

New enhancement: Strategic Water Resources - Severn Thames Transfer

Cost assessment representations: Appendix

Document Reference: D003e

This document is our response to the inclusion of £25.7m total totex allowance for Strategic Water Resources in the Draft Determination for United Utilities. This is insufficient to allow United Utilities to proceed with the scheme.

This document sets out the service enhancement expenditure and activity that we will undertake, through our 2020-2025 business plan, to deliver our contribution to strategic regional solution development: namely the Severn Thames transfer.

In the IAP, Ofwat put forward a proposal to facilitate the development of strategic water resources options for the South and South East of England. This includes potential major new water resources in the South and South East of England and national transfers of water from the North West to the South East of England. This will enable companies to evaluate multiple options in more depth and to ensure that appropriate regional solutions can be taken forward in future investment plans. We will work together with other companies to undertake more detailed feasibility and planning work.

United Utilities Water Limited



Name of enhancement area	Strategic Regional Solution Development (Severn Thames transfer)	
Price control(s) the enhancement relates to	Water Resources	
Total value of enhancement for AMP7	£23.4m (share of joint expenditure) + £21.9m (United Utilities expenditure) = £45.3m	
Total opex of enhancement for AMP7	-	
Total capex of enhancement for AMP7	£45.3m	
Remaining capex required after 31 March 2025 to complete construction	To be confirmed at Gate 3 / PR24	
Is the enhancement likely to feature a Direct Procurement for Customers (DPC) scheme? (please tick)	Yes	No
	✓	

	Brief summary of evidence to support enhancement requirements	Page
Need for investment/ expenditure	The need for investment in AMP7 arises from a national need to develop options to meet supply demand pressures and drought resilience in South East England. It is in line with Government policy and the recommendations of the National Infrastructure Commission. This nationally significant water transfer proposal is unique in the history of the industry since privatisation and there is no implicit allowance in any modelled costs to recognise the need.	29
Outside management control	The need arises because of an external factor outside United Utilities control, namely a significant supply demand deficit in South East England. That a future supply for the South East should come from United Utilities is within management control. As such, a specific cost adjustment is required to allow a scheme which is in the national interest to progress. Management control will be exercised through collaborative working and a gated process to protect customers from unnecessary investment during AMP7.	17
Best option for customers	Options appraisal has been carried out by Water Resources South East and Thames Water for the 2019 Water Resources Management Plans. These show that a Severn Thames transfer is selected as the best option in a variety of scenarios. Work by Water UK in 2015 also selected the transfer in the majority of scenarios. Water resources options within the North West to make water available to transfer were selected through extensive analysis and public consultation in United Utilities revised draft WRMP 2019.	37

	Brief summary of evidence to support enhancement requirements	Page
	The proposal is effectively a real options mechanism, and as such generates “option value” so that a choice between options is available in the future for the benefit of customers. Our proposal is a means of managing uncertainty that avoids pushing up customer bills unduly.	
Robustness and efficiency of costs	<p>Costs are based on our historic experience of delivering projects in AMP6. Probably the closest comparator in England and Wales is United Utilities Thirlmere transfer project. Estimating methods have been used consistent the rest of United Utilities PR19 business plan water infrastructure investment, which was assessed as being efficient in the draft determination.</p> <p>We have also carried out further benchmarking of costs for this scheme, including through collaborative working cost estimates for the joint scope of work.</p>	44
Customer protection	We are proposing a gated process which works in conjunction with a performance commitment and ODI. Evidence will be assessed by all relevant water sector regulators at each gate review and decisions taken in the best interests of customers. The ODI will enable any unrequired ‘allowed’ expenditure to be returned to customers in the event of the scheme not progressing through each gate and for the non-delivery or late delivery of outputs.	65
Affordability	Customer research indicates that application of the proposed cost adjustment is capable of being incorporated within a plan that is affordable, financeable and acceptable. Affordability of the plan in the round is evidenced in the final business plan.	73
Board assurance	<p>The evidence used within this document has been based upon information developed for and used within our Water Resource Management Plan, or our PR19 business plan, both of which were subject to explicit board assurance processes.</p> <p>The UUW Board Statement within our PR19 business plan confirms that the plan included well evidenced, efficient and challenging cost forecasts, including cost adjustment proposals which are conditional on the nature and basis of Ofwat’s final cost models. This board statement was supported by a robust ‘three lines of defence’ assurance framework as documented within section 10.3 of our business plan.</p>	73

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Water Resources – Strategic Regional Solution Development

Table and line no(s): WS2 Line 25, within document “*Cost assessment data tables – WS2, Wn6 and WWn8*”.

