Garden Village (Cullompton) we note that a new 2.5Ml service reservoir is required to accommodate the 2,100 new homes which are expected to be built by 2033. The infrastructure for Culm Garden Village is less notable and therefore not included under this enhancement investment case.

9. It should be noted that all operational and traditional network reinforcement schemes were considered to permit development as cost effectively as possible in these studies. Our consultancy report states that

> *"With the additional 100 properties applied to the model, the addition of the new 250mm ID main and with Bunny SR supplying the network by gravity two areas of unacceptably low pressures were identified, these were seen at customers to the north of the old Penwithick SR site and customers at Stenalees to the south of Bunny SR.*
>
> *Two solutions were identified to resolve these low pressure issues:*
>
> - *The first solution is to install two new local boosters at one at Stenalees and one at the new development to supply both existing and new high level properties around Penwithick SR.*
> - *The second solution would be to run Resugga Green pumps for extended periods throughout the day to include periods of peak demand, this would be achieved by enhancing the control systems and by upgrading the existing pumps. Doing this would lead to much higher operating costs due to the requirement of running the pumps during TRIAD periods. This solution would also result in a significant reduction in system operability and would provide limited security of supply to the network.*

The two alternative solutions identified above are hydraulically feasible but significantly compromise the operability of the existing system. Neither solution provides any increase in system capacity to accommodate the final new development and both remove any operational headroom there may have been. It should also be noted that all the investigations to date have been based around achieving a minimum customer pressure of 15m which is borderline acceptable at best and use a model based on typical demands. Should there be an unexpected increase in demand in the system, there are likely to be further significant supply problems

10. It should be acknowledged that these options, cited above, only consider the addition of 100 properties and not the full development. Thus, emphasising the need for the investment and that the selected option is in the best interest of existing customers.

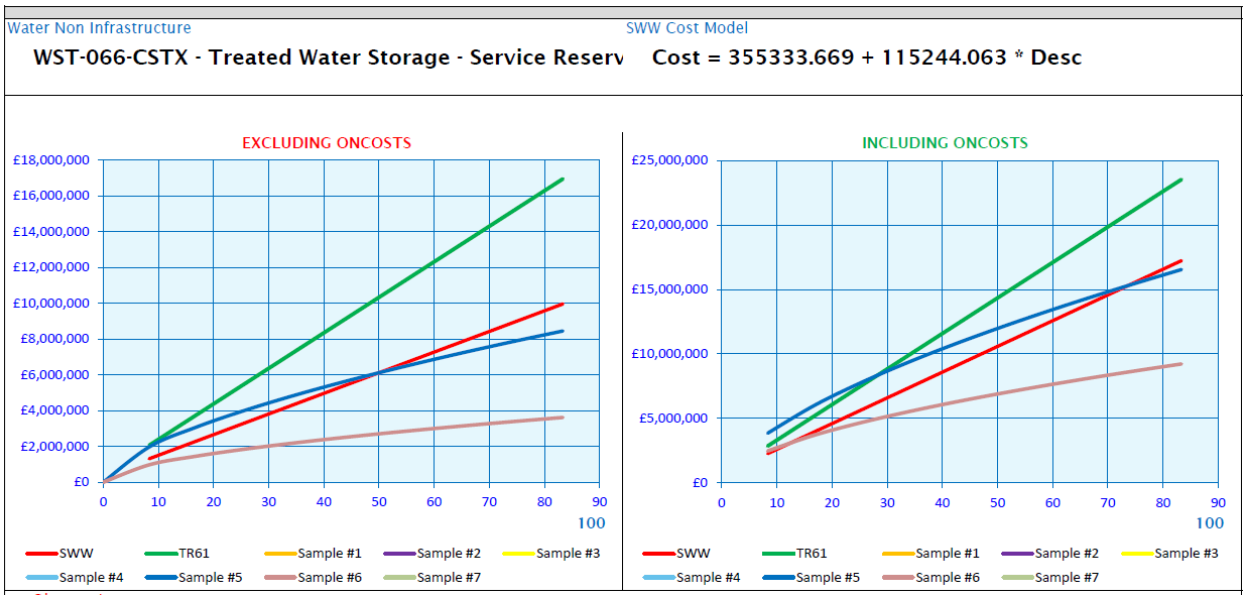
Robustness and efficiency of costs

11. PR19 cost models were used to develop a cost for these investments. For other assessment areas, using the same cost models, Ofwat granted a Partial Pass for these assessment criteria. We have since provided a copy of our independent cost modelling report which validates the efficiency of our costings.

12. For WTW Non-Infrastructure we also demonstrate how these cost models set the frontier against the company comparison data used in the benchmarking.

13. Specifically, for Service Reservoirs our cost modelling is shown to be efficient against the benchmarks. This is particularly true at low capacities akin to the two reservoirs proposed to support the garden villages. This is shown below.

Figure 3: Water non-infra service reservoir cost model benchmarking



Downstream Thinking (SWB.DD.CA11)

1. The deep dive into this cost area reduced the cost allowance by £9.7m of enhancement investment. This appears to have been reallocated to reduced sewer flooding risk and assessed under Ofwat's base plus modelling along with growth expenditure.

> **Representation**
>
> The additional evidence and information, emphasising the enhancement nature of the expenditure and need for the investment, supports a **representation of £9.7m** for Downstream Thinking costs.
>
> Additional information includes comment from third parties supporting our investment in this area.

Need for investment

2. Specifically, for AMP7 this Enhancement investment is to deliver:

    - Significant surface water separation schemes at Kingsbridge, Falmouth and Plymouth catchments. These are large catchments ready for the implementation stage where partnership funding has already been agreed to resolve chronic flooding, pollution and CSO spill issues holistically, in collaboration with other Risk Management Authorities
    - Property level SuDS separations and SuDS for Schools work – to work with more schools across the region to deliver the multiple benefits of quality, quantity, amenity and biodiversity as well as an education resource for the schools. This benefits our customers and the environment as well as educating our future generations about the water cycle and water conservation and reuse
    - An assessment of future obligations; following the publication of SfA8 (Sewers for Adoption Version 8) which lists the kinds of SuDS that could be adoptable as sewers and the potential retrospective transfer of existing SuDS that meet the criteria; and understanding the extent of surface water assets in response to the Actions identified in Defra's Surface Water Management document, July 2018
    - Piloting of the delivery of further SuDS and Natural Flood Management (NFM) schemes, helping to develop a best practice approach for delivery of these schemes which can inform the wider business on the Natural Capital Benefits.

Need for adjustment

3. The portfolio of investment above covers enabling work for alternative drainage solutions, collaborative approaches, meeting partnering commitments and pilots around NFM and Natural Capital Assessment – as such, it is key in discharging our duties as a Risk Management Authority, and key for enhancing customer service around drainage. Opportunities to incorporate sustainable principles are being sought across all of our investment areas in recognition of the wider benefits to customers and the environment which we believe this approach can deliver. Our Downstream Thinking work also enables access to other parties co-funding and leveraged benefits to our customers.

4. In line with Ofwat's comments in the draft determination spill frequency feeder model, where it is confirmed that 'Further to the representation from Dwr Cymru, we have used effective storage volume to allow the inclusion of alternative sustainable drainage approaches.' we believe that South West Water's investment in Downstream Thinking should also be categorised as enhancement rather than growth to ensure there is no inconsistency of approach.

Best options for customers

5. This is a base versus enhancement allocation issue. However, we believe customers' interests around this investment has significant protection through our performance commitments on sewer flooding and pollutions. We have set the most challenging reductions in the industry for pollutions and also have a compound penalty related to the Environment Agency's Environmental Performance Assessment (EPA) star rating. This EPA penalty is unique to South West Water and we also have no reward potential under the pollutions performance commitment, despite this being available to other companies and Environment Agency assurances that such rewards would not be allowed.

6. At PR14 customers supported investment to minimise internal flooding, they were also concerned about pollution to beaches and the sea and did not want any deterioration in current service.

7. Current focus group findings suggest these views have not changed substantially over the past four years. However, our extensive customer engagement has also confirmed additional priorities within the wastewater service. All of the priorities below are addressed in some way by Downstream Thinking projects:
    - Reducing sewer flooding
    - Increasing resilience of our sewerage network under extreme weather
    - Improving our customer service
    - Minimising odours from our wastewater treatment works
    - Understanding our impact on the environment through catchment management will also help protect our bathing waters and improve/maintain natural habitats.

8. Customers expect us to meet our legislative requirements and ensure we meet their performance expectations. Excellent bathing water quality is the highest priority within the wastewater service area followed by preventing pollution of watercourses. However, there is also more support to reduce external flooding in a prioritised manner.

9. We also have significant regulatory support for this proposed investment. The Environment Agency has stated:

    "I am really pleased to see South West Water's desire to work in partnership to reduce flood risk continue into PR19, building on the great work to date. Both of our customer bases have already benefited from having aligned investment programmes, joint working on integrated urban drainage modelling and scheme delivery. I am sure there will be many more successes to come."

    Ben Johnstone, EA Area Flood and Coastal Risk Manager Devon, Cornwall and The Isles of Scilly

10. The Chair of the South West Flood and Coastal Committee (SWRFCC) has stated:

    "South West Water have a proven track record of innovation and collaboration as part of their successful Upstream and Downstream Thinking programmes and I am pleased to see them continue to expand on the delivery of these within their PR19 programme … I see this as a key vehicle for demonstrating collaboration and partnership working both through the Strategic Planning Groups (SPGs) and by publically making the DWMP plans visible through the South West Water website …"

    Philip Rees, Chair, South West Regional Flood and Coastal Committee (SWRFCC)

Robustness and efficiency of costs

Table 1: Proposed Investments

Investments	2020/21 £000	2021/22 £000	2022/23 £000	2023/24 £000	2024/25 £000	TOTAL £000
Stakeholder working schemes and assessment of future obligations – SfA8 and Defra Action identified in Surface Water Management	-	-	299	287	788	**1,374**
SW Separation Schemes – property level SuDS and SuDS for schools	339	208	328	536	828	**2,239**
Plymouth IUDM Collaborative Schemes	1,500	1,500	1,000	-	-	**4,000**
Falmouth IUDM Collaborative Schemes	-	200	408	793	-	**1,401**
Kingsbridge IUDM Collaborative Schemes	336	266	98	-	-	**700**
TOTAL	**2,175**	**2,174**	**2,133**	**1,616**	**1,616**	**9,714**

11. We recognised there was the potential for overlap and synergistic benefits between this Downstream Thinking enhancement investment and a number of other wastewater investment programmes, so we identified the potential overlaps and reduced costs accordingly. Our work on solution side overlaps and benefits was described by our PR19 auditors as industry leading.

12. Synergies have been explored between the interventions for this business case and those planned under separate investment lines for the following business cases:
    - Wastewater Sewerage Networks
    - Wastewater Supply and Demand
    - DG5 Wastewater Sewer Flooding
    - Wastewater Resilience
    - Wastewater Long Term Planning and Network Modelling.

13. A high-level identification process was undertaken which attempted to match the location and activity of interventions. Further analysis was undertaken through group discussion within our Asset Management team to determine whether the specifics of an intervention had possible impact/synergies with other investment areas.

14. The wastewater planners met to review any synergies and overlaps in the business cases and a matrix was produced to show this graphically.

15. Where overlaps were identified across other investment lines the cost of these schemes were adjusted through our Investment Optimisation Tool inputs to ensure the synergies between business cases did not duplicate any costs.

16. Holistic planning and partnership building is essential in order to deliver successful outcomes to customers from this enhancement spend. Part of the Asset Planning process associated with this business case involved setting up coherence meetings with other internal stakeholders to share draft investment plans and identify risks at catchment and detailed level. Synergies with other business cases included:
    - Wastewater Sewerage Networks
    - Wastewater Pumping Stations

- Wastewater NEP Requirements
- Wastewater Sewer Flooding
- Legislative Obligations Shellfish Waters
- Legislative Obligations Bathing Waters
- Pollution ODI Strategy
- Wastewater Treatment
- Wastewater Treatment WINEP Requirements.

17. The objectives included:

    - Identify catchments with multiple investment drivers in AMP7 and beyond
    - Identify synergies and overlaps to optimise future investment plans
    - Optimise timing of investment to minimise construction set-up costs and project overheads
    - Catchments identified with multiple investment drivers warranted a documented overlaps and synergies process to identify an optimised delivery plan. In most cases the main driver for investment can be readily identified for each catchment and the scope and timing of interventions is developed around this primary need. Overlaps in investment are apparent in a number of areas including:
        - Pollution related CSO and dual node capital maintenance in catchments with Water Industry National Environment Programme (WINEP) Quality drivers for intermittent discharges
        - Pollution related capital maintenance for sewage pumping stations and rising mains
        - DG5 flooding and sewerage Supply/Demand network resilience.

18. We have examined the impact of reallocating £9.7m to the spill frequency model, as per Welsh Water's reallocation. This would increase our modelled costs to £49.5m, with the predicted allowance of £46.1m. In the WINEP in-the round-model, our allowance would increase by the full £9.7m as Ofwat's modelled allowance remains above our business plan costs including reallocations

Sludge (SWB.DD.CA12)

1. The deep dive into this cost area reduced the cost allowance by £5.2m of Enhancement investment. This was assessed under Ofwat's Water Freeform Categorisation. The Ofwat review identified the following reasons for the adjustment:
    - **Need for investment = Fail**
    - **Need for adjustment = Fail**
    - **Best option for customers = Fail**
    - **Robustness and efficiency of costs = Fail**

Representation

The additional evidence and information supports a **representation of £1.5m** for sludge enhancement totex – the representation value is below the level of the total adjustment reflecting our acceptance that a proportion of these costs appear to be accounted for in Ofwat's base modelling.

Additional commentary highlights the specific activities and investments that support the enhanced value, that do not seem to be reflected in the base plus growth modelling.

Need for investment

2. South West Water's sludge strategy is largely based on continued maintenance of existing assets. We therefore recognise and accept that a greater proportion of the investment could be deemed base maintenance and has been assessed in this way, however we have included additional information on our proposed investments that should remain as enhancement (rather than base or growth) – representing £1.5m of the £5.2m costs disallowed within the updated view of totex.

3. The £1.5m identified relates to the bio-resources market and enabling projects to facilitate this market – which is a key change for the 2020-25 regulatory period.

Need for adjustment

4. SWW have recognised the opportunity the bioresources market presents for the difficult challenges posed for sludge management in our region with small coastal populations centres and large transport distances between a high number of small wastewater treatment works across our region. To complement our maintenance investment, we have proposed formal market testing in AMP7 to develop our future approach.

5. To enable the sludge markets, we have undertaken trading trials with Wessex Water, implemented sludge measurement, undertaken technology trials with third parties and maintained access to our bioresources market information during the current regulatory period (AMP6). We also already use markets through contracts for all sludge transport and biosolds recycling.

6. In our Bioresources Wholesale Revenue Control we explain our approach to enabling markets in AMP7. Specifically, this involves:
    - Continued visibility of our sludge data (tonnages and locations) along with better sludge measurement and forecasting improvements, to facilitate market approaches to South West Water. To help the market we have developed an "expression of interest" document for third party/commercial organisations to propose potential operational outsourcing arrangements for sludge treatment and operational activities

- Formal market testing in 2020-25 – we don't plan to deliver any enhancement of our sludge assets in this period, but rather we will undertake a formal large-scale approach to the market to seek regional, site specific and/or service level solutions. We will assess market offers against internal service provision (where applicable) and use the most cost-effective solutions for customers to refine and evolve our long-term strategic approach and future investment
- Investigation into specific market innovations around storage and alternative (non-agricultural) outlets
- Maintaining and developing our regional sludge model to allow assessment of market opportunities and to drive efficiency in sludge management.

7. The associated investment with delivering the above market enabling work is noted as two of the key projects in our Wholesale Bioresources Revenue Control.

8. The £1.5m included in our representation for enhancement expenditure reflects the market enabling investment which is consistent with the approach noted for as other companies in their Draft Determinations. This £1.5m representation is in addition to any sludge costs for the Isles of Scilly which are considered in an overall review of the Isles of Scilly investment.

Best option for customers

9. For our bioresources services the relevant customer and stakeholder priorities are:
    - Reliable wastewater service
    - Resilience
    - Protecting the environment
    - Fair charging and affordable bills for all.

10. The maintenance investment we plan for AMP7 aligns well with our customer priorities in terms of protecting biosolids compliance, protecting wastewater compliance and reducing pollution risks. The proposed enhancement investment supports market development which we believe holds the key to developing the lowest cost and most sustainable bioresources service for customers in the South West.

11. We believe customer interests are protected as we will be unable to enhance physical treatment assets in future without having market comparisons/testing. This dictates the need for the market enabling enhancement investment proposed and ensures its delivery.

Robustness and efficiency of costs

12. In the table below we breakdown the proposed enhancement investment that compliments our planned maintenance expenditure and enabling of and participation in the bioresources market.

Table 1: Enhancement investment summary

Category	Description	2020 £000	2021 £000	2022 £000	2023 £000	2024 £000	Total £000
Regional Evaluations	Consultant support to develop strategic objectives including pricing/charging structures	50	50	50	50	50	250
Regional Innovation	Development and trial of initiatives to support formal assessment of market solutions to deliver any enhancement of service in the future	150	150	100	100	0	500
Regional Model Development	Establishes future trends in asset reliability and consequent service risk and inform market offers /enable comparison	90	90	90	90	90	450
Regional New Market	Development of initiatives, TOTEX modelling and investment to conform with the requirements of the new bioresources market and the Biosolids Assurance Scheme	60	60	60	60	60	300
					TOTAL		**1,500**

13. Costs for these investments have been developed from our experience of outturn costs in our wider asset modelling, trials, studies and cost modelling development from previous AMPs. This is lower than the initial position of £5.2m recognising an element of this sum would have been within base maintenance.

Sewer Pumping Stations (SWB.DD.CA13)

1. The deep dive into this cost area reduced the cost allowance by £7.9m of enhancement investment. This was assessed under *Ofwat's Water Freeform Categorisation*. The Ofwat review identified the following reasons for the adjustment:
    - **Need for adjustment = Fail**

> **Representation**
>
> The additional evidence and information supports a **representation of £7.9m** for sewer pumping stations enhancement totex, highlighting the need for investment specifically relating to new Environment Agency measures, rather than base maintenance.

Need for investment

2. Ofwat noted *" this expenditure related to investment at sewage pumping stations to maintain compliance with Environmental Permitting Regulations. In view of its stated purpose we consider that this activity is included within the base expenditure allocation and therefore we do not allow any enhancement expenditure"*. However, this expenditure is not about maintaining compliance with existing regulations, but is linked to new regulatory requirements (as detailed below).

3. Our investment allocated to enhancement in this area breaks down as follows:

Table 1: Extract from business plan commentary (Table WS2)

(2017-18 Prices)	2020-21 £m	2021-22 £m	2022-23 £m	2023-24 £m	2024-25 £m	Total £m
Sewage Pumping Stations (18%)	1.388	1.388	1.388	1.388	1.388	6.940
Frequent Spilling Overflows (50%)	0.175	0.200	0.225	0.200	0.175	0.975
Total	**1.563**	**1.588**	**1.613**	**1.588**	**1.563**	**7.915**

Wastewater pumping stations

4. Our pumping stations are a fundamental part of our wastewater network and their reliable operation can improve sewer resilience in extreme weather conditions as well as reduce sewer flooding and pollution incident risk. Whilst most of our investment in our pumping stations is maintenance expenditure, there is a subset that is needed to meet permit driven requirements around Pass Forward Flow measurement and investigations resulting from the new Environment Agency flow policy.

Frequent spilling overflows

5. The Environment Agency will incorporate spill frequency triggers into amended permits to be completed by 2020. This is for overflows which have previously been improved under a National Environment Programme for Shellfish Water or Bathing Water driver for spill frequency. Any previously improved Bathing Waters overflow spilling more than 5 times per Bathing Season or a Shellfish Water overflow spilling more than 14 times per year that hits the trigger levels and will require immediate investigation under these new permit conditions.

Need for adjustment

Wastewater pumping stations

6. We consider this to be enhancement expenditure that should be treated as such, as it delivers asset enhancement and is linked to a new regulatory requirement to measure Pass Forward Flow rather than derive this from pump capacity by the end of AMP7. This element of the pumping station programme represents £6.940m of enhancement as the associated investment is discrete, only applies to our 285-permitted wastewater pumping stations and is separate from our normal maintenance investment which is covered in base. The three stages of Enhancement investment in this area are:
    - Stage 1 – Flow Meter Investigation Programme. Investigation of wastewater pumping stations to determine if a flow meter is installed at the site and operating correctly
    - Stage 2 – New Flow Meter Installation – includes installation of flow meters at wastewater pumping stations with permitted Pass Forward Flow and no flow meters
    - Stage 3 – Follow-up capital Investigation and Intervention - but only interventions which are enhancement rather than maintenance (which is covered in Base).

7. The three-stage approach has been utilised to identify work required and derive the activity costing for the programme, with each stage of work priced using the SWW PR19 cost models.

Frequent spilling overflows

8. The driver for this £0.975m of enhancement investment is the new Spill Frequency Trigger Permit (SFTP) being introduced for AMP7 and that are due to be permitted by the Environment Agency by 2020. This enhancement investment is to deliver the new investigations requirements in an estimated 48 wastewater catchments and will also inform future WINEP schemes.

Best options for customers

9. Primarily this is a cost base versus enhancement allocation issue which is not directly relevant to customers. However, our customers' top priorities are for us to deliver a safe and clean drinking water supply, protect bathing and shellfish waters and prevent pollution. They expect our investments to meet our legislative requirements and at the same time ensure we meet their performance expectations in these areas.

10. Some of the key findings from our research, relevant to this investment are described below.
    - Protection of Bathing and Shellfish waters has been ranked as the second highest customer focus. The reliable operation of wastewater pumping stations in areas with designated bathing and shellfish waters is fundamental to meeting customer priorities and the new SFTP permit driven investigations will help ensure coastal water protection
    - Customer understanding of our wastewater service has historically been less than that for our drinking water service. However, PR19 survey results indicate that customer priorities for wastewater are the prevention of pollution, increasing sewer resilience in extreme weather conditions and reducing sewer flooding incidents. Our wastewater pumping stations are a fundamental part of our wastewater network and reliable operation of these assetscan improve sewer resilience in extreme weather conditions and reduce risk of sewer flooding incidents. Whilst this is largely driven by our maintenance activities our enhancement investment for new measured flows and associated investigations will benefit our customer priorities in this area.

Robustness and efficiency of costs

Wastewater pumping stations

11. We have bottom up costing for this enhancement investment, as follows:

Stage 1

- Allowance to undertake Initial Investigations at 115 wastewater pumping stations sites, where it is known that no flow monitoring exists, and these are not covered by Flow4 or AMP6 programmes. Investigations priced at £1k each - **total allowance of £115k** derived using AMP6 Flow4 prices.

Stage 2

- Installation and/or upgrading of flow monitors – to install first-time flow monitors or upgrade unsuitable flow monitors allowance for work at 115 sites, where no flow monitoring recorded (as noted above), at £20k each - total allowance of £2.30m. Cost derived using AMP6 Flow4 prices.

Stage 3

- Investigations to identify intervention solutions to achieve pass forward flow compliance. An allowance for intervention investigations at 22 sites, based on £30k per investigation, from AMP6 investigation costs - **total allowance of £660k**
- Intervention Programme for 12 sites –at £203k per site – **total allowance of £2.445m**. Prices derived based on average historic costs for pumping station capital maintenance schemes for pump replacement and rising main replacement costs
- Intervention Programme at 8 named sites, identified from known permitted pass forward flow compliance issues against new requirements - **total allowance of £1.42m**. Schemes costed by South West Water's Commercial Team.

Frequent spilling overflows

12. We have estimated that 130 SFTP investigations will be needed within AMP7 based on our Event and Duration Monitoring data for the relevant permitted assets. Our unit costs for investigations have been derived from our extensive experience in delivering intermittent discharge investigations for shellfish and bathing water driver. **Total allowance of £0.975m.**

Isles of Scilly – Enhancement and Base Costs (SWB.DD.CA14)

1. The deep dive reviews of the special totex factor claim for the Isles of Scilly identified a reduction in the enhancement spend of £3.0m and base of £3.9m. Whilst all the areas of Ofwat's requirements were met the key challenge related to the perceived level of optimism bias within the cost claim.

Representation

This is a unique investment area and the costs included in our business plan resulted from extensive discussions with a number of parties including the EA, DWI, Defra and Ofwat, as well as considerable consultation with the Isles of Scilly council.

The additional evidence and information supports a **representation of £6.9m** for Isles of Scilly investment and highlights that with further evidence the original business plan submission did not include a level of optimism bias. In summary, £5.9m of specific areas have already been identified since our original business plan submission, with additional areas expected to be confirmed as we continue this process.

We consider these risks and associated costs whilst not part of the original business plan specifically, are the types of items that were included within the 'optimism bias' factor which was disallowed within the draft determination.

These are a series of unknown risks at the time of the business plan submission that have revealed themselves as the company undertakes operational responsibilities on the islands.

These are risks that were unknown due to the asymmetry of information within the due diligence process.

	Description	Totex
1	Loss of critical resource to St. Mary's desalination plant – install permanent sea intake for desalination plant	£1.7m
2	Reduce inundation flooding risk to new Wastewater treatment works – relocate works with new dedicated discharge away from tourist areas.	£1.0m
3	St. Agnes & St Martins – Increase in system capacity to support transfer of private supplies at customer request	£2.8m
4	Bryher treatment works upgrade to preserve water resources and improve resilience	£0.4m

In addition, within our response to the fast-track Draft Determination we proposed that the Isles of Scilly investment should be included in our WaterShare mechanism so the risk and rewards of any difference in costs would be shared with customers as they arise.

The additional evidence below should be considered alongside the totex claim made in our original business plan submission.

Overview

2. The Isles of Scilly are in a unique position in the UK regarding water and environmental legislation as the Water Industry Act and associated drinking water and environmental legislation did not include the islands in 1989 at the privatisation of the water industry. Water and Sewerage services on the islands have been under the direction of the Department of Environment, Food & Rural Affairs (Defra). Standards of service, particularly environmental performance on the islands, are very different compared to the services delivered under a privatised water company.

3. South West Water has applied for a variation in our license to become the licensed water company for the Isles of Scilly. As part of our PR19 business plan submission we presented a specific business plan for the Isles of Scilly. The objective of this business plan was to invest to ensure that customers on the Isles of Scilly received the same standard of service as our mainland customers, by 2025. The plan aimed to ensure compliance with drinking water standard and environmental standards not currently attained on the islands at present. To advise the Isles of Scilly business plan detailed surveys and reviews of the current asset base and its performance were carried out. This extensive data and information was used to identify investment needs and scope solutions for the business plan. Since that time, our knowledge of the issues and challenges on the islands has developed further and emerging risks identified. This is a unique position for SWW or any water company as we have no historic understanding of the operational challenges of the assets on the islands as we have never operated there. To improve this understanding, a SWW Senior Manager has been seconded, since January 2019, to the Council of the Isles of Scilly to both support the Council and also to capture key operational learning to make the transition to SWW as smooth as possible. This has also facilitated the capture of some further emerging risks as well as simplifying some solutions.

4. In the Isles of Scilly PR19 business plan SWW had included an optimism bias of 19.6% to manage uncertainty in the plan, which was removed in the course of Ofwat's assessment of the plan. It was envisaged that this would be used to rebalance the plan to address emerging risks that had not been captured or identified prior to the business plan submission. This would leave SWW with a significant financial challenge to address the known risks and issues on the islands and manage the emerging risks that are still coming to light. The following is a summary of the principal issues that have been identified since the submission of the PR19 business plan. The development of robust solutions to these issues is ongoing.

5. Following the publication of the EA's Isles of Scilly Coastal Flood Modelling draft report, SWW have identified new updated information to our business plan which would we consider should be reassessed in order to deliver resilient services on the islands. Key to this was the high risk of flooding which would impact the planned location of the new sewage treatment plant and increase erosion of the critical Cliffside borehole sources.

6. The optioneering, scoping and costing of the schemes and cost estimates are based on South West Water modelled solutions and some bespoke solutions. Consultants (AECOM and Chandler KBS) have been appointed to support our development of these projects.

Loss of critical resource to St. Mary's desalination plant – install permanent sea intake for desalination plant.

7. The desalination plant provides 36% of the water resources for St Mary's and is used to blend with the Higher and Lower Moors high nitrate boreholes in order to reduce nitrate levels. The blending of the high nitrate borehole water is also used to re-condition the desalination plant output water to improve taste.

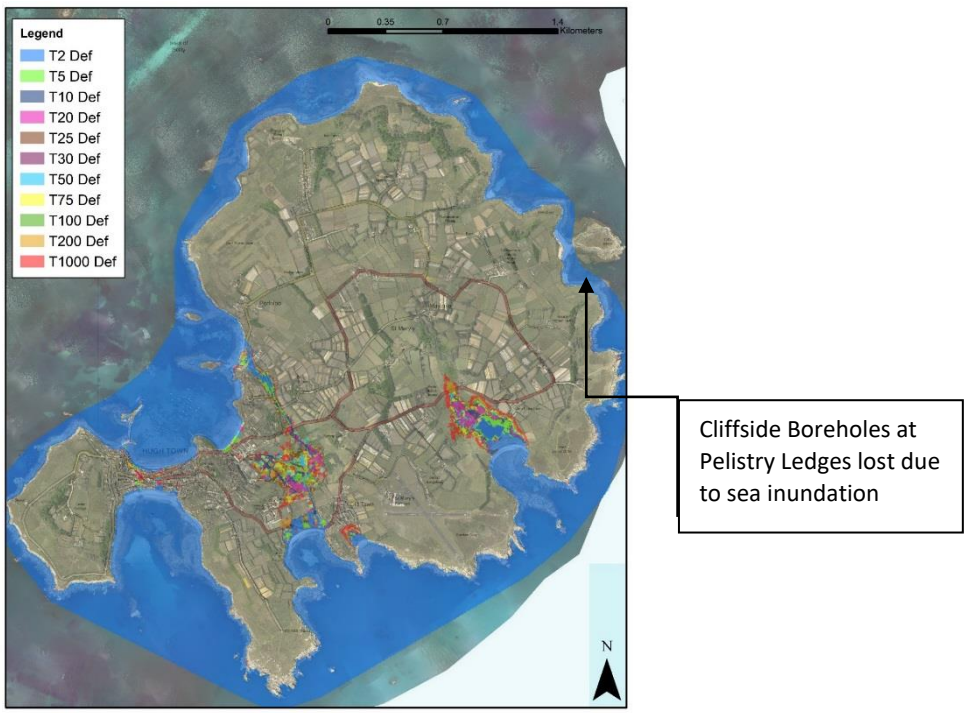
8. During the winter, supplies to the desalination plant come from the Cliffside boreholes at Pelistry Bay. This is a network of 13 boreholes of which approximately 6 are used at any one time. The borehole water is high in chloride and iron. In summertime a temporary seawater intake system is deployed. This is a temporary floating intake system, not designed to withstand winter storms. The intake pipeline floats just below the surface of Pelistry Bay. The duty only intake pump is suspended from a flotation device approximately 1m below the surface of the bay. It was designed and first implemented in 2016 and has been deployed in May/June and removed in September/October every year since then. The installation as it is currently designed would not withstand winter storms and

would sustain significant damage if left in position beyond September. Deployment and removal take a number of weeks of the local operations team time and require the services of a specialist diver.

9. The Local Flood Risk Management Strategy (Council of the Isles of Scilly, March 2017) recognises that the Cliffside boreholes are vulnerable to flooding and coastal erosion. There is already evidence of erosion to the cliff at Pelistry Ledges, demonstrating the need for investment.

10. The Isles of Scilly Coastal Flood Modelling Draft Report was prepared for the EA in December 2018. The draft report specifically assesses the risk associated with long range, long period Atlantic swells, recognising that the highest impacts are generally caused by the extremes in the wave climate. The model output shown below, under present day conditions for flood defences, indicates that the area of Pelistry Ledges where the Cliffside Boreholes are located would be subject to flooding under the model scenario or condition of 50% of the Annual Exceedance Probability (T2 Def). The risk of inundation and therefore operational loss of these boreholes, even for a short period of time would result in either the complete loss of supply to St. Mary's or high nitrate exceedances over a prolonged period, resulting in a health-related water quality event and failure to achieve drinking water standards.

Figure 1: Model Flood Extents – St. Mary's defence levels - Present Day



11. Furthermore, water availability in these boreholes has been falling in recent years and it is proving challenging to abstract the minimum requirement of 19m3/hour for single train desalination plant operation. These boreholes are not regularly monitored for levels, flows or conductivity and are not permitted by the Environment Agency due to the current unregulated situation on the islands. SWW is actively planning to install remote level, flow and conductivity monitoring on these and all other boreholes in the coming weeks. All indications are that the water availability in these boreholes will be found to be unsustainable in the near future.

12. In response to this flood modelling report, SWW has developed a solution to construct a permanent sea intake for the desalination plant to ensure this vital water resource would be available to the islands all year around and would be protected from any potential flood inundation. The solution would require specialist directional drilling to ensure the sea intake is protected from extreme weather

conditions all year round, is safe to operate and maintain, and is appropriate for the natural environment in which it would be located.

13. The costs associated with the permanent intake are circa £1,700k based on initial design outputs.

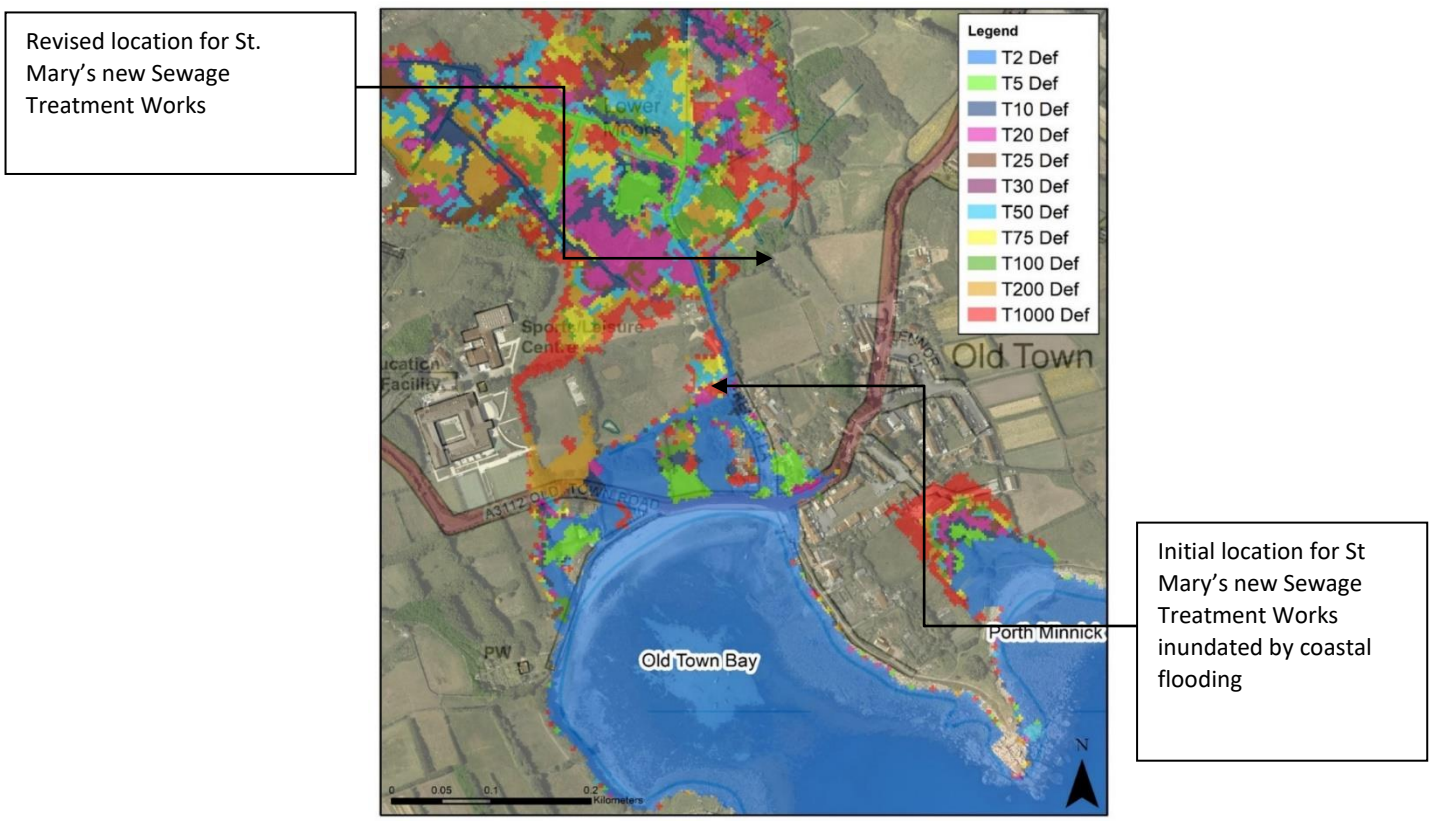
Reduce inundation flooding risk to new wastewater treatment works – relocate works with new dedicated discharge away from tourist areas

14. A key requirement for St. Mary's was the provision of appropriate, sustainable sewage treatment for the residents of Old Town and Hugh Town. Our PR19 business plan solution is based on the proposed sewage treatment works (STW) location proposed by the Council of the Isles of Scilly, near the site of the existing Bio Bubble plant at Trench Lane near Old Town. The Isles of Scilly Coastal Flood Modelling Draft Report shows that this area of Old Town will be significantly impacted by coastal flooding under present day conditions, with current defences, see Figure 2 below.

15. This has necessitated the proposed location for the wastewater treatment works to change and move to the east to higher ground. This will require the construction of a new discharge outlet sewer from the sewage treatment works to the adjoining Porth Minnick bay. The original discharge to the Old Town Bay has already been shown to be inappropriate and controversial due to the tourist nature of this bay, where children frequently play on the discharge pipe from the current Bio-bubble works. The relocation to Porth Minnick will ease any local reaction, as this is a rocky bay just below the airport which is seldom visited by tourists or locals. The outlet sewer will also support the proposed new housing development at Old Town and will also act as a surface water discharge for the development.

16. To enable the design and construction of the wastewater treatment works in the revised location, we are entering into negotiations with the Duchy of Cornwall, as ownership of the site rest with them. The land is currently farmed by a tenant farmer who will need to be compensated to give up this land for the wastewater treatment works. The original proposed site is owned by the Council of the Isles of Scilly and would have been much more straightforward and cost effective to purchase and develop.

Figure 2: Model flood extents St Mary's Old Town Bay Defended present day



17. The estimated cost for the additional discharge outlet sewer is estimated at £750-£1,000k.

St. Agnes & St Martins – Increase in system capacity to support transfer of private supplies at customer request

18. The water resources and treatment requirements on St. Agnes proposed in the PR19 business plan included an upgrade of the existing treatment to ensure compliance with water quality standards but broadly maintained the customer base at the current level. To meet affordability constraints the majority of the investment in St. Agnes was planned for AMP8. This includes securing appropriate water resources, treatment and network provisions scaled to meet the maximum demand on the island.