Executive summary

This enhancement expenditure relates to the development of strategic water resources options for the South and South East of England. In this case a national transfer of water from the North West to the South East of England: the Severn Thames transfer scheme. We will work together with Severn Trent Water and Thames Water to undertake more detailed feasibility and planning work. This will enable the scheme to start construction in early AMP8, should it be selected in regional plans and WRMPs. This work is in line with Government policy and the recommendations of the National Infrastructure Commission.

Detailed proposals were submitted in response to IAP action U UW.CE.A3, building on evidence from Water Resources Management Plans. This was in submissions for 1 April and the 3 May 2019. This document combines that evidence in a single document, in the form of a cost enhancement claim, so that we can have confidence that the necessary costs will be included in our PR19 totex baseline. This alternative form of presentation supplements the information previously presented as a direct response to the IAP action.

If appropriate allowances are not included within our totex baseline, United Utilities will not be able to participate in the work to develop the Severn Thames transfer.

This document should be read in the context of six key points:

1. Costs to deliver the joint scope of work for the Severn Thames transfer have been assessed as **£70.1m** (compared to £77.1m in Ofwat’s IAP), i.e. **£23.4m** for each company;
2. In addition to the joint scope, United Utilities and Severn Trent each have individual company activities that are needed to deliver the Severn Thames transfer, and these are not currently reflected in Ofwat’s cost assessment. The additional required enhancement expenditure for United Utilities in AMP7 is **£21.9m**. This is consistent with previously submitted material on the proposal but has not yet been reflected in the cost assessment in the Draft Determination;
3. We propose that all variations in expenditure on the scheme should be subject to 50:50 totex sharing to align incentives between the three participating companies;
4. The proposed ODI for United Utilities covers both joint activity (i.e. £23.4m) and individual activity (i.e. £21.9m) into a single target and incentive rate;
5. The ODI is intended to be symmetric, thereby allowing a mechanism to recover costs of any scope change that might arise through an “outperformance” payment;
6. Both “outperformance” and “underperformance” against the proposed ODI would be applied through an end of period RCV adjustment. This is a symmetric approach which reflects that the ODI is designed to reconcile a totex allowance for long term investment rather than reflect in-period service performance to customers.

Customers rank the provision of a reliable, continuous supply of water as one of their highest priorities¹. A range of evidence shows that at least one strategic supply solution is required over the next 5-15 years to secure drought resilience in the south-east. This evidence includes the Water Resources Management Plans (WRMP) of Thames Water, Affinity Water, South East Water and

¹ For example United Utilities UU Customer Priorities, Boxclever, November 2016.

Southern Water, the Water Resources South East regional strategy², Water UK's long term water resources planning framework³ and the National Infrastructure Commission (NIC) work on water for the National Infrastructure Strategy⁴.

There is therefore a need to progress a number of schemes through various investigations and stages of development to ensure that the optimum solutions can be brought into supply during the 2030s.

The NIC's analysis considered the costs and benefits of extreme drought and concluded that it would cost less to invest in infrastructure to provide resilience than it would cost to respond to events. It makes the case that additional capacity is needed to provide resilience to extreme drought (0.2% annual probability, i.e. 1 in 500 year events). The investment is described by the NIC as "low regrets".

The NIC's report recommended that Ofwat should launch a competitive process by the end of 2019, complementing the Price Review, so that at least 1,300 Ml/day is provided through (i) a national water network and (ii) additional supply infrastructure by the 2030s. The NIC said that "A network of strategic transfers could potentially provide about 700 Ml/day more capacity, at costs comparable with other options and increased adaptability of the overall system. The remaining capacity should be provided by the most cost-effective combination of supply infrastructure."

United Utilities, Severn Trent and Thames Water carried out customer research into the water trading proposal⁵. Customers raise multiple concerns about water trading: the security of supply, environmental and financial impacts. Potential 'donor' customers are concerned as to the impact on their own supply, whilst Thames Water customers ask whether water will be available when needed. Despite concerns, 74% of all customers agree⁶ they support water trading as part of the solution. Mitigation for customer concerns needs to be considered in the design and development of the scheme.

1. Introduction

This is our response to the inclusion of £25.7m total totex allowance for Strategic Water Resources in the Draft Determination for United Utilities. The amount included by Ofwat in the Draft Determination is based on an assessment by Ofwat in the IAP and is insufficient to allow United Utilities to proceed with the scheme.

As part of the initial assessment of companies' business plans ("IAP") Ofwat introduced proposals to support the delivery of strategic regional solutions to improve drought resilience in the south east over the next 5 to 15 years. The proposals make allowances for six companies and describe an associated gated process for the co-ordination and development of a consistent set of strategic

²FROM SOURCE TO TAP: The south east strategy for water, Water Resources South East, Jan 2019
http://www.wrse.org.uk/wp-content/uploads/2019/01/From_Source_To_Tap.pdf.

³ Water Resources Long Term Planning Framework, Water UK, 2015.

⁴ Preparing for a drier future, National Infrastructure Commission, 2018.

⁵ Market research company Verve consulted customers were from the operating areas of Thames Water, United Utilities and Severn Trent Water in England and across Wales from March to May 2018. The insight gathered is based on an informed customer view - throughout the research process, participants were provided with information on the issue of future water scarcity in the UK, possible solutions and considerations. The approach involved a qualitative 'deep dive' with 49 non-household depth interviews and an online community with 173 household participants over 5 days. Results were quantified with an online survey of 1,505 household participants. The sample was designed to be representative of key demographics within each water company area.

⁶ "agree" is a total of those who agree strongly or slightly with the statement "I support water trading as part of the solution to the water scarcity in the UK".

water resource schemes. The six companies are Affinity Water, Anglian Water, Severn Trent Water, Southern Water, Thames Water and United Utilities.

Each of these companies received an individual action that they were required to respond to by 1 April as part of the PR19 IAP process. Each company is involved in at least one strategic resource, and some companies are involved in more than one. This document sets out the case for enhancement expenditure for the Severn Thames Transfer (“STT”). It is consistent with the joint response of Severn Trent Water, Thames Water and United Utilities Water to the IAP action for the Severn Thames Transfer (“STT”).

The STT involves the transfer of raw water from the River Severn to the River Thames through a new interconnector pipeline. It also involves the development of water resources options by United Utilities and Severn Trent to make water available for transfer through the interconnector. Each of these scheme components will require design and development work during 2020-25 (AMP7) to enable the option to be taken forward into construction in the early 2030’s (AMP8) should it be subsequently selected as part of the optimal plan for the South East’s water needs. We have proposed that development of the interconnector and associated environmental studies are **joint activities**, to be carried out by United Utilities, Severn Trent and Thames Water. The development of the water resources options are **individual activities** to be carried out by United Utilities and Severn Trent for their own options, but in a way that is aligned to the overall STT programme.

To provide evidence for the costs of both joint activity and individual company activity to be included as an enhancement allowance in the PR19 Final Determination, this document covers management control, the need for investment, the best option for customers, the robustness and efficiency of costs, customer protection, affordability and assurance.

In the rest of this introductory section we respond on the substantive areas of difference between Ofwat’s cost assessment and company estimates of cost for the whole scheme. This supplements the information previously supplied within the April and May 2019 responses to the IAP and does not seek to repeat information contained within these other than for where it directly relates to an issue raised. Sections 2 to 9 of this document contain a full set of evidence in the form of an enhancement claim.

1.1. Status of the scheme prior to the IAP

The STT was identified and appraised in United Utilities and Thames Water’s draft Water Resources Management Plans (WRMPs) (1 December 2017). In those plans we made it clear that there were United Utilities water resources elements to the scheme as well as an interconnecting pipeline between the Severn and the Thames⁷.