19. In January 2019 South West Water took part in a community engagement programme on the Isles of Scilly, prior to the release of Ofwat's public consultation on the variation of the license to operate, where every island was visited, and communities invited to share their thoughts on the proposed changes to their water service provision. We had been aware that a significant number of residents of St. Agnes, and also St. Martin's, were private supply owners and had allowed for some additional requests to connect to the future South West Water networks on these islands and in line with our investment programme. However, the strength of feeling among residents in their wish to connect to the future supply was much greater than anticipated. It is now likely that the majority of residents on both islands will submit requests to connect to the South West Water network quite soon after we take up operations. To address this and connect those residents with serious concerns regarding the quality of their private supplies we will need to bring forward the planned investment in St. Agnes.

20. When the PR19 business plan was prepared for the Isles of Scilly, the priority for SWW was investing to safeguard the existing community supply. The scale of the quality issues with the private supplies, the risk to public health that they presented and the urgency with which residents intend to request to transfer to the future South West Water supply became clear to us in the community engagement of January 2019.

21. At this time, the long-term viability of the groundwater sources on St. Agnes & St Martins is not well understood but South West Water plan to begin monitoring levels, flows and conductivity in the coming weeks to gain this understanding and inform the first Isles of Scilly Water Resource Management Plan. We are also planning a water quality sampling programme due to start in summer 2019. This data will be used to advise the design of new water treatment facilities on St. Agnes. The estimated additional cost to carry out the water resource, treatment and network upgrades to meet water quality standards and make all required new connections is approximately £2.759m.

Bryher – Water Resources and Treatment Resilience

22. During South West Water investigations into existing assets and their performance on the Isles of Scilly, we became aware of a bespoke low-pressure reverse osmosis (RO) plant used to treat high salinity borehole water on Bryher. This plant was installed by the Council of the Isles of Scilly in May 2017. The plant effectively removes salinity and is delivering compliant water into supply since it was commissioned. However, in common with other membrane processes, the water losses through the process are high, up to 60% of the feed water is lost through the process, in spite of good operational practices including blending raw water with the RO treated water and recycling high salinity effluent through the low-pressure RO process.

23. The result of this is, that in order to meet demand, raw water abstraction from boreholes on Bryher has increased to cover the losses from the low-pressure RO plant. After the dry, hot summer of 2018 borehole levels dropped and salinity levels increased on Bryher. While levels have recovered over the winter and spring of 2019, salinity levels have remained high raising concerns that saline intrusion is taking place in these boreholes. Further online monitoring is being rolled out in June 2019 and will

provide a more definitive answer to the question of saline intrusion, but if this is the case, SWW will need to consider either alternative resources for Bryher, possibly via subsea pipeline from Tresco or an alternative treatment process for the increasing salinity in the Bryher boreholes.

SPECIAL TOTEX CLAIMS

UV Treatment (SWB.DD.CA15) – RSNP2: Wastewater: complexity of treatment and UV consents

1. Overall the **claim of £13.6m** associated with wastewater base costs for UV consents, which incorporates an efficiency against the estimated costs and allows for an assumed implicit totex allowance.

Background

2. In our 2018 cost adjustment claim submission,[9] we provided evidence on a number of areas, submitting three claims (Isles of Scilly, Knapp Mill, and Alderney water treatments works) and highlighted that we assumed a number of other areas would be captured by Ofwat's cost assessment modelling. In particular, we stated 'To the extent that these key characteristics are captured appropriately within Ofwat's cost modelling for PR19, we would not consider it necessary to make any wastewater complexity/UV cost adjustments for SWW, though given the data available we consider it will be difficult to capture UV treatment in the industry cost models.'

3. Indeed, it is clear that none of Ofwat's wastewater models account for UV treatment. Ofwat's models at draft determinations were:

Table 1: Ofwat modelling variables

Model name	SWC1	SWC2	SWT1	SWT2	BR1	BR2	BRP1	BRP2
Dependent variable (log)	Sewage collection		Sewage treatment		Bioresources		Bioresources + Sewage treatment	
Sewer length (log)	0.819***	0.897***						
Load (log)			0.856***	0.847***			0.840***	0.809***
Sludge produced (log)					1.217***	1.186***		
Load treated in size bands 1-3 (%)			0.058**		0.053***		0.051***	
Load treated in size band 6 (%)				-0.015*				-0.011**
Pumping capacity per sewer length (log)	0.281*	0.619***						
Load with ammonia consent below 3mg/l (%)			0.004***	0.004***			0.005***	0.005***
Number of properties per sewer length (log)	1.186***							
Weighted average density (log)		0.193 (0.109)			-0.235*			
Sewage treatment works per number of properties (log)						0.325*		
Constant term	-8.588***	-6.534***	-6.273***	-4.765***	-0.542	0.775	-5.777**	-4.296***
Overall R-Squared	0.93	0.87	0.87	0.85	0.82	0.80	0.92	0.92
Number of observations	70	70	70	70	70	70	70	70

4. Although complexity of treatment is captured, though the variable 'load with ammonia consent below 3mg/l (%)', the impact of UV treatment is not. Therefore, we consider that Ofwat should make an adjustment to account for the higher costs associated with UV treatment. As such, we are re-submitting updated evidence on the impact of UV treatment to support this variable within the cost modelling.

[9] South West Water Limited (2018), '2019 Price Review: Cost Adjustment Claim', 3 September.

Need for the claim

5. The level of required treatment is driven by local environmental sensitivities and is a key driver of wastewater service costs. There is a wide variety in permits and treatment approaches across the industry. While this operational aspect should be included in the modelling, it is very likely that the specific approach will not appropriately predict South West Water's costs. This is because UV treatment is not included in the aggregate level data, but only in the large wastewater treatment data (while data on other permits is included in the aggregate dataset). As a result, Ofwat's current models, as used at draft determinations do not include UV treatment.[10] As such, we set out below our particular issues.

6. One third of the designated bathing beaches in England and Wales are within the South West Water region, along with sensitive habitats and shellfish waters. Legislation starting with the original 1974 EU Bathing Water Directive led to a significant programme of improvements from the late 1970s to now. With the major population centres also being predominantly coastal, the result is higher sewage treatment operating costs due to the higher standards of treatment required for bathing waters and with higher operating costs driven by the large number of small works arising from the topography.

7. The Environment Agency requires us to operate UV plants all year round, due to shellfish waters and high recreational water use year-round (in contrast with Northumbrian Water and Welsh Water, where it has been possible to negotiate seasonal UV operation in a number of locations).

8. When compared to other companies, we have proportionally many more wastewater treatment works with UV processes.

Table 2: Industry comparison of wastewater treatment works with UV processes

	% of works with pathogen reduction (mostly UV disinfection)	% p.e. served by works with pathogen reduction (mostly UV disinfection)
Anglian	0.6%	2.5%
Dwr Cymru	4.3%	21.8%
Northumbrian	1.4%	50.8%
Severn Trent	0.0%	0.0%
Southern	1.9%	4.3%
South West	**9.0%**	**70.8%**
Thames	0.0%	0.0%
United Utilities	4.3%	13.1%
Wessex	4.4%	26.3%
Yorkshire	1.3%	2.6%
Industry Average	**2.6%**	**10.4%**

Source: *SWW Company Special Factors Final PR09 Submission (April 2009) – more recent data is not directly available, however, the UK 2014 UWWTD data return confirms a similar position is maintained with the percentage p.e. served by UK works with UV treatment at 11.52%.*

9. The three companies with the largest proportion of population equivalent served by pathogen reduction works: South West, Northumbrian and Dwr Cymru all perform in the bottom half of the industry in Ofwat's draft determination models of sewage treatment and aggregate wastewater base expenditure over the historical period. Furthermore, all three companies face substantial challenges to their business plan base expenditure over AMP7 at the draft determination stage.

[10] Ofwat (2019), 'PR19 Draft Determinations: Securing cost efficiency technical appendix', July.

10. This does not take into account the additional costs that are incurred in operating these UV processes at works. Furthermore, the costs are compounded by the costs of monitoring which at smaller sites can be up to 200% of the annual running cost of these works.

11. On the other hand, the same coastal characteristics result in the South West Water region generally having lower numbers of permits with tight ammonia limits. As such, when modelling this issue in this submission, we have included the advantageous effect of lower ammonia alongside the disadvantageous effect of UV consents (note that, in the models we submitted as part of the cost model consultation, only advantageous effects of lower ammonia consents were included).

12. To the extent that these key characteristics are captured 'in the round' within Ofwat's cost modelling for PR19, we stated in our 2018 submission that we would not consider it necessary to make a regional cost adjustment for this issue for SWW. However, Ofwat's current cost modelling, as undertaken for the draft determinations, does not capture this issue appropriately, as only ammonia consents are included in the cost modelling. Thus, SWW's predicted costs are too low,[11] as the higher costs associated with UV treatment / tight consents / bathing waters are not being captured and the allowances would, in the round, be insufficient to accommodate these special factors without a claim. As noted above, the performance of other companies with large proportion of UV treatment suggests this might be a relevant omitted factor.

Management control and mitigation

13. Bathing Water designation is made in line with the Bathing Water Directive and associated UK regulation and policy. The South West region has the highest numbers of bathing waters of all UK WASCs and over one third of all the bathing waters in England. UV disinfection is required on wastewater discharges that would otherwise impact adversely on bathing water quality and compliance with the Bathing Water Directive and associated UK regulations. UV may also be required to protect shellfish water quality (now covered under the Water Framework Directive). The need for UV is included in discharge permits from the EA. As previously described seasonal UV is a possibility, but not for shellfish waters and / or where there is high recreational use of bathing waters out-of-season. SWW has worked closely with the EA in assessing the requirements for UV on our wastewater discharges to ensure the need is scientifically robust and justified. Options to avoid UV are also used such as relocating discharges to less sensitive locations and the use of long-sea outfalls, where most cost effective. As such SWW have exerted appropriate management control, where available, and the UV requirements remaining are beyond that reasonable influence.

Quantification of the efficient costs of the claim

14. As discussed above, environmental quality permits and WWTWs near the coast / bathing waters is clearly outside our control. However, it is not possible to readily quantify this factor as UV permits are not collated at the company level for modelling in any of the value chain models.

15. We have developed two approaches to quantifying the impact of UV on our costs:
    - a bottom-up approach based on an assessment of the incremental expenditure South West faces as a result of running UV treatment works; and
    - a top-down approach based on econometric models we have developed using the large WWTW's dataset shared by Ofwat in the company datashare.

[11] Ofwat (2019), 'PR19 Draft Determinations: Securing cost efficiency technical appendix', July.

Bottom-up quantification of the impact of UV treatment

16. In developing our bottom-up quantification of the impact of UV treatment on operating expenditure the primary driver is running and replacing UV bulbs. We have 6,754 UV bulbs running across a large number of generally small sites, 63 in total, as shown in the table below. It is also apparent from table 2 above that while SWW have a significantly higher population with UV treatment than even Northumbrian, Wessex and Dwr Cymru (as the next highest UV companies), these other companies have UV on fewer and larger works with associated economy of scale efficiencies – SWW have UV on 9% of WWTW versus 4.4% for Wessex, 4.3% for Dwr Cymru and 1.3% for Northumbrian. Running UV across a large number of sites increase expenditure on replacement, monitoring and capital maintenance.

Table 3: UV Site Details

SPID	Site	Consent start	Total lamps	Lamp power type	UV manufacturer	UV model	PLC ballast type
S3013	Ashford	01/07/1997	144	F	Wedeco	TAK(33)	Philips
S6006	Aveton Gifford	05/08/2002	16	F	Wedeco	TAK(48M)	Philips
S1515	Bodmin Nanstallon	31/01/2011	72	V	Wedeco	TAKHP(48M)	Wedeco
S1517	Bodmin Scarletts Well	15/06/2011	24	V	Wedeco	TAKHP(48M)	Wedeco
S4522	Brixton	31/08/2004	8	V	Wedeco	TAK(48M)	Philips
S4722	Camels Head	01/04/2004	256	V	Wedeco	TAK(48M)	Philips
S4537	Cargreen	31/08/2004	12	V	Wedeco	TAK(48M)	Philips
S6048	Chillington	14/10/2005	12	V	Wedeco	TAK(48M)	Philips
S3349	Combe Martin	31/03/2001	48	V	Wedeco	TAK(48M)	Philips
S0028	Constantine	31/08/2002	16	F	Wedeco	TAK(48M)	Philips
S3023	Cornborough	01/01/2003	144	V	Wedeco	TAK(48L)	Philips
S7594	Countess Wear	03/07/2003	594	V	Wedeco	TAK(48M)	Philips
S3071	Croyde	08/07/2003	24	F	Wedeco	TAK(48M)	Philips
S6412	Dartmouth	01/09/2002	72	V	Wedeco	TAK(48M)	Philips
S6524	Dawlish	01/01/2001	48	V	Wedeco	TAK(48L)	Philips
S6084	Dittisham (UV)	01/05/2012	8	V	Wedeco	TAKHP(48S)	Wedeco
S4724	Ernesettle	15/05/2001	324	V	Wedeco	TAK(48M)	Philips
S7600	Exmouth	05/10/1999	144	V	Wedeco	TAKHP(48M)	Philips
S0061	Falmouth	01/01/2001	120	V	Wedeco	TAKHP(48M)	Philips
S1545	Fowey	18/01/2003	48	V	Wedeco	TAK(48M)	Philips
S6130	Galmpton Hope Cove	01/01/2003	8	F	Wedeco	TAK(48M)	Philips
S1900	Golant	31/01/2011	8	V	Wedeco	TAKHP(48M)	Wedeco
S1569	Gorran Haven	02/12/1996	16	F	Wedeco	TAK(33)	Philips
S6148	Heathfield	01/04/2010	48	V	Wedeco	TAKHP(48M)	Wedeco
S4614	Holbeton	01/10/2002	8	F	Wedeco	TAK(48M)	Philips
S3149	Ilfracombe	01/10/1997	60	F	Wedeco	TAK(33)	Philips
S4622	Ivybridge	29/05/2015	32	V	Wedeco	TAKHP(55M)	Wedeco
S6190	Kenton & Starcross	05/08/2002	36	V	Wedeco	TAK(48M)	Philips
S6194	Kingsbridge	19/01/2005	48	V	Wedeco	TAK(48M)	Philips
S0128	Ladock	17/02/2003	24	V	Wedeco	TAK(48M)	Philips
S1624	Little Petherick	31/01/2011	8	V	Wedeco	TAKHP(48M)	Wedeco
S4658	Lodge Hill	01/04/2006	48	V	Wedeco	TAKHP(48L)	Philips
S4660	Looe	04/04/2000	36	V	Wedeco	TAKHP(55L)	Wedeco

SPID	Site	Consent start	Total lamps	Lamp power type	UV manufacturer	UV model	PLC ballast type
S1626	Lostwithiel	31/01/2011	12	V	Wedeco	TAKHP(48M)	Wedeco
S1703	Luxulyan	01/04/2006	48	V	Wedeco	TAK(48M)	Philips
S7802	Lyme Regis	30/09/1996	60	V	Wedeco	TAKHP(48M)	Philips
S1702	Menagwins	18/12/1996	180	F	Wedeco	TAK(33)	Philips
S4676	Menheniot	29/05/2015	8	V	Wedeco	TAKHP(55M)	Wedeco
S0140	Mylor	18/12/2002	8	F	Wedeco	TAK(48M)	Philips
S0240	Newham	01/04/2004	168	V	Wedeco	TAK(48M)	Philips
S1652	Newlyn East	20/03/2002	16	F	Wedeco	TAK(48M)	Philips
S1653	Newquay	07/07/2000	150	F	Wedeco	TAK(33)	Philips
S7702	Otterton	01/04/2003	24	F	Wedeco	TAK(48M)	Philips
S0172	Perranporth	05/11/1997	144	F	Wedeco	TAK(33)	Philips
S4731	Plymouth Central	23/12/2005	2240	F	Infilco Degremont Incorporated	NULL	NULL
S0173	Porthallow	26/08/1999	4	F	Wedeco	TAK(33)	Philips
S1714	Porthilly	29/06/1999	48	F	Wedeco	TAK(33)	Philips
S0179	Porthleven	01/05/1997	24	F	Wedeco	TAKHP(48S)	Philips
S0180	Porthtowan	31/05/2002	36	V	Wedeco	TAKHP(48S)	Philips
S6234	Salcombe	14/01/1997	30	V	Wedeco	TAKHP(48M)	Philips
S7756	Seaton	26/06/2003	72	V	Wedeco	TAK(48M)	Philips
S1701	Seaton & Downderry	24/03/1998	16	F	Wedeco	TAK(33)	Philips
S8080	Sidmouth	01/01/2001	80	V	Wedeco	TAK(48M)	Philips
S1706	St Columb	01/04/2008	60	V	Wedeco	TAKHP(48M)	Philips
S3254	St Gennys	01/04/2007	8	V	Wedeco	TAKHP(48S)	Wedeco
S0216	St Mawes	30/01/2003	24	V	Wedeco	TAK(48M)	Philips
S6515	Torbay	30/04/2002	432	V	Wedeco	TAK(55M)	Philips
S6321	Totnes	31/03/2004	54	V	Wedeco	TAK(48M)	Philips
S0230	Trecerus	22/10/1997	128	F	Wedeco	TAK(33)	Philips
S1730	Treknow	01/04/2007	8	V	Wedeco	TAKHP(48S)	Wedeco
S1765	Wadebridge	31/08/2004	96	V	Wedeco	TAK(48M)	Philips
S6336	West Charleton	30/09/2004	8	V	Wedeco	TAK(48M)	Philips
S3332	Woolacombe	31/03/2001	54	V	Wedeco	TAK(48M)	Philips

17. The impact of running these UV sites is set out below:
    - the current energy price per kwh is 10.5p, and average consumption of UV bulbs is 260W. Allowing for an element of downtime it is assumed UV treatment is operational 90% of the time. With these factors the power costs are calculated as follows:
        - £0.105 x 0.260kW x 90% x 6,754 x 8,760 = £1.454m
    - regarding bulb replacement costs, UV lamps are prepaid over a 30 month period in line with manufacturer's guidelines. In 2017/18 the total in year cost of lamps released was £0.191m
    - average telemetry costs per annum are c.£2k per site across 63 sites, equating to £0.126m
    - Since our previous special cost factor submission, an additional 7 sites have had UV installed and the monitoring costs are now £0.453m

- Pre-bathing water season checks are carried out at UV sites to ensure they are ready to treat additional loads. The average annual cost over the previous 3-year period for this is £0.046m.

18. This is summarised in the table 4 below:

Table 4: Operating cost impacts within 2015-20

Operating costs item	Value p.a. (£m)
Power	1.45
Bulb replacement	0.19
Telemetry	0.13
UV monitoring	0.45
Pre-bathing water season checks	0.05
TOTAL	**2.27**

19. Capital maintenance costs not included in the above relate to the electrical equipment and any civils upkeep, for example. Below we estimate the impact of UV on maintenance costs based on AMP6 as well as expectations for AMP7 based on also including Plymouth.

20. We have undertaken the following proactive and reactive maintenance on UV equipment over AMP7.

Table 5: Capital investment within 2015-20

Year	6.01 UVT programme	6.01 UV refurb	6.01 – Looe fire damage	6.01 – RIO	6.01 – Reactive	6.02 – Ops reactive	Total (£)
1		154,000	322,000	36,460	96,744	45,024	654,228
2	103,000	41,000		39,207	84,721	250,855	518,783
3	103,000			13,273	59,870	162,545	338,688
4	82,000	30,000		4,565	78,978	243,760	439,303
5		40,000		37,208	24,444	32,423	134,075
Total	**288,000**	**265,000**	**322,000**	**130,713**	**344,757**	**734,607**	**2,085,077**

21. Whilst expenditure reduces in year 5 of the programme this reflects an offset due to the acceleration of maintenance investment in response to the Looe Fire Damage in year 1 of the programme as spend was re-balanced – hence we have left the Looe expenditure in the overall spend assessment. The overall programme over the five years has resulted in an average spend of around £417k per annum.

22. For AMP7, the predicted capital maintenance expenditure for UV expenditure is £4.8m. This includes two components;

    - The replacement of the Plymouth Central final effluent UV installation which is estimated at £2m. This site is one of the oldest and largest UV installations within SWW and is considered to be life expired. The business plan seeks to fully replace this installation as performance and reliability is deteriorating. (See figures 1 and 2 below)
    - Maintenance across the remainder of the UV sites of £2.8m. This implies average annual maintenance spend of £560k per annum across the asset base.

23. Figure 1 shows the age profile of the UV sites including Plymouth Central. Figure 2 shows the performance and breakdown information for Plymouth Central. As can be seen the breakdown performance information for Plymouth Central is increasing as a result of the deterioration of the asset base requiring the replacement of the UV treatment process to be considered. The site was originally constructed in 1998 and then upgraded in 2005 as part of the requirements of the NEP for new treatment standards. A UV treatment process typically has an asset life of 15 years. The Plymouth site is now 21 years old and was last upgrade 14 years ago and is considered to be approaching end of life. The performance data for the site in Figure 2 confirms the need to undertake replacement activity at the site. Many of our UV sites are generally now over 15 years old and performance risk is increasing requiring a replacement strategy which is different from our past investment needs.

Figure 1: Age profile of all UV Sites within deterioration model

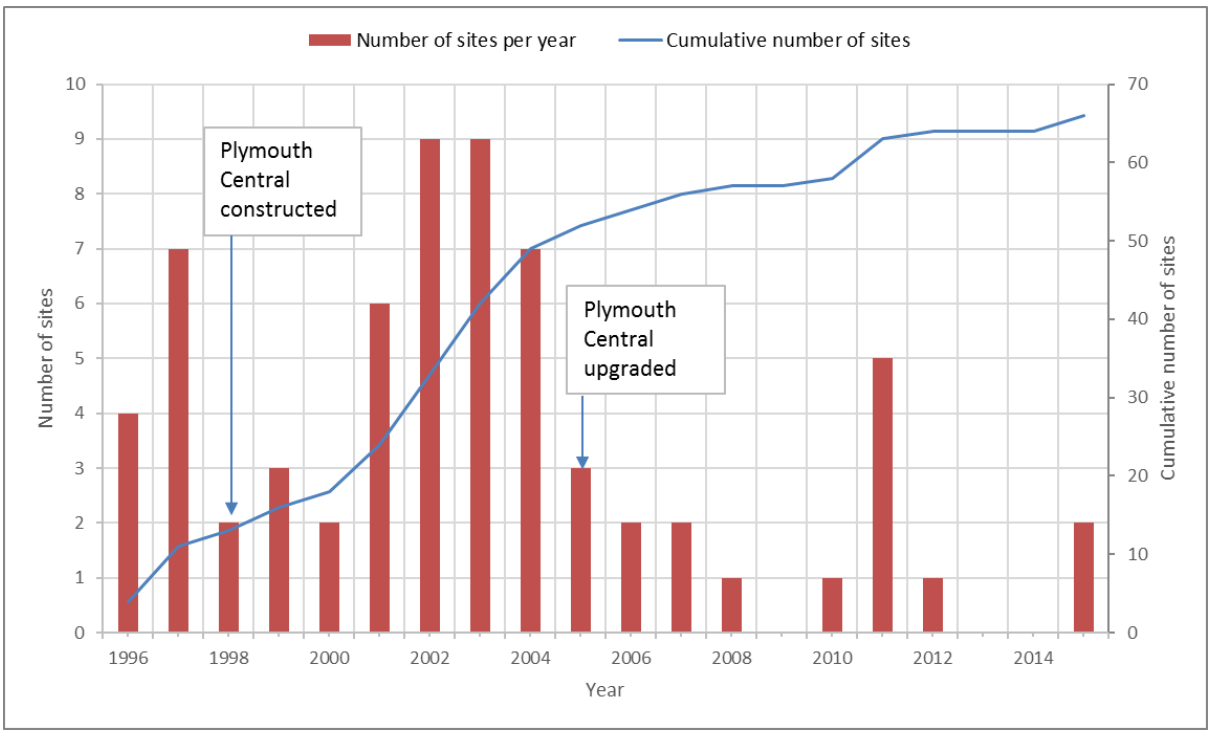
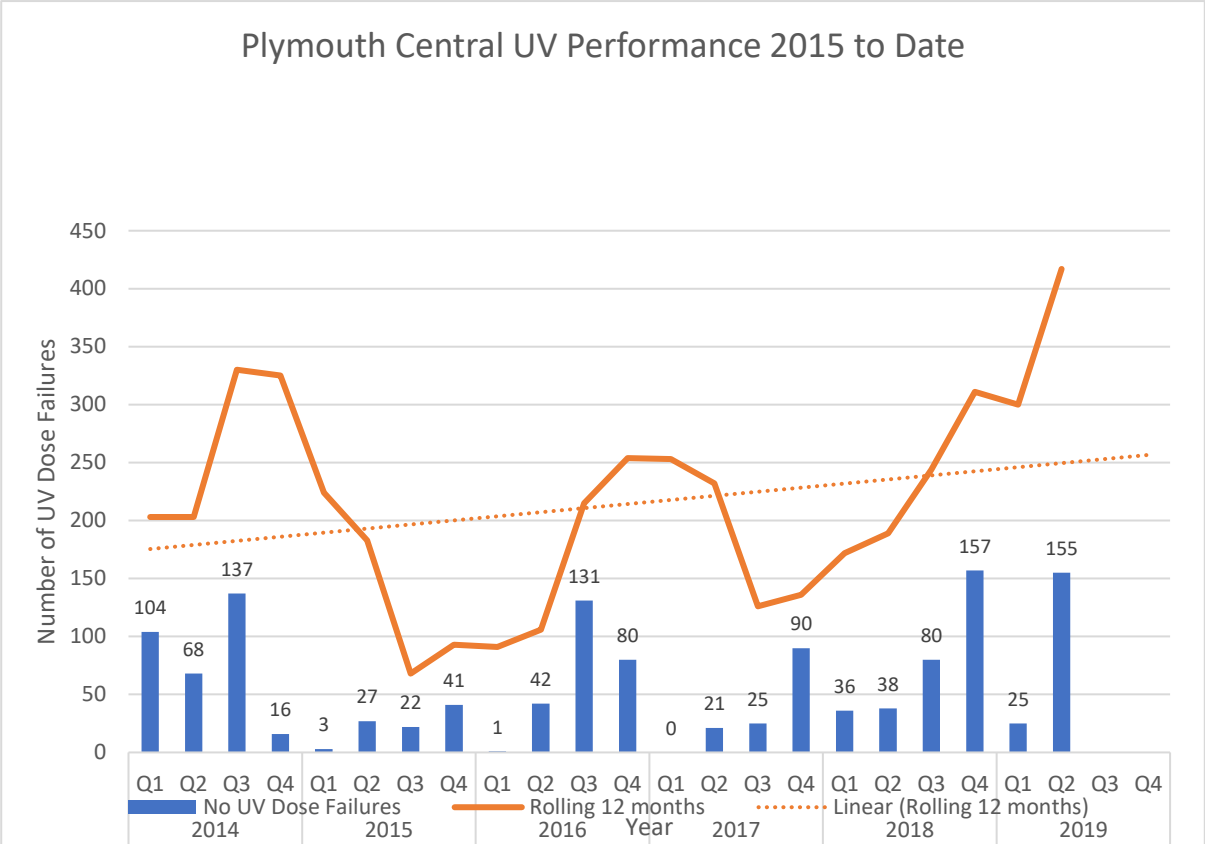


Figure 2: Performance and breakdown information for Plymouth Central UV installations

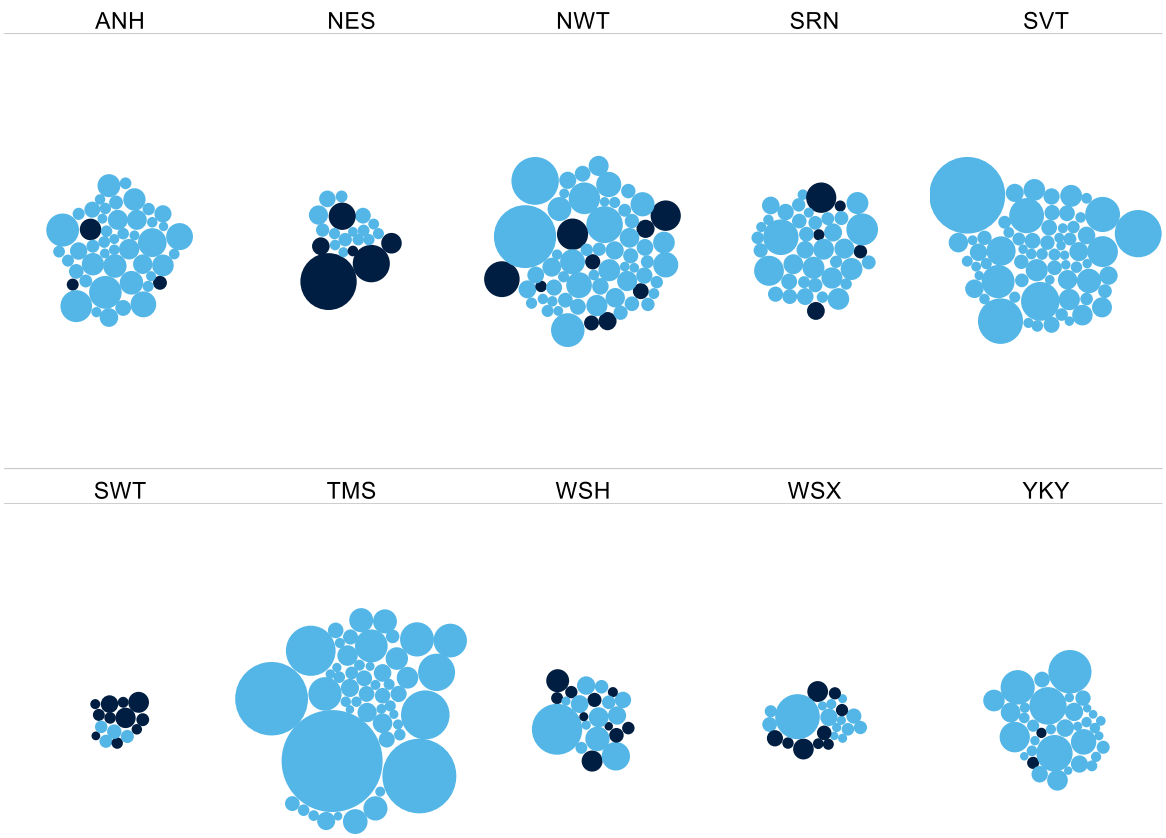


24. Thus, in total, we estimate, from a bottom up perspective that our base expenditure for UV treatment is **£3.23m** p.a. Over AMP7 this implies a total cost adjustment claim of **£16.15m** (**Top-down quantification of the impact of UV treatment).**

25. To cross check this figure and to provide evidence that this quantification is robust, efficient, and incremental we developed econometric large treatment works models. Although these models only cover the cost base of large treatment works operating costs, it is the only dataset that provides data on UV permits and associated expenditure across the industry. We pro-rate this impact to the rest of the cost base.

26. In figure 3 below we show the distribution of UV across large works. Each point is a treatment works, scaled by load treated. Works which carry out UV treatment are coloured in dark blue, while works that do not carry out UV treatment are coloured in light blue. It can be seen that a disproportionate proportion of load treated by SWW requires UV treatment and that this treatment is typically carried out at smaller works than for the rest of the industry.

Figure 3: Wastewater treatment works size and UV comparison



27. We have used a balanced approach, and, in our models, we have included both the proportion of tight ammonia permits (a relatively advantageous factor) and UV permits (a disadvantageous factor). With the exception of including UV permits, our models are otherwise consistent with Ofwat's draft determination models: controlling for the amount of load treated, the tightness of ammonia consents and—as the data is modelled at the treatment work level—works size is accounted for through the load treated variable. These models are detailed in Appendix 2 of this document. We have also included a sensitivity in which we removed all of the South West Water treatment works from the sample and re-estimated the model. We find the coefficients are not materially changed, demonstrating that this is an industry relationship, rather than being driven by South West Water.

28. We adopted three approaches to estimating the incremental impact of a claim of UV within our two models:
    - Approach 1—the coefficient on UV treatment multiplied by South West Water's deviation from the average percentage of load treated with UV
    - Approach 2—the difference in cost prediction between South West Water and a hypothetical company with our treatment works but no UV treatment. As we would expect this approach to potentially overstate the impact of this claim, this informs the range but is not used to set the central estimate
    - Approach 3—the impact on the efficient (UQ) cost prediction for South West Water when the UV permit variable is removed from the model.

29. We find an impact ranging between £1.12m-1.66m p.a. depending on the model and approach used, with a central estimate of **£1.17m p.a**. (based on the average of a number of estimated)

30. We extrapolate this impact to small works using the ratio of UV lamps at large works (4,716) to those at small works (2,150), which gives an uplift factor of 1.46.[12] We considered this to be the most appropriate basis as costs scale directly with the number of lamps used. This can be seen in our bottom-up quantification of the claim. Applying this ratio leads to a pro-rated impact across all wastewater treatment operating costs of **£1.70m p.a.** This may understate the true OPEX associated with UV treatment at small works, as the factors such as diseconomies of scale would be expected to compound the additional expenditure associated with UV treatment.

31. It is more difficult to extrapolate expenditure to capital maintenance. Applying the same ratio of operating costs to capital maintenance as we identified in our bottom-up assessment over the historical period would give an impact of £1.79m p.a. In total, our top-down estimate of the impact of UV treatment on base expenditure is £9.5m across a 5-year AMP. Applying a historical catch up target for South West Water over the historical period[13] gives a lower figure of **£9.2m** over the AMP[14].

Comparison of Top-down and bottom-up quantification of the impact of UV treatment

32. This £9.5m can be considered as a cross check to the bottom-up assessment. There is a gap of £6.7m over AMP7 between this top-down quantification and our bottom-up assessment. £3.0m of this gap can be explained by the difference in capital maintenance schedules on an historical basis compared to a forward-looking basis. The maintenance requirements for AMP6 have been relatively small, constituting only 13% of expenditure on UV. As discussed above, this is expected to increase substantially over AMP7 as a result of a significant increase in maintenance and replacement, in particular at the central Plymouth works. There is substantial replacement required across the UV asset base as many of the sites are approaching the 15-20 year position where first time replacement is required following the initial investment within the NEP. This is supported by both the age profile of the asset base and the deteriorating performance and increasing risk across the asset base.

33. The remaining £3.7m gap between the bottom-up and the top-down assessments is likely to be driven by the downwards bias in the top-down estimate from pro-rating the impact on large works to small works, as economies of scale are not accounted for. That is, by basing the pro-rating methodology on the number of lamps, we would weight the incremental cost of UV treatment equivalently between the 53 works which operate the remaining 2,150 UV lamps and a hypothetical single work which operated the same total number of lamps.

34. South West Water is constrained by its geography and population distribution in the extent to which it can consolidate across its large network. The incremental impact on power efficiencies, bulb replacement and, in particular, monitoring should be considered outside of management control and allowed for in Ofwat's efficient cost allowance for South West Water.

35. The £3.7m gap is also likely to be driven by other factors that are not accounted for in the top-down assessment, in particular the extent to which other companies are able to operate UV treatment seasonally rather than year-round.

36. We therefore consider that the lower top-down assessment should not be considered as evidence to revise the bottom-up estimate downwards, but rather a downwards-biased cross check which remains high and material.

[12] (2,150 + 4,716) / (4,716)

[13] 1.054, Ofwat (2019), 'Feeder model 2: Wholesale wastewater – Wastewater Catch up adjustment', 18 July.

[14] In calculating this backwards-looking catch up target we have incorporated the efficient UV expenditure. First we applied Ofwat's 1.054 challenge to the UV expenditure to get an efficient allowance of £9.0m. Then we recalculated the historical catch up accounting for an additional £9.0m of additional efficient expenditure from UV which is not controlled for in the feeder models. The resulting catch up target of 1.040 was used to derive the figure above.

Implicit Allowance

37. Another reason for the gap is that the bottom-up quantification sets out the total expenditure driven by UV treatment, whereas the top-down quantification is incremental to the industry average and, therefore, already accounts for any implicit allowance in Ofwat's models. Thus, it is necessary to remove an implicit allowance from our bottom-up quantification.

38. We use the top-down models we have developed above to estimate an implicit allowance for the bottom-up UV claim. However, as it relies on the large works data it is subject to the same issues with regard to not capturing all the drivers of difference between SWW and the industry. Therefore, it overstates the implicit allowance.

39. To derive this implicit allowance, we estimate the result using approach 2[15] above for every company in the industry. We find that the average company has an uplift of 4.0% when UV consents are accounted for, relative to 12.8% for South West Water. This implies that 31% of the impact of UV consents is implicitly allowed for within the large sewage treatment works model. If this is applied to the large works OPEX impact in isolation this would suggest an implicit allowance of **£1.84m** over the AMP. This is a lower bound for an implicit allowance of total expenditure relating to UV as it is unlikely that no other companies have treatment works in size bands 1–5 that use UV treatment or capital maintenance associated with UV. However even this lower band is likely to be biased upwards as it does not account for seasonality of operation in operating large works—i.e. that SWW operates all UV works year-round whereas some comparators are permitted to operate seasonally.

40. Extrapolating this impact to the total top-down impact, using the same pro rating as for the quantification for South West Water, would give an implicit allowance of £2.96m. However, this is likely to be an overstatement, as it is unlikely that other companies have the same ratio of small UV works to large UV works as South West Water. Please refer to our wastewater growth cost adjustment claim for evidence on SWW's atypical prevalence of small wastewater treatment works relative to the rest of the industry. As such we would consider this to be an upper bound for a possible impact of the cost of UV treatment.

41. We consider a simple average of the two to represent a reasonable central estimate for the implicit allowance within the data for cost associated with UV. This provides an implicit allowance estimate of **£2.36m** over AMP7.

42. Accounting for the implicit allowance leaves a £1.3m gap over the AMP explained by the downwards bias inherent in the top-down approach.

[15] We use approach 2 of the three approaches as it estimates total cost (rather than the incremental cost relative to the industry average, as estimated by approaches 1 and 3). As such, it is the only approach of the three that can be used to calculate the implicit allowance for the industry.

Efficiency challenge and incremental impact of UV treatment

43. Finally, we overlay an efficiency challenge onto the bottom-up claim, derived from the gap between our submission and Ofwat's allowance over AMP7. This is then consistent with our top-down quantification which includes a backwards-looking efficiency challenge. Taking into account our submitted cost adjustment claims for UV and growth at wastewater treatment works[16] gives a challenge of 1.3% over AMP7.[17]

44. The combined impact of implicit allowance and efficiency challenge on the final claim is set out below.

	Estimated AMP7 cost £m	**Implicit Allowance £m**	**Efficiency challenge £m**	**Claim £m**
UV cost claim	16.15	2.36	0.18	**13.61**

45. Thus, we estimate the incremental impact of UV treatment to be **£13.6m**, based on our bottom up quantification. This compares to £12.5m (£9.4m + £3m), based on our top-down quantification, which, as stated above, is biased downwards.