Sections 6.5, 7.6 and 7.7 of United Utilities draft WRMP (1 December 2017) set out the need and selection of water resources options to maintain supplies in North West England when Vyrnwy Reservoir is used to supply Thames Water as part of the STT. Following consultation United Utilities revised draft WRMP (31 August 2018) confirms the need and sets out the options needed in an adaptive pathway to the preferred plan (Sections 6.5, and 8). The WRMP provides a substantial set of evidence, confirmed through consultation, that these options are needed to allow an export to Thames Water, and that the costs and benefits of these options were subject to a robust appraisal process. In the WRMP we also explained how we had worked with Thames Water, submitting

⁷ See Sections 6.5, 7.6 and 7.7 of United Utilities draft Water Resources Management Plan (1 December 2017)

indicative prices for different sized exports for it to include in its option appraisal⁸. These indicative prices reflect recovery of the costs of the water resources options needed to enable the exports.

Thames Water’s draft WRMP (1 December 2017), revised draft WRMP (3 October 2018) and updated revised draft WRMP (1 April 2019) appraised the options needed to meet the supply-demand needs within its operating area. Thames Water’s option appraisal methodology is detailed in Appendix W of its WRMP. Thames Water included the cost of the raw water supply from Vyrnwy using the indicative bulk supply prices that we provided them as opex in their WRMP appraisals. Different variants of the STT with different support options were assessed in the Thames Water plan reflecting the different costs and benefits. It is shown in Appendix X of Thames Water’s plan that different variants of the STT with differing supporting options are selected in different scenarios.

In these WRMP appraisals, which evidence the need for the scheme, full costs including the water resources within United Utilities area have been included in the economic case.

The Severn Thames transfer scheme and the proposal to start design and development work within AMP7 for both United Utilities water resources and the interconnector were discussed in meetings with Ofwat on 16 August 2017, 24 January 2018 and 25 April 2018. Figure 1 shows a slide used in each of those meetings which highlights that planning and design of United Utilities new sources / enabling works is a key activity for the STT. Planning and design of the interconnector between the Severn and the Thames is clearly shown as only one of a number of key activities.