[16] Note that this does not account for other cost adjustment claims, so this will potentially overstate the size of the efficiency challenge and therefore understate the post efficiency claim value.

[17] In calculating this forward looking catch-up target we have incorporated the efficient UV and growth at sewage treatment works cost adjustment claims. If these claims were not accounted for, then this would imply an efficiency challenge of 5.7% and an efficient cost prediction of £13.0m.

Appendix 1: Cost adjustment claim summary form

Name of claim	**Wastewater: UV treatment**	
Claim identifier		
Price control(s) the claim relates to. (Please delete those not relevant)	Network plus wastewater	
Total value of claim for AMP7	£15.97m. Note that this includes an efficiency challenge of £0.18m.	
Total opex of claim for 2020-2025	£11.23m	
Total capex of claim for 2020-2025	£4.75m	
Depreciation on capex in 2020-2025 (retail controls only)	n.a.	
Remaining capex required after AMP7 to complete construction	£0m	
Whole life totex of claim	£15.97m	
Do you consider that part of the claim should be covered by our cost baselines? If yes, please provide an estimate.	**Yes. £2.37m is implicitly allowed for within Ofwat's cost baselines. This leaves £13.61m unaccounted for.**	
Expected materiality of claim impacting on 2020-2025 as percentage of business plan (5 year) totex for the relevant control(s) (please tick)	1.5%. Note this materiality calculation is based on the claim net of the implicit allowance.	
Is the claim likely to feature as a Direct Procurement for Customers (DPC) scheme? (please tick)	Yes	No
		X

	Brief summary of evidence to support claim	**List of accompanying evidence, including document references, page or section numbers.**
Need for claim	The level of required wastewater treatment is driven by local environmental sensitivities. One third of the designated bathing beaches in England and Wales are within the SWW region. The Environment Agency requires us to operate UV plants all year round, due to shellfish waters and high recreational water use year round (in contrast with Northumbrian Water and Welsh Water). When compared to other WASCs, SWW has proportionally many more WWTW with UV processes. On the other hand, we generally have lower numbers of permits with tight ammonia and phosphorous limits. Ofwat's modelling only accounts for our advantageous factor, and not the UV treatment. When modelling this issue in this submission, we have included both the advantageous effect of lower ammonia and phosphorous permits alongside the disadvantageous effect of UV consents.	SWW Cost Adjustment Submission (above)

Management control and mitigation	Bathing Water designation is made in line with the Bathing Water Directive and associated UK regulation and policy. The South West region has the highest numbers of bathing waters of all UK WASCs. UV disinfection is required on wastewater discharges that would otherwise impact adversely on bathing water quality and compliance with the Bathing Water Directive and associated UK regulations. UV may also be required to protect shellfish water quality (now covered under the Water Framework Directive). SWW has worked closely with the EA in assessing the requirements for UV on our wastewater discharges. Options to avoid UV are also used, where most cost effective. As such SWW have exerted appropriate management control, where available, and the UV requirements remaining are beyond that reasonable influence.	SWW Cost Adjustment Submission (above)
Efficient cost estimate of claim	To quantify the impact of the UV consents on SWW's efficient cost base we have developed econometric models using the large WWTW's dataset. We have estimated the impact of UV consents incremental to the model, including advantageous ammonia and phosphorous consents, and relative to an upper quartile benchmark. We have also cross-checked this using a bottom up assessment of our AMP6 and projected AMP7 costs. The top down and bottom up estimates are broadly consistent.	SWW Cost Adjustment Submission (above)

Appendix 2: Large wastewater treatment works models

Below we provide the large wastewater treatment models used to evaluate cost adjustment claims within this submission (UV treatment complexity). Coefficients and standard errors are given from a cross sectional OLS models using robust standard errors. Asterisks denote statistical significance: *** p<0.01, ** p<0.05, * p<0.1. Further details are available on request.

Cost/cost driver	**Large works functional OPEX, log**	**Large works functional OPEX, log**	**Large works functional OPEX, log**	**Large works functional OPEX, log**	**Large works functional OPEX, log**	**Large works functional OPEX, log**
					(Excluding SWW)	(Excluding SWW)
Load treated, log	0.793***	0.793***	0.797***	0.797***	0.794***	0.794***
	(0.0170)	(0.0171)	(0.0172)	(0.0172)	(0.0171)	(0.0172)
Ammonia consent (>3mg/L, <10mg/L)		-0.187***		-0.173***		-0.183***
		(0.0383)		(0.0379)		(0.0387)
Ammonia consent (>10mg/L)		-0.204***		-0.160***		-0.204***
		(0.0405)		(0.0395)		(0.0411)
UV treatment	0.157***	0.162***			0.135**	0.140**
	(0.0539)	(0.0543)			(0.0591)	(0.0593)
Ammonia consent (<3mg/L)	0.194***		0.167***		0.192***	
	(0.0338)		(0.0330)		(0.0340)	
Constant	-0.00199	0.189	-0.00467	0.165	-0.00516	0.182
	(0.142)	(0.153)	(0.143)	(0.154)	(0.143)	(0.154)
Observations	783	783	783	783	753	753
R-squared	0.732	0.732	0.728	0.728	0.739	0.739

Growth Modelling – Water (SWB.DD.CA16)

1. Overall the claim associated with **water growth is £8.7m**, which incorporates an assessment of new connections allowances following the reallocation (and subsequent reduction) from costs initially included as third-party services within the business plan and other supporting information and evidence for other growth areas:

	Total £m
Modelling discrepancies	4.6
Other factors – self-lay	2.8
Other factors – low occupancy	1.3
TOTAL Special Totex Claim	**8.7**

- **Modelling discrepancies** – we have identified a discrepancy in Ofwat's application of the ONS growth data which adversely affects our allowances by £4.6m. Similarly, we have identified the updated approach to growth modelling omits some of the key drivers which reflective how costs are incurred in this area. For both observations, we have provided additional evidence to support the totex to be included within our business plan
- **Other factors** – South West Water has the lowest level of self-lay activity within England and therefore the unit costs associated with a new connection within the South West region are higher than other companies. South West Water's published charges scheme identifies a standard new connection for a typical 50 property development as £214 per connection without excavation and reinstatement or £1,404 per connection with South West Water excavation. However, one which is carried out under self-lay reduces to £63. This results in our new connection costs per unit being higher than other companies (although not considered inefficient). In addition, we observe a significant difference in population demographic, as reported by the ONS giving rise to higher than average costs for our region.

2. We propose the adjustments are made as a single enhancement allowance rather than base modelling updates and a separate enhancement allowance.

Background

3. In the PR19 Business Planning tables South West Water included £20m (£4m per annum), for the cost of clean water new connections. Within table *WS1 – Wholesale water operating and capital expenditure by business unit* these costs were included within third party services. The same value was also included within the *WS2 – wholesale water capital and operating enhancement expenditure by purpose, line 12 – new connections element of new developments* as noted within the commentary:

Table 1: Extract from Business Plan commentary (Table WS2)

Investment Area (2017-18 Prices)	2020-21 £m	2021-22 £m	2022-23 £m	2023-24 £m	2024-25 £m	Total £m
Meters for New Connections	0.191	0.190	0.190	0.190	0.190	0.951
New Communication Pipes	4.000	4.000	4.000	4.000	4.000	20.000
Total	**4.191**	**4.190**	**4.190**	**4.190**	**4.190**	**20.951**

4. Following South West Water's Draft Determination it was confirmed that the investment should be recorded within principle services (rather than third party services – with the 2018/19 APR reflecting his) and the review of Ofwat's latest view on Totex identifies that when these costs are included within growth costs overall totex is reduced by £20m.

5. The table below highlights the growth expenditure assumed to have been considered within base plus growth modelling:

	Total £m
New developments	26.4
New Connections (meters)	1.0
New Connections (previously third party)	20.0
Total growth Totex	**47.4**

Need for the claim

6. We have identified that the updated approach to growth modelling omits some of the key drivers which are reflective of how costs are incurred in this area for South West Water. We deem these costs to be significant enough to warrant an enhancement allowance such that we are not adversely affected by matters outside of our control or where our approach is creating greater market competition:

    - Modelling discrepancies (population forecasts)
    - Other factors:
        - Self-lay and contestable activity
        - Population growth to occupancy ratio
        - Rurality and nature of new developments.

Need for the adjustment

7. **Modelling discrepancies** - the ONS data used by Ofwat provides a high-level UK wide forecast for population growth. Our own property and population forecasts were prepared in accordance with the Water Resources Planning Guideline published by the EA. This methodology was used in the preparation of the company's draft WRMP published in March 2018, which underwent an internal assurance process in November 2017, undertaken by Jacobs. The final WRMP is based on this same methodology, but with the base year updated to account for 2017/18 outturn data, and the latest Office for National Statistics population estimates. Full details of the processes used to forecast these figures can be found in chapter 3 of the WRMP.

8. As part of the draft determination Ofwat applied household data based upon forecast data rather than using the forecast produced by water companies as set out within the Table 3.

Table 2: Summary of changes to our forecast of cost drivers

Variable	Connected properties (water and wastewater)
Approach at IAP	Forecasts based on historical growth rates of connected properties for each company.
Approach at July View	Forecasts based on household growth rate projections produced by the Office for National Statistics (ONS)[18] (e.g. to forecast the number of connected properties in 2018-19, we multiply the actual number of connected properties reported by companies in 2017-18 by the corresponding annual growth rate of 2018-19).
Rationale	While historical forecasts are independent, we accept that they may not capture changes in growth rates. We have looked at independent and recognised sources as the basis for our forecasts and consider that ONS best fits these criteria. ONS growth rates tend to be higher than historical rates and lower than company forecasts (although not always the case).

[18] Data on household projections in England can be obtained here: England household projections: 2016-based. The Welsh data are provided separately by StatsWales and are available here: Wales Households projections

9. Whilst we recognise the need to pull together comparative data on household projections from a single source, the process by which this is reviewed and amended should replicate best practice for household projections and should reflect local knowledge.

10. We consider that the ONS forecast used by Ofwat within the draft determinations significantly under forecasts the growth within our region as the projection is based upon household formation from 2001 to 2011 rather than the economic conditions that have occurred from 2014/15 to 2017/18. On this basis we believe that the SWW forecasts better reflect the economic conditions for the South West and the forecast number of properties likely to be constructed. Comparisons are provided in Figure 1 and Table 3.

11. To ensure consistency of our plan with other returns to our regulators, we used the same Ofwat definition of households as we do for annual reporting, which is slightly different to that used by the DCLG in their projections. To overcome this difference, we first took base year property numbers from our billing system using Ofwat definitions. As all new properties are now metered individually, we then applied the year-to-year increases from our forecasts of household numbers and to the base year numbers.

12. Our development database contains geographical information, which allows us to assign planned development to a 'water into supply' (WIS) zone. All properties currently in our billing system are assigned to a WIS zone. These individual areas were then aggregated to give properties and forecast growth for each WRZ.

13. We compared the historic rate of housing growth in the SWW supply area with that predicted by both the local authority plans and DCLG projections. Local authority plans show a much higher pace of development over the next decade than have been achieved historically, while DCLG projections appear low in comparison to the current level. New connections data for 2018/19 to date indicates that outturn figures are similar to those for the base year.

Figure 1: Water property growth comparisons (number of new properties per annum)

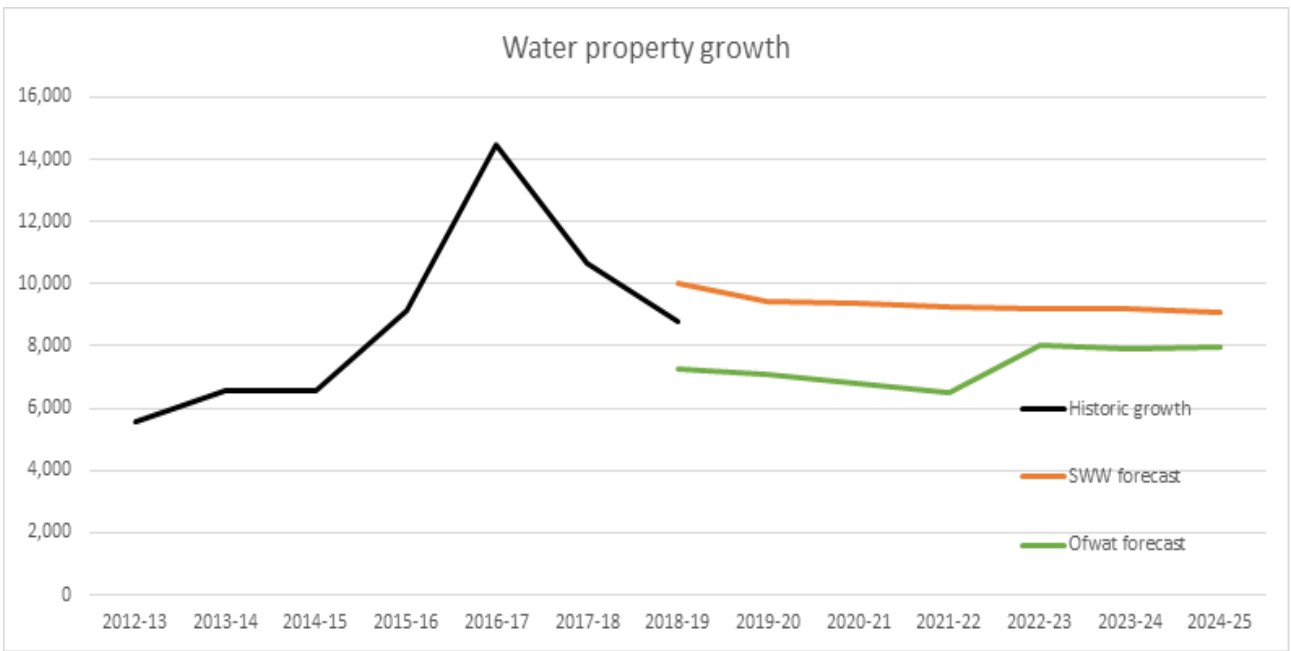
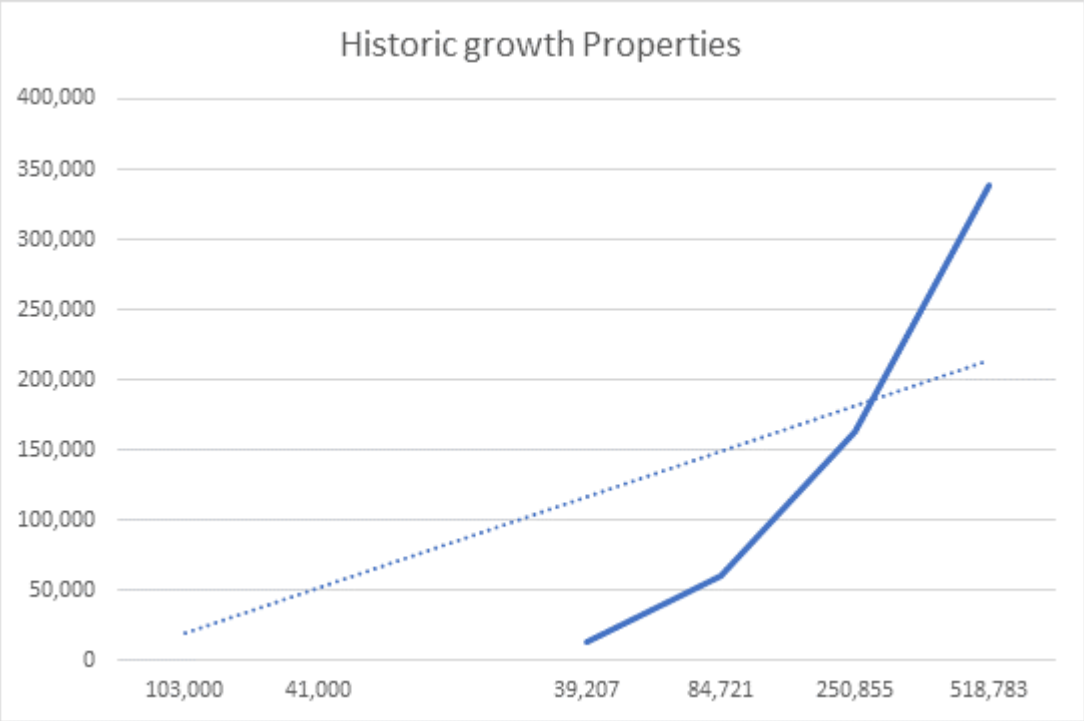


Table 3: Water property growth comparisons (number of new properties)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Historic growth	6,546	6,556	9,146	14,461	10,659	8,797						
SWW forecast						10,038	9,408	9,359	9,273	9,219	9,202	9,079
Ofwat forecast						7,261	7,090	6,787	6,498	8,023	7,940	7,997

14. The ONS household growth for the SWW area has a mean projected increase for the period 2017 to 2024, of 5,412 properties per annum. This contrasts with the mean (between 2014/15 and 2017/18) annual number of actual new connections for SWW, of 7,595 properties. There is a clear contradiction on the numbers of household properties forecast from the ONS household growth numbers and the actual new connections for SWW. We have no indication that this build rate is exceptional or that it is likely to reduce during AMP7. Figure 3 shows that there is quite a lot of variability within the properties recorded against the trend line (standard deviation of over 3000 properties) the annual variation of 1241 from the 2018-19 forecast is well within the standard deviation. However, the reduction proposed by Ofwat is around one standard deviation below the forecast.

Figure 2: Historic property numbers with trend line.



15. This variation is also supported by a number of local issues on five specific sites where there are multiple planning issues which may delay each development, these sites represent over 12,400 properties and even small delays within these sites could reflect the 1241 property variation observed in the regional forecasts.

Table 4. Large development issues

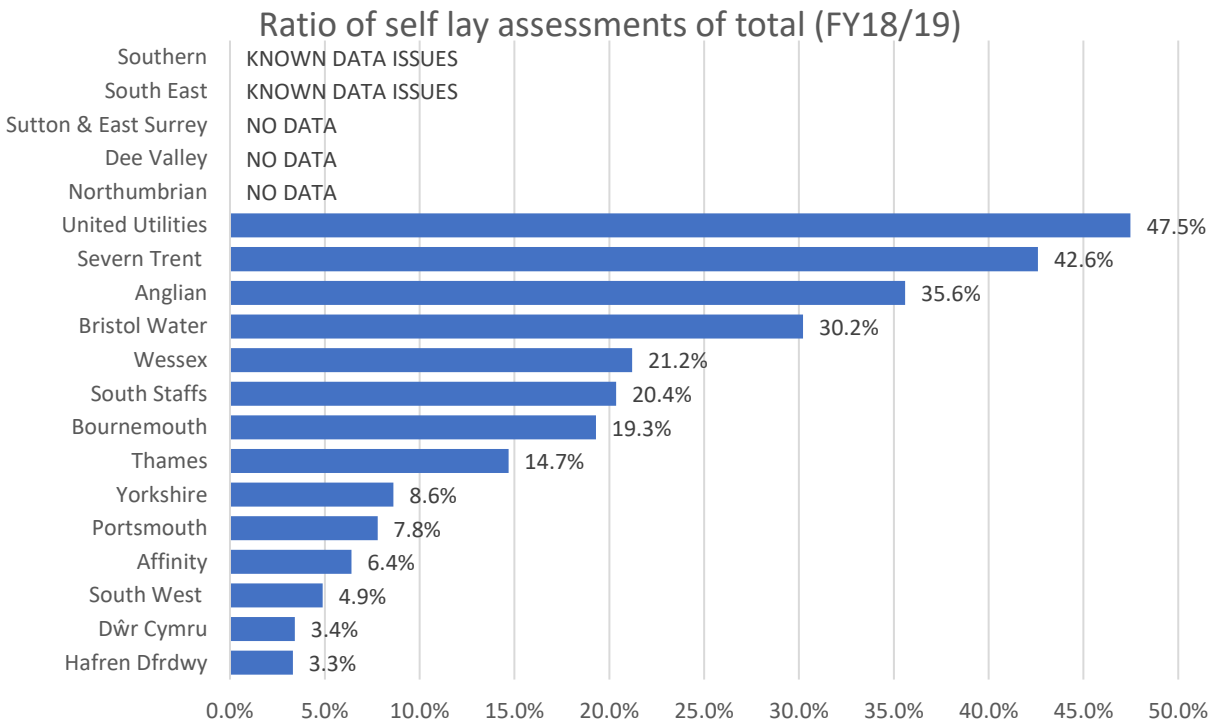
Development name	Properties	Cause
Threemilestone (Truro)	2,700	Planning issues/Multiple developers
West Carclaze (Luxulyan)	1,500	Planning issues
Broadmoor Farm (Ernesettle/Saltash)	1,200	Planning issues
Matford (Countess Wear)	2,000	Planning issues/Council boundaries
Culm (Cullompton)	5,000	Planning issues

16. There is a clear contradiction on the numbers of household properties forecast from the ONS household growth numbers and the actual new connections for SWW. The reductions proposed are lower than those developed from our bottom up analysis of development in the region and are below any natural variation we would expect to see around delays in specific developments.

17. SWW maintains the application of its forecast property numbers within the econometric model compared with Ofwat's application of the ONS data.

18. **Other factors - self lay and contestable activity –** we have one of the lowest self-lay ratios in the industry, after Welsh Water and Hafren Dfrdwy (Figure 3). In addition to this, we have a high level of contestable work being completed by our Developers in the region. Although this is not classified as self-lay, it negatively affects our unit rate of delivery by leaving only the more expensive elements of work, i.e., the length of connection in the highway or third-party land where the connection is made, as opposed to the length of main within the development boundary which his undertaken by the developer/contractor themselves.

Figure 2: Industry comparison of self-lay assessments, Source data: Water UK



19. Applying an industry average self-lay ratio of 19% to South West Water would reduce our new connection expenditure by more than **£2.76m** in AMP7. This is calculated by determining the cost difference for our region between a self-lay proportion of 19% and 4.9%.

20. Approximately 6,000 of our connections over AMP7 would be delivered via self-lay, if our self-lay levels of activity were akin to the industry average (19%). Applying our current average connection cost of £460[19] to this differential, demonstrates a total additional cost to SWW of £2.76m.

21. **Other factors - low occupancy –** by 2025 the ONS forecasts that the South West will have a 3.3% higher percentage of retired and elderly population living in our region than the average region in the UK and we are forecast to be a clear 2 percentage points higher than the next highest region. In 2017 the percentage of the South West population over 70 was only 15.6% and more closely aligned to the industry average. Therefore, we observed a substantial forecast in population growth for this demographic at a rate much greater than average regional trends.

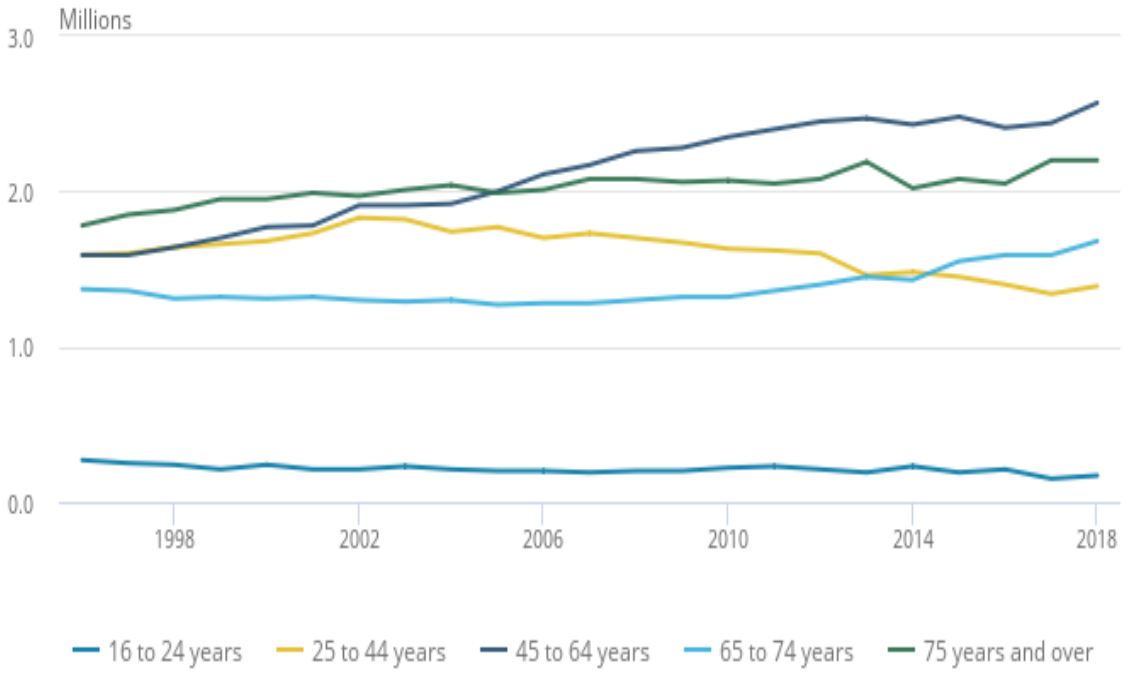
Table 5: Proportion of population above 70 and 45 years old

Region	% of population >70 in 2025	% of population >45 in 2025
East	15.8%	47.0%
East Midlands	15.6%	46.6%
London	9.2%	36.8%
North East	15.8%	47.1%
North West	14.8%	45.3%
South East	15.7%	47.2%
South West	**17.8%**	**49.4%**
West Midlands	14.7%	44.2%
Yorkshire and The Humber	14.8%	45.1%
Average	**14.5%**	**44.9%**

22. The significance of this point is that this demographic is more likely to live alone or at a lower occupancy rate that other age profiles. Therefore, we would expect property growth (new connections) to be disproportionate in our region compared to others when population growth is considered alone.

[19] All costs based on a typical 50 property development, using our published Developer Services Charges https://www.southwestwater.co.uk/developer-services/developer-services-charges/

Figure 4: The number of people living alone by age group. Source: ONS Labour for Survey



23. To demonstrate the impact on housing growth in the South West we have analysed our forecast population growth to property requirements based on our demographic profile compared to the industry average. We present two scenarios when lower than average occupancy rates are applied to: 1. Population >70 *and* 2. Population >45.

24. Scenario 1 - for this assessment we have assumed an occupancy rate of 2.5 people per property for population <70 and 1.2 people per property for population >70; which equates to 0.4 and 0.8 properties per person respectively. We are able to demonstrate that the housing need for the South West region is 2.8% higher than the same level of population growth occurring in another region in the UK[20]. If applied to our total growth allocation this equates to £1.33m.

25. Scenario 2 - when population >45 is considered to have lower occupancy rates, under the same analysis, the housing demand is 3.1% higher for the South West than an equivalent region in the UK. If applied to our total growth allocation this equates to £1.47m.

26. **Other factors - Rurality and nature of new developments** – in our Cost Adjustment claim we made reference to the challenges we face due to rurality and topography in our region. Although a specific cost adjustment claim was not submitted against this item, we calculate expenditure of £20 – 57.5m which may not be wholly captured within base modelling.

27. The SWW operating region is largely rural with dispersed, isolated communities. Higher density population centres tend to be concentrated in our coastal areas. This rural / urban pattern is in juxtaposition to our water supply sites which are generally located near to our natural water sources in remote or upland areas, away from the coast. The regional topography is dominated by our national parks of Exmoor and Dartmoor, along with Bodmin Moor. Many of our source waters and treatment sites are located in these areas and whilst these are at higher altitude, the undulating nature of the topography adds complexity to our supply network as it has to contend with transferring water from

[20] *SWW housing requirement = 29,458 = (62,500 population growth *17.8%*0.8) + (62,500*(1-17.8%)*0.4)*
*National equivalent company =28,633 = (62,500*14.5%*0.8) + (62,500*(1-14.5%)*0.4)*
Difference = (29,458 – 28,633) / 28,633 = 2.8%

treatment sites to the main centres of population, as well as the smaller rural communities. The resultant water distribution network is an inherently complex mix of trunk and distribution mains, with relatively more service reservoirs and booster pumping stations.

28. Specifically, for new developments, we are seeing more rural and large scale developments in the region, i.e., the development of new garden villages and towns outside of existing population centres. By the rural nature of these developments it means that blocks of flats are less likely to be built which further adversely affects our ability to service these new developments at unit costs comparable to other companies, i.e., we are unable to benefit from a single main allowing multiple properties to be connected at a single location, in the case of high rise living.

29. Furthermore, we already operate one of the highest average pressures in industry. This is due to the disparate nature of our population centres across the region and the natural topography of the South West coastline. These circumstances make it very difficult to accommodate new development in the region without the provision of supporting infrastructure, i.e. local booster stations, new PRV's and in some case new mains and service reservoirs.

30. Unlike other areas across the UK where minor changes to pressure settings in a network can facilitate new development, without a detrimental impact to mains bursts and leakage, it less likely in the South West that such changes can be accommodated.

31. These challenges are becoming more and more typical as we see large new developments being situated in rural areas of land setback from many of our coastal populations. By their nature, these new developments are typically at a higher elevation than the predominate population centre for the area (typically located near to the coastline), which is making their supply particularly challenging.

32. Summary of Need - if the modelling does not adequately account for the divergences in population growth and the impacts of this growth on costs, then it will result in systematic under – or over-recovery of revenues[21]. We cite three individual areas' that have the potential to be under-accounted for with our modelling.

33. If we were to consider each area in isolation, then the impact would be less profound. However, as we have demonstrated, all three factors are relevant to the South West and therefore will likely have a compounding affect.

Management control

34. There is limited management control that is available to SWW to mitigate new development as we are required to support growth within the region and are expected to comply with all drinking water standards as well as those of pressure and flow. Whilst we are not a statutory consultee for new developments, we can seek deferments until improvements at treatment works are completed to delay new development. Typically, that could defer new development for up to three years whilst a new treatment facility was constructed.

35. Similarly, the others factors we cite within the 'need for adjustment' arise from market competition (self-lay and contestable activity), socio-economic change (population growth, occupancy rate and rurality) and/or government policy (in the support for new garden village developments).

36. Management control is therefore limited, and future investment will be driven by new development and growth as it occurs.

[21] https://www.ofwat.gov.uk/wp-content/uploads/2018/03/SRN-Oxera-Treatment-of-growth-expenditure.pdf

Best option for customers

37. These factors do not lend themselves to be reviewed against whether or not our investment provides the best option for customers. However, we cite our 2018/19 overall Developer Services Upper Quartile performance in 11 out of 17 (water measures) and 6 out of 9 (sewerage measures) as an example of how we are working in the interest of our customers.[22]

38. Similarly, we asked FairWater Connections to undertake a 3rd party audit of our processes in this area to ensure we continue to act in the best interest of our customers. Their findings show we operate an 'Open Culture' and that we are 'Balanced' in our payment terms.

Robustness and efficiency of costs

39. **Modelling discrepancies** – we have undertaken econometric modelling using both the Ofwat ONS projection and those forecast by SWW. The impact on SWW's allowed water base expenditure of using company forecasts for connected properties instead of Ofwat's is an increase of £4.6m (allowed base expenditure rises to £635.1m from £630.4m).

	Business plan submission	Allowance with Ofwat forecasts	Allowance with company forecasts properties	Allowance with all company forecasts
Water	**£586m**	**£630m**	**£635m**	**£642m**

40. **Self-lay and contestable activity** – applying an industry average self-lay ratio of 19% to South West Water would reduce our new connection expenditure by more than £2.76m in AMP7. Thus, demonstrating a case for additional enhancement investment of this amount evidence previously.

41. **Low occupancy** – applying the more conservative view of a 2.8% increase in growth costs arising in the South West compared to other regions, due to a higher than average occupancy rate, provides the foundation for the inclusion of an additional £1.33m within our enhancement allowance.

42. **Rurality** – we have not specifically cost the effect of rurality; however, we ask that consideration is given to this additional compounding factor when assessing the validity of our claims above.

[22] WaterUK. Developer Service levels of service report. https://developerservices.water.org.uk/latest-reports

Appendix 1: Cost adjustment claim summary form

Name of claim	**Water: Growth**	
Claim identifier		
Price control(s) the claim relates to. (Please delete those not relevant)	Network plus water	
Total value of claim for AMP7	£8.7m.	
Total opex of claim for 2020-2025		
Total capex of claim for 2020-2025	£8.7m	
Depreciation on capex in 2020-2025 (retail controls only)	n.a.	
Remaining capex required after AMP7 to complete construction	£0m	
Whole life totex of claim	£8.7m	
Do you consider that part of the claim should be covered by our cost baselines? If yes, please provide an estimate.	No	
Expected materiality of claim impacting on 2020-2025 as percentage of business plan (5 year) totex for the relevant control(s)	1.2%	
Is the claim likely to feature as a Direct Procurement for Customers (DPC) scheme? (please tick)	Yes	No
		X

	Brief summary of evidence to support claim	**List of accompanying evidence, including document references, page or section numbers**
Need for claim	We have identified discrepancies in Ofwat's application of the ONS growth forecasts. This undervalues SWW's growth allowance by £4.6m. In addition we provide evidence of local factors not considered within the modelling that demonstrates why our costs to accommodate growth is more in the South West when compared to other regions. Namely, low self-lay activity levels, low occupancy rates and the rurality of our region.	SWW Cost Adjustment Submission (above)
Management control and mitigation	There is limited management control that is available to SWW to mitigate new development as we are required to support growth within the region. Similarly, the others factors we cite within the 'need for adjustment' arise from market competition (self lay and contestable activity), socio-economic change (population growth, occupancy rate and rurality) and/or government policy (in the support for new garden village developments).	SWW Cost Adjustment Submission (above)
Efficient cost estimate of claim	To quantify the impact of the population growth discrepancies we have undertaken econometric modelling using both the Ofwat ONS projection and those forecast by SWW. The impact on SWW's allowed water base expenditure of using company forecasts for connected properties instead of Ofwat's is an increase of **£4.6m.** The impact of the other factors on our costs are demonstrated with a bottom up analysis for AMP7 which shows the impact of low self-lay activity (£2.76m) and low occupancy rates (£1.33m).	SWW Cost Adjustment Submission (above)

Growth Modelling – Wastewater (SWB.DD.CA17)

1. Overall the claim associated with **wastewater growth with £20.1m**, which incorporates an efficiency against the estimated costs:

	Total £m
Descriptive to Numeric Compliance	6.3
Specific Scheme – Saltash	13.8
TOTAL Special Totex Claim	**20.1**

Background

Ofwat's slow-track draft determination approach to growth expenditure

1. In the slow track draft determination Ofwat has integrated both the maintenance and growth totex costs into a single econometric model which uses either the percentage load treated through size Band 1-3 treatment works or the percentage load treated by size Band 6 treatment works as cost drivers. The input data for this is based upon historical data only to derive the relationships and uses forecasts of the cost drivers to project costs for AMP7.

2. The changes within this model have resulted in a wastewater growth reduction adjustment of £20m for South West Water.[23] At the fast-track draft determination Ofwat included an 'in the round' adjustment of £31.2m, including £26.7m in respect of waste growth expenditure, equivalent to allowing our waste growth expenditure submission in full.[24]

The drivers of wastewater growth for SWW are atypical

3. Whilst we would accept that growth related expenditure is routine, in that we have growth to address in every AMP we do not consider that it is either linear or responds in the same way to operational and capital maintenance cost drivers, such as company scale (load). In particular, growth investment on wastewater treatment works is impacted by a number of discontinuities at boundaries between permit types and limits, some of which require significant investment (e.g. substantial rebuilding of works) to respond to marginal increases in population, flow or load in order to maintain improvements to the environment.

4. Wastewater growth investment can be lumpy and subject to tipping points such as the jump between a descriptive and numeric permit for example. Due to the nature of our region and the nature of growth in our region we have many more small works than other companies for the total population and therefore experience a significant amount of growth at smaller networks and treatment works (see further details on this below). The attached examples show the degree of investment associated with growth in or around the numeric/descriptive boundary as well as at an exceptional project at Saltash. The econometric models do not adequately account for the inclusion of these growth examples and as such we consider that these costs should be considered as exceptional and be appraised outside the econometric models.

[23] We have calculated our estimate of the implicit allowance made for growth in the Draft Determination models by comparing the allowed expenditure including and not including growth expenditure. This suggests that Ofwat's base expenditure models currently allow for £82m of wastewater growth expenditure, relative to our submission of £102m over AMP7, taking into account Ofwat's reallocation of freeform lines to growth expenditure.
[24] Ofwat (2019), 'Feeder model: Enhancement aggregator' (FM_E_aggregator_IAP.xlsx).

5. The impact of this issue can be seen from a comparison of South West Water's unit growth position relative to the rest of the industry over the historical period and AMP7. These are plotted below, in figure 1 which plots average expenditure per new development (on the vertical axis) against number of new developments (on the horizontal axis). It can be seen that some companies face significant movements in expenditure. Over the historical period, Wessex Water (WSX) had among the lowest unit expenditure in the industry but rises to the second most expensive in its projections for AMP7. Conversely, United Utilities (NWT) was historically the second most expensive but is projected to be among the lower cost companies in AMP7. As stated above, we do not consider there to be a driver in the wastewater modelling that can capture the relatively lumpy nature of tipping points for growth expenditure.

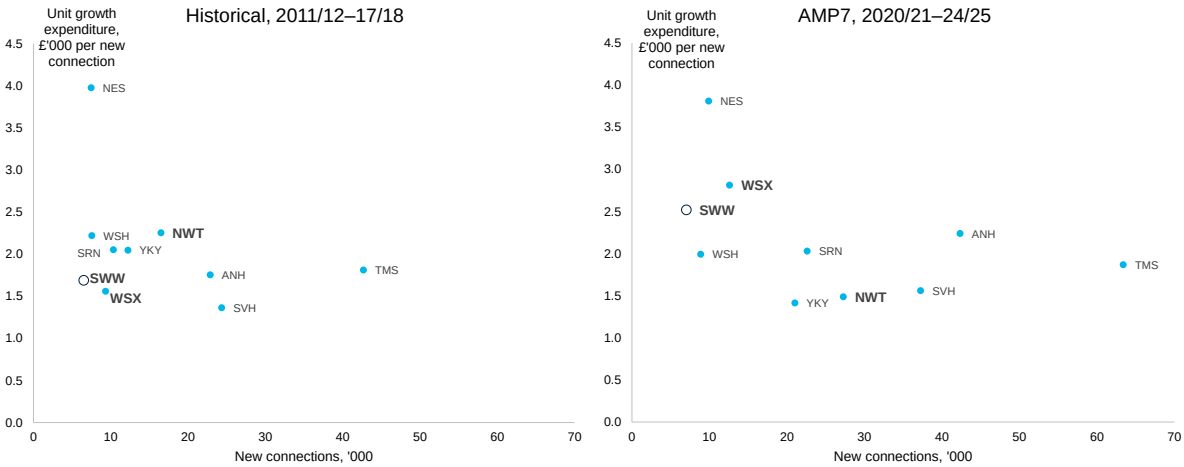


Figure 1: Graph showing unit growth expenditure (£'000 per new connection) and number of connections ('000), over the historical period (2012–18) and AMP7 (2021–25).