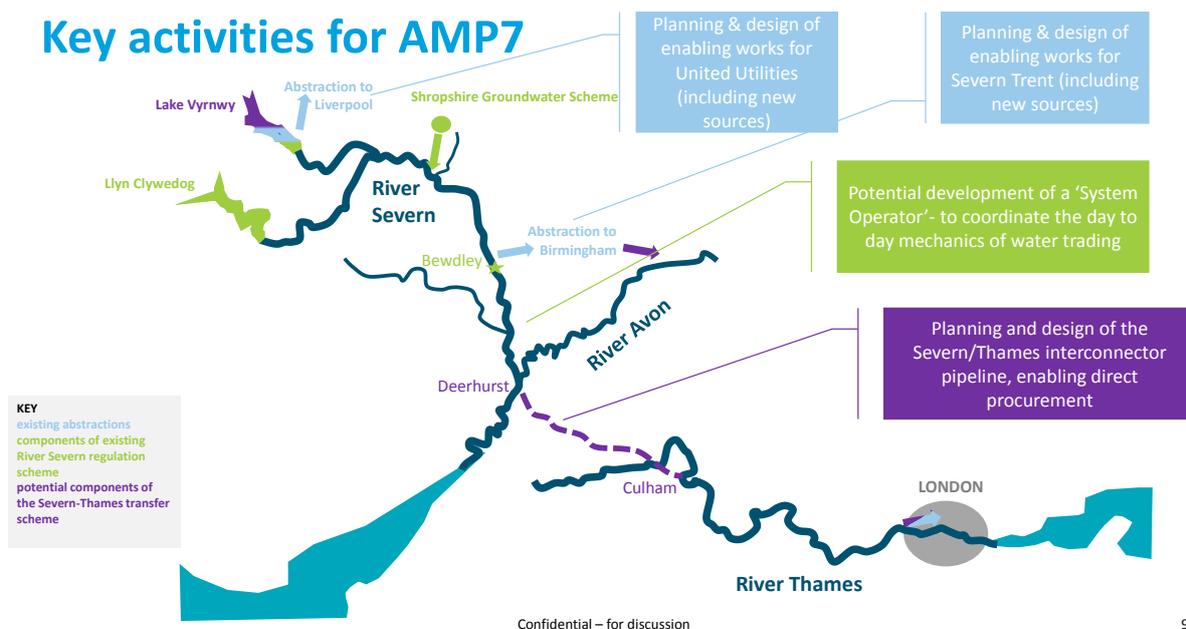


Figure 1. Slide used in meetings with Ofwat in August 2017, January 2018 and April 2018. It shows that planning and design of United Utilities new sources / enabling works is a key activity for the STT alongside development of the interconnector.

Recognition of development costs for the seller were highlighted as barrier to trading in the earlier meetings, and indicative costs for AMP7 were highlighted in the later meeting. We indicated that order of magnitude AMP7 costs were likely to average £30m per company once supporting water resources were included.

Based on feedback received, and the conclusions reached in Thames Water’s draft Water Resources Management Plan, we took the view that a case to carry out design and development work in AMP7 would not be supported as the need for the scheme was likely to be later than the 2030’s.

⁸ See Section 8.4 Draft WRMP19 Technical Report - Options identification (1 December 2017); Section 8.4 of Revised Draft WRMP19 Technical Report - Options identification (31 August 2018).

Therefore United Utilities did not include the Severn Thames transfer scheme in either the May 2018 or September 2018 business plan submissions to Ofwat.

Following discussions between the Chief Executives of Ofwat, United Utilities, Severn Trent and Thames Water we drafted a Terms of Reference document which set out how the companies could work together to get the Severn Thames transfer to be construction ready by AMP8. This Terms of Reference document was emailed to Rachel Fletcher on 8 January 2019.

The January 2019 Terms of Reference set out that there were **joint activities** relating to the interconnector and **individual company activities** relating to the provision of water resources for transfer through the interconnector. In that document we also provided illustrative costs for AMP7 for both the joint scope and the individual company scope. This was £94m in total comprising £64m for the joint scope and £30m for the total of the individual company activities. At that stage costs could only be illustrative because we had not confirmed the level of development that the scheme would need to reach by the end of AMP7 and not carried out joint activity between companies to produce a single agreed estimate.

Our first formal PR19 submission relating to the STT was after the IAP was published on 31 January 2019.

1.2. Assessment of the scheme in the IAP and Draft Determination

Ofwat's Initial Assessment of Plans (IAP) was published on 31 January 2019. Ofwat identified from companies' water resources management plans and business plans that at least one strategic solution is required over the next 5-15 years to secure drought resilience in the south-east. Ofwat allocated costs to companies involved in these schemes, one of which was the STT. The strategic regional solution development allocation is to allow the delivery of consistent and transparent investigations, planning and development of strategic options with the overall aim of optimum solutions being construction ready by 2025.

The cost allocation in the IAP was based on a high-level method:

- Total scheme costs were identified from water resource management plans or business plans
- For some companies an efficiency challenge was applied
- A small set of benchmarking evidence (4 projects) was used to identify that 6.4% of total scheme costs were needed to develop the scheme
- The development costs were divided equally between the participants in the scheme

For the STT method this resulted in a development cost estimate of £77.1m, allocated as £25.7m each for United Utilities, Severn Trent and Thames Water.

Our principal concerns with the cost assessment in the IAP are that:

- The scheme costs used in the IAP were not total scheme costs, as they did not include costs for United Utilities water resources
- The 6.4% benchmark is insufficient to develop a scheme to the necessary level of maturity

Ofwat assigned an IAP action (UUW.CE.A3) which included a request to provide a more detailed assessment of expenditure allocations. Our first formal PR19 submission on the STT was our response to the action on 28 March 2019 (with additional evidence provided on 1 May 2019). These submissions made it clear that there were **joint activities** relating to the interconnector and **individual company activities** and provided a more detailed assessment of the expenditure required for each.