6. We are also concerned that the impact of rurality and topography is not fully captured in Ofwat's models, as the focus of the models is either on the percentage load treated through size Band 1-3 treatment works or the percentage load treated by size Band 6 treatment works. Within section 5.9 of our Business plan submission in September 2018, we highlighted that, as a result of the rurality of the South West region, we have a substantially higher proportion of Band 1, 2 and 3 wastewater treatment works compared with the rest of the water industry, many of whom also have extremely large works well beyond the Band 6 threshold that does not get picked up through the Band 6 variable (for ease of reference we include a comparison across the industry of wastewater treatment works by size band below).

7. As a result, we consider that Ofwat's revised modelling approach does not take into account a number of significant costs associated with the Wastewater growth within our region associated with:

    - the movement in wastewater treatment works from Bands 1 to 2
    - an exceptional treatment works investment at Saltash.

8. We consider that the exceptional costs of £20.3m for descriptive permits to numeric and Saltash wastewater treatment works should be considered outside the econometric models due to the exceptional nature of these costs. While the impact of the movement from descriptive permits to numeric and the Saltash wastewater treatment works are both driven by the same underlying factors, below, for certain assessment areas, we separate out the discussion on Saltash wastewater treatment works as this has additional atypical issues.

Need for claim: Movement from Descriptive permits to Numeric permits

9. Descriptive permits (Band 1 works) are historically defined based upon a population of 250 and/or a daily flow of $50m^3$. Recent permits issued by the Environment Agency refer only to the 250-population threshold. Where population increases occur and these exceed the 250-population limit then a new numeric permit is required, such a permit requires compliance with new numeric parameters determined by the Environment Agency. This change in permitting at the 250-population boundary requires a substantial rebuilding of a treatment works to comply with the new numeric permit as the environmental treatment requirements are more substantial. Typically costs for such a rebuild are between £500k-1000k per site.

10. The econometric model does not take these permit changes into account even though there is a statutory requirement to undertake this work in order to maintain permit compliance with the Environment Agency. The econometric model only looks at the load in Bands 1-3 (or Band 6), rather than modelling each band individually and monitoring the movement between bands. Further, the model does not differentiate between the impact of a difference in size bands across companies and within companies. One might expect the operational impacts of running small works to have a different relationship with cost than upgrading treatment works to a higher size band.

11. We consider that the discontinuity change from descriptive to numeric permits is not modelled and that the cost impact is not correctly identified and costed. The model does not appropriately consider the movement between descriptive permits and numeric permits, and that the costs associated with this movement should be considered outside the econometric model as a cost adjustment claim.

12. Due to the rural nature of SWW and the high level of descriptive works in Band 1 this movement from Band 1 to Bands 2-3 is a more likely event than for other companies (with the possible exception of Anglian Water), with a higher disproportion of cost due to the need to rebuild these treatment works. Table 1 sets out the proportion of load treated at treatment works of each size band by company. It can be seen that SWW has a disproportionately high proportion of works in all of the size bands below the largest, size Band 6.

Table 1: proportion of load treated at wastewater treatment works of each size band, by company

Company	Size band 1	Size band 2	Size band 3	Size band 4	Size band 5	Size band 6
ANH	0.6%	0.8%	4.2%	14.3%	15.1%	65.1%
NES	0.6%	0.3%	1.7%	6.1%	6.1%	85.2%
NWT	0.3%	0.3%	0.8%	3.0%	5.9%	89.6%
SRN	0.2%	0.3%	2.2%	8.2%	7.1%	82.2%
SVH	0.4%	0.4%	1.8%	6.7%	8.7%	82.1%
SWW	**1.8%**	**1.8%**	**6.8%**	**16.2%**	**15.1%**	**58.2%**
TMS	0.0%	0.1%	0.5%	2.3%	2.8%	94.2%
WSH	1.2%	1.2%	4.1%	8.4%	12.2%	72.8%
WSX	0.4%	0.4%	3.8%	10.0%	15.3%	70.2%
YKY	0.5%	0.4%	1.5%	6.0%	11.8%	79.9%
Average	**0.6%**	**0.6%**	**2.7%**	**8.1%**	**10.0%**	**78.0%**

13. We have identified 12 at-risk sites within our business plan submission which potentially trigger this investment associated with the descriptive to numeric permit movements up to 2025. The total cost of upgrading these wastewater treatment works has been estimated as **£8.6m**.

14. Some of the risks at these sites are driven by peak tourism to these catchments with some having substantial camping and caravan sites. We recognise that the tourist population use a lower average per capita consumption than the resident population (campers particularly have a much lower PCC). We have undertaken a risk appraisal for each site based up the assumption of a PCC of 136.1 l/head/day in 2019 dropping to 126 l/h/day in 2025 for domestic properties. Our PCC assumptions for tourism are 21 l/head/day for campers and 100 l/head/day for tourists within static caravans and holiday cottages (these have been assumed to be the same for 2019 and 2025).

15. Our risk appraisal takes into account an assessed population equivalent and estimated daily volume for each works and is shown in Table 2 (for 2019) and in Table 3 (for 2025).

16. Assessing the risk of each works to exceed the permit requirements in 2019 (Table 2), we have identified two works where there is a significant risk that both the 250 population and 50m3/day targets will be exceeded (Red highlighted WWTWs), with a further four works where only the 250 population criteria is exceeded. (Amber works).

17. In contrast, the 2025 assessment still shows two works where there is a significant risk that both the 250 population and 50m^3/day targets will be exceeded (Red highlighted WWTWs), with a further six works where only the 250 population criteria is exceeded. (Amber works). There is a slight reduction in the population forecasts for Whitstone WWTW which may well be a function of the small size of the catchment, although the works remains a Red risk. There are also reductions in the forecast volumes as a result of the reduction in PCC.

Table 2 – Descriptive to Numeric works position in 2019.

	CAPR19 Data			Population Equivalent includes 10% infiltration		Daily Volume (m^3) - incl 10% Res. Flow Infiltration			Forecast Costs £K
	Res. Pop	Ave. Tourist	Peak Tourist	PE (Ave. Tourist)	PE (Peak Tourist)	Residential only	Res. + Ave Tourist	Res. + Peak Tourists	
STOKE STW (HARTLAND)	74	135	427	103	150	11	14	20	£ 633
SALCOMBE REGIS STW	67	130	422	94	141	10	12	19	£ 610
BRIDGETOWN STW	55	128	396	81	124	8	11	16	£ 375
GRIMSCOTT STW	360	15	34	407	422	52	54	56	£ 200
WHITSTONE STW	370	9	20	414	422	54	54	56	£ 1,197
STIBB STW	89	88	293	112	145	13	15	19	£ 633
MERTON STW	274	8	16	307	314	40	40	41	£ 492
BLISLAND STW	253	13	30	288	301	37	38	40	£ 1,266
BOYTON STW	250	7	17	280	288	36	37	38	£ 500
SHEEPWASH STW	196	35	66	221	226	28	29	30	£ 500
SHOP STW	188	32	67	212	217	27	28	29	£ 740
BRIDFORD STW (TEIGN VALLEY)	229	13	27	262	272	33	34	36	£ 1,490

Red	Exceeds 250 population equivalent in 2019 and flow rate of 50m3
Amber	Exceed 250 population equivalent in 2019
Green	Does not exceed either 250 population equivalent and 50m3 flow rate.

Red	£ 1,397
Amber	£ 3,748
Green	£ 3,491
	£ 8,636

Table 3 – Descriptive to Numeric works position in 2025

	2025 Forecast			Population Equivalent includes 10% infiltration		Daily Volume (m^3) - incl 10% Res. Flow Infiltration			Forecast Costs £K
	Res. Pop	Ave. Tourist	Peak Tourist	PE (Ave. Tourist)	PE (Peak Tourist)	Residential only	Res. + Ave Tourist	Res. + Peak Tourists	
STOKE STW (HARTLAND)	79	135	427	109	158	11	14	20	£ 633
SALCOMBE REGIS STW	63	130	422	91	140	9	11	18	£ 610
BRIDGETOWN STW	57	128	395	84	129	8	11	16	£ 375
GRIMSCOTT STW	381	17	37	433	448	53	55	57	£ 200
WHITSTONE STW	356	9	19	399	407	49	50	51	£ 1,197
STIBB STW	94	88	293	118	152	13	15	19	£ 633
MERTON STW	323	8	16	362	368	45	46	46	£ 492
BLISLAND STW	241	13	30	275	289	33	35	36	£ 1,266
BOYTON STW	254	7	16	285	292	35	36	37	£ 500
SHEEPWASH STW	202	34	66	249	275	28	29	29	£ 500
SHOP STW	180	32	67	223	251	25	26	26	£ 740
BRIDFORD STW (TEIGN VALLEY)	209	13	27	240	251	29	30	32	£ 1,490

Red	Exceeds 250 population equivalent by 2025 and flow rate of 50m3
Amber	Exceed 250 population equivalent by 2025
Green	Does not exceed either 250 population equivalent and 50m3 flow rate.

Red	£ 1,397
Amber	£ 4,988
Green	£ 2,251
	£ 8,636

18. We consider that both the Red and Amber works should be considered as exceptional investment with forecast costs included within the final determination. The remaining green works should be closely monitored to see if there are flow increases at these sites with a view that these works are considered for future price reviews based upon the evidence collected within the AMP7 period.

19. Based upon the above analysis the cost of implementing the Red and Amber works would be **£6.385m**.

Need for claim: Saltash

20. Our Business plan also includes costs associated with an exceptional project at Saltash, which is currently part of the Ernesettle catchment in Plymouth:

    - The Ernesettle wastewater treatment works serves a large catchment to the North West of Plymouth as well as the town of Saltash where flows are pumped via a strategic main under the river Tamar. Ernesettle is overloaded according to standard loading rates, and is set to see an increase in demand from major developments expected in Saltash and the Northern Plymouth corridor
    - Up to 60% of the flow to treatment at Ernesettle is pumped from Saltash through a single rising main and up to 1,200 new properties are planned to the West of Saltash, on top of 3,250 new properties planned within the Ernesettle Plymouth catchment within the 2035 design horizon
    - The works process capacity of 55,000 p.e. is exceeded by an UWWTR forecast loading of up to 88,000 p.e., representing an over-loading of over 50%. Of this load, dewatering liquors from the sludge centre form a significant part, over 10,000 p.e.A liquor treatment plant (LTP) is planned for Ernesettle STC during 2019-20 and is currently in detailed design to alleviate the load from the liquor treatment plant and reduce the growth risk on Ernesettle in the short term
    - Ernesettle STW secondary filters are currently operating at capacity and there is an elevated compliance risk and loss of resilience against loading increases such as a housing development of up to 1,600 properties (3,600 p.e.) expected to be completed before the end of AMP7, and a further 800 properties currently forecast in AMPs 8 and 9
    - The existing footprint at Ernesettle STW makes the installation of additional plant and processes for expansion of the STW within the existing boundary very difficult. Additional land would need to be purchased in this area to allow for expansion at significant cost. The land adjacent to the works boundary has already been developed and therefore options for local expansion are limited.

21. As a result, we have identified that the best option for customers is to build a new treatment works at Saltash (see below). Again, such tipping points are not captured directly by Ofwat's modelling of base plus growth expenditure (though we do below calculate an implicit allowance for both Saltash and the movement from descriptive permits to numeric permits).

Management control and mitigation

22. There is limited management control that is available to SWW to mitigate new development as we are required to support growth within the region and are expected to comply with all discharge permits. Whilst we are not a statutory consultee for new developments, we can seek deferments until improvements at treatment works are completed to delay new development. Typically, that could defer new development for up to three years whilst a new treatment facility was constructed.

23. The development at Saltash is currently being reviewed by the Secretary of State for Housing as this is considered a major development within Cornwall.

24. Management control is therefore limited, and future investment will be driven by new development and growth as it occurs.

Best options for customers: Movement from Descriptive permits to Numeric permits

25. The investment in numeric to descriptive sites will help to maintain asset health and ensure wastewater service can be reliably provided to accommodate growth, thus reducing treatment works overloading due to insufficient capacity, supporting economic and population growth and safeguarding of the environment. The assessment of options and investment decisions are based upon a totex hierarchy which follows the following core principles;
    - To eliminate or defer the investment need by providing evidence-based challenge (both internal and with external stakeholders)
    - To collaborate with other stakeholders to assess opportunities for synergies and multi-benefit solutions
    - To consider operational interventions instead of traditional capital investment
    - To optimise and/or invigorate existing assets
    - To deliver capital investment to address the improvement measure

26. Our programme of numeric to descriptive investments, derived from the adoption of the above hierarchy includes a variety of solutions which range from the assessment of populations and validated flows within a catchment to the abandonment of treatment works with associated transfer of flow to adjacent catchments and finally to the provision of new / expanded treatment capacity at existing sites.

27. The adoption of the hierarchical approach ensures best value for customers, supports regional growth and protects the environment. For example, should investment be required at Salcombe Regis that we would close the works and transfer flows to Sidmouth. We are also considering similar solutions for the Grimscott site, the costs proposed reflect these transfers rather than building new wastewater treatment works.

Best options for customers: Saltash

28. Our Investment Committee has reviewed the strategy for Ernesettle on three separate occasions in 2018-19 to challenge and review the potential options and strategy for Ernesettle and Saltash.

29. A detailed feasibility study has been undertaken, examining a number of options as part of the strategy development for Ernesettle and Saltash.

Option	Description	Cost £m
1	Expand Ernesettle site	9.8
1a	Expand Ernesettle and duplicate Tamar transfer pipeline	13.1
1c	Expand Ernesettle site with Nereda process	15.0
2	Construct new treatment works facility at Saltash	13.9

30. Whilst option 1, has the lowest unit cost, it does not address the risk associated with resilience failure of the Tamar transfer pipeline. This would be a significant Cat 1 pollution event if it occurred resulting in substantial reputational damage, prosecutions and penalties within the ODI framework. The additional cost of this replacement under option 1a raises the cost to £13.1m.

31. Option 1c examined an innovative solution delivery with Nereda technology, but the costs of this are £15m for the Ernesettle work only. (£18.3m including duplicating the transfer pipeline).

32. Option 2 considers the construction of a new treatment works facility at Saltash with all Saltash flows transferred to the new works, creating headroom at Ernesettle for future growth.

33. The preferred strategy chosen by the Investment Committee was Option 2 at a cost of **£13.9m**, which is considered to be the most cost beneficial solution as this delivers the benefit of supporting the growth within the catchment whilst also removing the risk of a significant pollution event on the River Tamar, the scale and magnitude of which would be significant.

34. The preferred strategy allows all wastewater flows from Saltash to be treated on the Saltash side of the Tamar. Ernesettle STW would also not require any future investment to support long term development growth. Resilience benefits also occur with this strategy as a result of removing the single point of failure on the Tamar crossing; these additional resilience benefits were supported by a willingness to pay assessment alongside an appraisal of potential prosecution and penalties should the event occur. The cost of these penalties was higher than the £0.8m differential between option 1a and option 2.

Robustness and efficiency of costs

35. We have considered that there could be overlap with historic costs modelled within the econometric models. SWW has delivered four improvement works in the 2015-20 period (at Brixton, Woolsery, Ashill and Gwithian) moving from descriptive to numeric permits. There have not been any new wastewater treatment works driven by supply demand needs where a whole new works is required within the AMP6 period (similar in nature to the Saltash works), but there is also the possibility that other companies will have delivered such schemes and that these costs are included, to some extent, within the econometric baseline assessment. Although we have not been able to identify any such costs from our analysis of other company plans, where historic and future costs in business plans vary substantially.

36. We have been closely monitoring a number of treatment works within the AMP6 period and have considered the need for investment to move from Descriptive to Numeric permits. Where possible in AMP6 we have chosen to defer such investments due to the flexibility of permits and by monitoring actual flows on sites. Whilst this has been an effective management control technique and has reduced costs of investment for customers, we consider that this approach is not sustainable and that a number of sites have now reached the point where investment is required.

37. Recognising that there will inevitably be an overlap with historic investment at an industry level, we have estimated an implicit allowance for the growth at sewage treatment works expenditure category as a whole. Removing the expenditure line growth at sewage treatment works from the definition of modelled expenditure and re-estimating the models gives a base expenditure allowance for South West Water of £699m over AMP7, relative to an allowance of £716m[25] in the draft determination models. This implies an implicit allowance made for growth at sewage treatment works of £17.3m, relative to a proposed programme of £41m before reallocations and £43m afterwards.

38. Given the exceptional nature of the Saltash programme and the movements from descriptive to numeric permits for South West Water relative to the historical period, and the large gap between the implicit allowance and our planned expenditure in this area we would consider the entirety of the claim to fall outside of the implicit allowance allowed by Ofwat. The implicit allowance is sufficient to cover the business as usual expenditure to manage growth at sewerage treatment works.

39. Applying the forward-looking efficiency challenge from Ofwat's feeder model at the draft determination would imply a cost challenge of 5.4%[26], and an efficient cost prediction of £19.2m. Accounting for this cost adjustment claim and for the UV cost adjustment claim in our calculation of South West Water's base efficiency[27] reduces the cost challenge to 1.3%, giving an efficient cost of £20.05m

40. Combining this cost adjustment claim, of £20.05m, with Ofwat's implicit allowance for growth at wastewater treatment works, of £17.3m, gives an overall expenditure level in this area of £37.3m. Relative to our submission of £42.7m, this implies an efficiency challenge to our overall growth at wastewater treatment works programme of 12.5%, considerably more stretching than the overall

[25] Before the addition of cost adjustment claims.

[26] Ofwat predicted that £728.6m was an efficient level of expenditure at the slow track draft determination. SWW submitted wastewater base expenditure of £770.4m. To arrive at an efficient cost for wastewater growth we multiply the bottom-up estimate by the proportion of submitted expenditure assessed as efficient at the slow track draft determination—728.6/770.4. This implies a cost challenge of 5.7% = 1 – 728.6/770.4.

[27] Note that this does not account for other cost adjustment claims, so will potentially overstate the size of the efficiency challenge and therefore understate the post-efficiency claim value . We account for the two cost adjustment claims by adding their efficient level, less any implicit allowance, to Ofwat's slow track draft determination prediction. This gives a slow track prediction of £728.6m + £19.2m + £13.0m, relative to the same company submission of £770.4m. This implies a cost challenge of 1.3% = 1 - 760.8/770.4

base expenditure challenge. If this cost adjustment claim is not allowed, it would imply an efficiency challenge of 59.5% to our growth at wastewater treatment works expenditure programme, which we would consider unreasonably punitive.

Customer protection

41. The numeric compliance measure is an asset health measure for the AMP7 period with penalties associated with non-compliance. Should the permit be required to be changed by the Environment Agency without the proposed solutions being delivered then the overall company compliance position would be impacted resulting in additional penalties being applied to the company.

42. The numeric compliance measure is also a measure on the Environment Agency's EPA metric with associated reputational impacts, SWW also have an ODI metric around the EPA star rating and should the numeric compliance position deteriorate then additional penalties could be applied from the EPA appraisal.

43. Based upon the application of both of the above ODI metrics, we consider that there is sufficient customer protection to ensure that this investment is appropriately targeted and delivered within the AMP7 period.

44. Due to the exceptional nature of the Saltash project we consider that this project should be considered outside the econometric models and should be separately assessed.

Overall conclusion of exceptional cost claim

45. Based upon our analysis of the cost adjustment claim we consider that the additional cost claim as set out below is required.

	Estimated AMP7 cost £m	Implicit Allowance £m	Efficiency challenge £m	Claim £m
Descriptive to Numeric	6.40	0.0	0.08	6.32
Saltash	13.90	0.0	0.17	13.73
Total	**20.30**	**0.0**	**0.25**	**20.05**

Appendix 1: Cost adjustment claim summary form

Wastewater Growth at Wastewater Treatment Works

Name of claim	**Wastewater: growth at sewage treatment works**	
Claim identifier		
Price control(s) the claim relates to. (Please delete those not relevant)	Network plus wastewater	
Total value of claim for AMP7	£20.05m. Note this includes an efficiency challenge of £0.25m.	
Total opex of claim for 2020-2025	£0m	
Total capex of claim for 2020-2025	£20.05m	
Depreciation on capex in 2020-2025 (retail controls only)	n.a.	
Remaining capex required after AMP7 to complete construction	£0m	
Whole life totex of claim	£20.05m	
Do you consider that part of the claim should be covered by our cost baselines? If yes, please provide an estimate.	No.	
Expected materiality of claim impacting on 2020-2025 as percentage of business plan (5 year) totex for the relevant control(s) (please tick)	2.3%. Note this materiality calculation is based on the claim net of the efficiency challenge.	
Is the claim likely to feature as a Direct Procurement for Customers (DPC) scheme? (please tick)	Yes	No
		X

	Brief summary of evidence to support claim	**List of accompanying evidence, including document references, page or section numbers.**
Need for claim	Growth investment on Wastewater treatment works is impacted by a number of discontinuities at boundaries between permit types and limits some of which require significant investment (e.g. substantial rebuilding of works) to respond to marginal increases in population, flow or load in order to maintain improvements to the environment. Wastewater growth investment can therefore be lumpy and subject to tipping points such as the jump between a descriptive and numeric permit for example. Due to the nature of our region and the nature of growth in our region we have more many small works than other companies and therefore experience a significant amount of growth at	SWW Cost Adjustment Submission (above)

	smaller networks and treatment works. The examples shown within our claim highlight the degree of investment associated with growth in or around the numeric/descriptive boundary as well as at an exceptional project at Saltash. We consider that the econometric models do not adequately account for the inclusion of these growth examples and as such we consider that these costs should be considered as exceptional and be appraised outside the econometric models.	
Management control and mitigation	There is limited management control that is available to SWW to mitigate new development as we are required to support growth within the region and are expected to comply with all discharge permits. Whilst we are not a statutory consultee for new developments, we can seek deferments until improvements at treatment works are completed to delay new development. Typically, that could defer new development for up to three years whilst a new treatment facility was constructed. The development at Saltash is currently being reviewed by the Secretary of State for Housing as this is considered a major development within Cornwall. Management control is therefore limited and future investment will be driven by new development and growth as it occurs.	SWW Cost Adjustment Submission (above)
Efficient cost estimate of claim	The overall cost estimate of our claim is £19.1m. This is made up of a descriptive to numeric cost estimate of £6m and the cost of the Saltash exceptional scheme of £13.1m. Both of these claims have been subject to an efficiency reduction of 5.7% in line with our business plan submission.	SWW Cost Adjustment Submission (above)

Appendix 2: Extract from SWW Business plan submission – September 2018

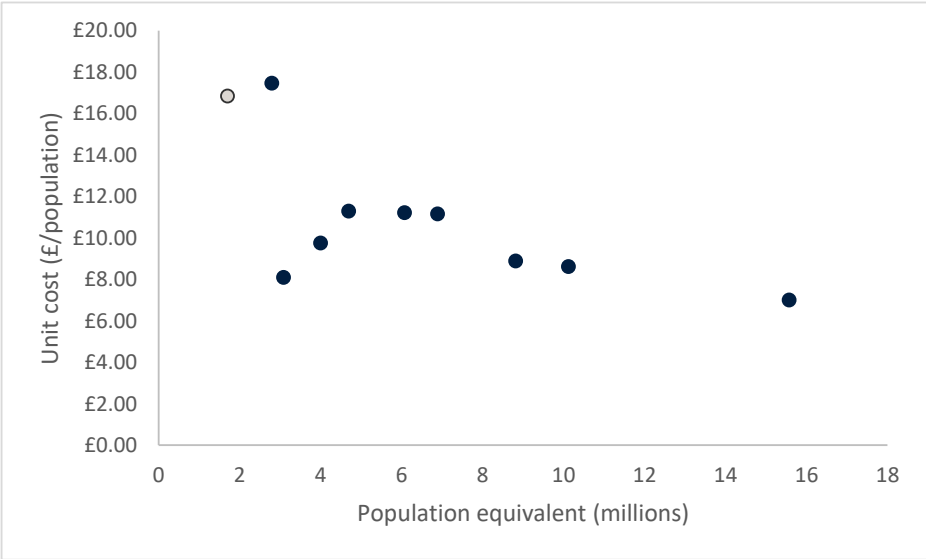
RSNP1: Wastewater: topography and rurality and the resultant complexity of the asset base

Need for claim

46. The topography, sparsity and density of a company's region is a key driver of wastewater service costs, mostly as these factors dictate the average size of WWTWs and there is a direct relationship between average size of WWTW and average cost to serve. Sparsity, density and topography vary across the industry. We have both a sparse regional and an undulating landscape and combined these two effects result in the smallest average size of WWTW in the industry and a more complex wastewater asset base than a region which is only sparse. In contrast, dense regions are able to use very large treatment works and benefit from significant economies of scale in treatment. On the network side, there are both positive and negative effects of density as, unlike water services, sewerage services in sparse areas consist of small local networks in catchment areas. So, although SWW's region is sparsely populated, on a property per sewer length basis, we have an above average value (and thus SWW 'benefits' from Ofwat's models that include this 'density' measure). Overall, we consider that the benefits available to densely populated regions with significant urban populations from having large WWTW far outweigh any other density / sparsity effects, as such we consider densely populated regions to have beneficial impacts on the waste side, rather than there being a U-shape effect as we have found exists in water services. We test this point econometrically.

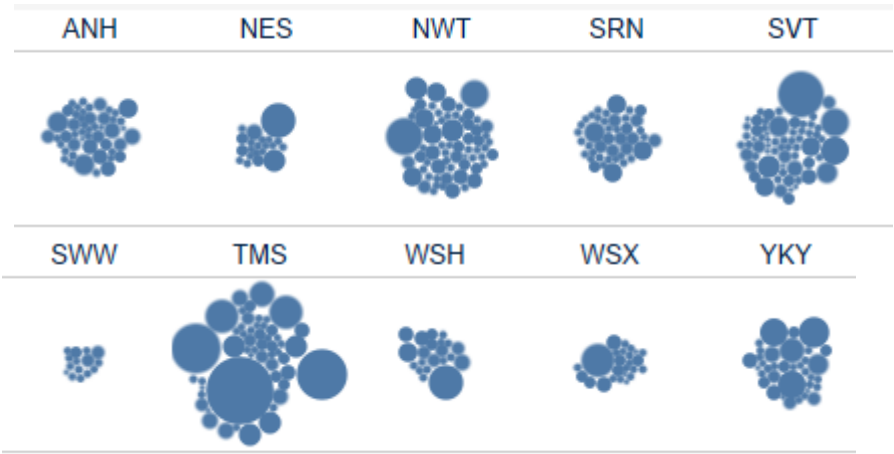
47. The topography *and* rural nature of the SWW region necessitates a large number of CSOs per km of sewer, large numbers of small treatment works and additional sewage pumping stations, as in many case wastewater flows need to be pumped from remote settlements over undulating land to the WWTW that covers that catchment. Difficulties in obtaining consents for discharges to groundwater in environmentally sensitive areas and planning permission restrictions for new sites has also increased the number of sewage pumping stations when compared to the resident population over time. In the models that we submitted to the cost modelling consultation, we simultaneously included both sparsity measures and pumping capacity (and CSOs).

48. The key impact of operating in a rural environment (combined with an undulating landscape) is on the size of WWTW. There are significant economies of scale in wastewater treatment. The chart below shows the average unit wastewater treatment operating cost by company against the total population equivalent of load treated. SWW, the smallest company, is marked in grey.

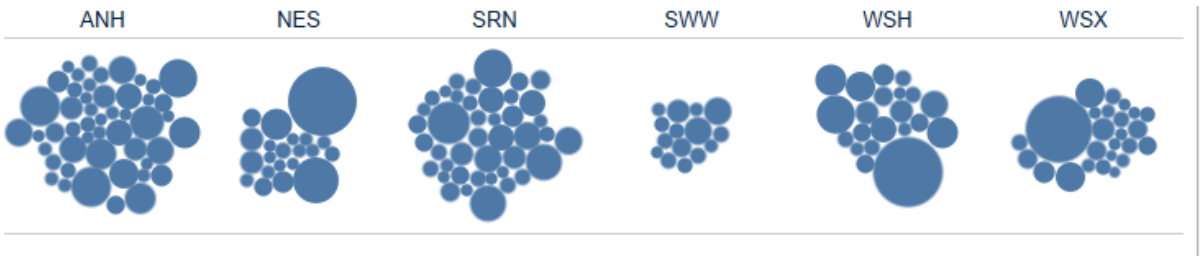


49. What the above chart does not capture is that SWW's region has no *major* urban conurbations and thus no potential for a very large WWTW (which benefit from the greatest economies of scale). All other companies can offset, to some extent, the disadvantageous factor of a sparse region with one or more very large works. Even similarly sparse companies, such as Welsh Water and Wessex Water operate very large treatment works (Cardiff and Avonmouth respectively).

50. In the figure below, we show the scale of large treatment works (those greater than size band 5 in the company data share) for each WASC. Each treatment works is represented by a bubble, scaled by the amount of load processed at that treatment works. It can be seen from this figure that there are several companies (TMS, SVT and NWT) which benefit from works so large that they approach the size of the entire SWW area.



51. What is less clear from the above figure is the extent to which SWW is still an outlier amongst those companies which have relatively smaller works. Find below a figure which excludes the 4 companies with the largest works (NWT, SVT, TMS and YKY). Even amongst this comparator set, SWW's largest WWTW: Countess Wear (Exeter) and Brokenbury Quarry (Torbay) compare to smaller works at other companies.



52. In the table below, we present unit operating costs by WWTW size by band, to give a view of the unit cost advantage that very large works have. We have split the data for band 6 into load ranges to further illustrate the cost advantages and our unique position versus the rest of the industry. There are clear step changes in unit cost through the size range from the very small treatment works treating 0 to 250 population equivalent (p.e.) having the highest costs which decrease by approximately half for the works in the 250 – 50,000 p.e. range. There is another step change from below 50,000 to between 50,000 and 750,000. Within this range unit costs decrease by around 25%. The next step change is at works above 750,000 where the unit cost drops further to less than half that of the works below 50,000. SWW has no very large works and we also treat far more of our load at the smallest works in the industry.

Band	Population equivalent treated	Unit total OPEX	Number of WWTWs (national)	% of SWW treatment	% of industry treatment
1	0 to 250	1.54	2,986	2%	0.4%
2	250 to 500	0.91	686	2%	0.4%
3	500 to 2,000	0.57	1,126	6%	2%
4	2,000 to 10,000	0.32	849	16%	6%
5	10,000 to 25,000	0.23	316	16%	8%
6	25,000 to 50,000	0.22	154	14%	9%
6	50,000 to 125,000	0.17	142	27%	18%
6	125,000 to 250,000	0.16	52	17%	13%
6	250,000 to 500,000	0.13	26	0%	14%
6	500,000 to 750,000	0.15	7	0%	7%
6	750,000 to 1,250,000	0.11	6	0%	9%
6	1,250,000+	0.09	4	0%	14%

53. The fixed costs of the high number of small works with associated dis-economies of scales may be a special factor for SWW depending on the models used by Ofwat, especially when combined with the absence of any very large WWTW to off-set their cost to serve impacts.

54. Additionally, high numbers of CSOs and pumping stations per km of sewerage network drive costs. CSOs per km of sewer are a factor of topography, degree of surface / foul sewer combination, demographics (location of customers) and climate (high rainfall). This manifests as higher costs per km of sewer associated with CSO screen cleaning and maintenance. High numbers of CSO per km of sewer in coastal regions with extensive bathing and shellfish water designations drives storage requirements (3 spills per bathing season and 10 spills per annum for shellfish in many locations) to reduce storm spills and drives higher cost per km through maintenance of storm storage and pumping costs to empty storm storage.
55. Pumping stations per km of sewer is a factor of topography, degree of surface / foul sewer combination, online storage, demographics (location of customers) and climate (high rainfall) and drives associated higher costs per km of sewer from pumping energy costs and pump maintenance.

56. While we consider that this operational aspect should be included in the modelling, there is a possibility that the specific approach will not appropriately predict SWW's efficient costs, as such, we set out below our particular issues. For example, we note that many models submitted as part of the consultation do not account for this factor (including all of Ofwat's wastewater Network plus models[28]) and, if such models were subsequently used for PR19, a cost adjustment claim (as per below) would be appropriate.[29] Equally, while we note that Ofwat does include STW size band 1-3 in all of its wastewater treatment and wholesale wastewater models, this only partially accounts for this factor and not all of its aspects (such as the significant impact of very large WWTWs, the asset

[28] No measures of sparsity of asset complexity are included, while density is included in four models, but with a positive sign, which is counter-intuitive to us. Source: Ofwat (2018), 'Cost assessment for PR19: a consultation on econometric cost modelling. Appendix 1 – Modelling results', March.
[29] While economies of scale are captured in Ofwat's models through the scale driver this does not appropriate pick up the impact of the size of works. For example, two companies could have exactly the same load but one company has only one works the other 100 due to sparsity/topography, the latter will clearly have higher costs.

complexity / pumping costs / maintenance costs in terms of the number of pumping stations and the number of CSOs) and in some cases the magnitude is too low compared to operational insight.

57. To the extent that these key characteristics are captured within Ofwat's cost modelling for PR19, we would not consider it necessary to make *any* regional cost adjustments. However, it may be the case that Ofwat's PR19 modelling does not capture this circumstance appropriately, e.g. if only density is included in the cost modelling SWW's predicted costs will be too low,[30] as the higher costs associated with sparse regions would not be captured and the allowances would, in the round, be insufficient to accommodate special factors without a claim. Likewise, the impact of very large WWTWs on costs may not be adequately captured in modelling, as Size Band 6 covers an extremely broad range of sizes of WWTWs (from 25,000 p.e. and up to 3,600,000 p.e.).

Management control and mitigation

58. Clearly, the location of the population we serve is outside of our control. The sewer network is expensive to construct and our topography is undulating, thus it is not cost beneficial to move wastewater around to treat at a few large sites. All companies with sparse regions have small local works in those regions, while those companies with major population centres have large treatment works relatively close to those population centres.

59. Our ability to rationalise and make this service more efficient is limited by remoteness and topography which constrain economic transport and pumping distances. Indeed, where we have had to build new large WWTW for urban wastewater treatment directive (UWWTD) and bathing water compliance, these have been required to be built in remote locations some distance from the coastal towns they serve in order to secure planning approval, resulting in additional pumping costs up to these sites.

60. Where it has been possible, SWW have rationalised WWTWs to improve economies of scale. For example, Gwithian to Hayle and Ottery St Mary to Fluxton transfers in AMP6. Plymouth's four WWTW and Carnon Downs were both considered for rationalisation but these were not cost effective as the topography led to high pumping costs. We continue to investigate rationalisation opportunities as

[30] Ofwat's models in PR14 included length of sewers (but this does not pick up sparsity impact in wastewater, which primarily drives the need for lots of small WWTWs, density. Some models did include % treated in bands 1-3)

NEW ADDITIONS TO THE BUSINESS PLAN

Southern Transfer Additional Volume (SWB.DD.CA18)

1. In the draft determination we have identified new information indicating a requirement to potentially supply an additional 10Ml/d to Southern Water. "West Country Water Resources regional transfer to Southern Water comprising 15 Ml/d from Wessex Water and 10 Ml/d from South West Water is identified. This is in addition to the 20 Ml/d transfer from South West Water proposed in its revised draft water resources management plans."[31]

2. In principal we are very supportive of this and we are currently working with Southern Water to identify the best options to help them meet their supply demand shortfalls. However, early conversations have been focused around the provision of 20Ml/d, as per our water resources management plan.

3. This additional 10Ml/d requires additional capacity requirements on the delivery of our new strategic water treatment work investments in Bournemouth Water, particularly as this transfer will need to be accommodated with our peak week design capacity, i.e. all core infrastructure will need to be sized to accommodate this additional capacity to in order to ensure this volume of water is available when needed.

4. This position is further exacerbated given reductions in the totex allowances given to these particular schemes (note this is included as a specific representation item). We believe our representation on these cost allowance reductions will demonstrate: the need for investment; management control; best options for customers; robustness of efficiency; and customer protection.

5. In acknowledgement of the additional 10Ml/d transfer to Southern Water, we have evaluated the costs to design and construct our water treatment works to accommodate this additional capacity. The additional capacity (and cost) will be incurred at Knapp Mill water treatment works which is our largest site and therefore most economical to increase capacity. A summary of these costs based on design capacity are provided below.

Knapp Mill WTW	**PR19 Cost Model pricing**	**Delta from Business Plan**
104 Mld	£72,566,604	-
114Mld	£78,139,937	**+£5,573,333**

6. Please refer to our representation for Knapp Mill for further evidence of the need and efficiency of the schemes proposed.

[31] Ofwat 2019, PR19 draft determinations: Strategic regional water resource solutions appendix. Pg 15.

Strategic Regional Water Resources Solutions (SWB.DD.CA19)

1. South West Water is partners in the West Country Water Resources Group (alongside Bristol Water and Wessex Water). Within this group we have considered the 'Strategic regional water resources solutions appendix' and have jointly developed an ambitious proposal focused on opportunities to provide bulk transfers to Southern Water.

2. As part of this group was have prepared a joint proposal on this area, which is included in our representation as a separate document.

3. The key aspects of this proposal representation are:
    a) **Proposed solutions.** We propose to develop additional strategic source capacity, transfers and solutions of 95 Ml/d compared to 75 Ml/d in the DD comprising:
        - Additional capacity – Southern Water transfer (25 Ml/d vs 25 Ml/d in DD)
            - Release of potential forecast surplus (South West Water and Wessex Water) through network reinforcement, new service reservoirs and pumping stations and treatment outputs
            - Additional transfer routes to provide resilience
            - We recommend that this is considered separately to the existing proposed transfer of 20 Ml/d to Southern Water as this is a new potential solution set (see below)
        - Additional sources (70 Ml/d vs. 50 Ml/d in DD)
            - Effluent reuse (Wessex Water)
            - Promotion of the second reservoir at Cheddar and other opportunities (Bristol Water)
            - Pumped storage scheme (South West Water).
            -

    b) **Costing to meet common reporting standard.** We propose revised costings for the strategic schemes reflecting funding across all companies in the West Country and correction of an error in the calculation of the DD funding and to meet the new common reporting standard.

    c) **Standard Gateways, reconciliation approach and collaboration.** We propose the standard gateways will be adopted rather than the accelerated timetable proposed for some of the Southern Water schemes, and we support the suggestion that the gate timings are aligned with the regional planning timetable. We also include a recommendation on the reconciliation mechanism.

4. Overall, we are including representation for an additional £2.3m (above the £1.3m highlighted in the latest view by Ofwat) reflecting the joint proposal from the West Country Water Resources Group.

South West Water

Bournemouth Water

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