These submissions also made clear that Ofwat's IAP assessment was based on a proportion of scheme capex from Thames Water's WRMP and therefore did not take into account United Utilities and Severn Trent costs which were included as opex in Thames Water's WRMP.

On 11 April 2019 Ofwat published its Draft Determination for United Utilities. We understand that due to timing limitations Ofwat was not able to take account evidence we submitted on 28 March in the Draft Determination. However Ofwat needs to consider this evidence and allow United Utilities the opportunity to make representation on its preliminary conclusions before making a final determination.

In the following sections we set out the substantive areas of difference between Ofwat's cost assessment and company estimates of cost.

1.3. Need for cost adjustment

It is implicit in Ofwat's approach to the IAP and Draft Determination that Ofwat accepts the need for investment and the need for a cost adjustment for the STT. However it is not clear whether Ofwat accepts the need for the full scope of works involved in the STT, i.e. the need for the provision of Water Resources in addition to an interconnecting pipeline. We therefore set out evidence of the need for this below.

An unsupported STT (i.e. without supporting water resource) is estimated in Thames Water's WRMP to have a deployable output benefit of 80 MI/d. This is inadequate to meet the scale of strategic water resources need in the South East and, due to the costs and benefits of this option versus supported transfer options, a wide range of scenarios selected supported transfer options in preference.

The use of Vyrnwy reservoir has been identified to support the Severn Thames transfer. Vyrnwy reservoir was built in the 1880s for Liverpool Corporation Waterworks to supply Liverpool. It remains a significant and cost efficient source of water for Liverpool today, also supplying parts of Cheshire and providing resilience to Greater Manchester through our West East Link main. The reliable yield of Vyrnwy for public water supply is 180 MI/d.

We therefore tested the impact of releasing up to 180 MI/d from Vyrnwy in our Water Resources Management Plan. The water would be diverted to the South East rather than supplying the North West. At the problem characterisation stage we identified a 'high' impact on our supply-demand balance. This indicated that significant options would need to be implemented to maintain resilient supplies to customers in the North West. We therefore adopted an "extended methods" options appraisal methodology to identify and select options. The assessment method, metrics used and the resulting options selected are documented in our both our draft and revised draft Water Resources Management Plans.

In public consultation on our Water Resources Management Plan fifteen respondents commented on national water trading in their response. Eight respondents supported our proposal to explore water trading in the future, recognising our commitment to ensuring that we also maintain reliable supplies for our customers. A further four respondents were amenable to further exploration of water trading, providing that our region's water supplies are not adversely affected; there are no detrimental environmental, social and economic impacts on our region, particularly the Lake District and Wales; and there is a sufficient surplus of water to enable the trade. Three respondents said that trading should not be considered if there is the likelihood of negative impacts on the Lake District, such as a resulting shortage of supply in the Strategic Resource Zone.

Ofwat's response to our WRMP consultation said that we used methods and data appropriate to the scale and complexity of the problem, particularly through the use of complex methods to address the potential large export to Thames Water. It noted that customers appear to be generally supportive of water trading, although they have expressed concerns regarding the security and quality of their supply, and the potential cost and environmental impacts of facilitating the trade. Ofwat also asked for greater clarity on the rationale of the supply options to support the trade of water, questioning whether the aim is to maintain the surplus at the level it was prior to the transfer rather than to simply ensure the supply-demand balance is maintained.

In our statement of response we provided greater clarity, explaining that our approach was driven by the clear customer and stakeholder concern that water trading could result in impacts to customers (e.g. levels of service, resilience) and the environment. Feedback indicated a requirement that these be protected. This guided our approach at the pre-consultation stage of the WRMP process. This was an important part of our extended methods options appraisal approach to develop a plan that would provide the necessary reassurance, whilst also preventing barriers to water trading that would otherwise occur (with the resulting loss of benefit to customers in other regions). Recognising that a surplus has an inherent value, for example, greater drought resilience, we do not feel that it is appropriate that customers lose this benefit.

This is particularly acute because our system would benefit from enhanced leakage reductions proposed in the WRMP which customers have valued (based on expected benefits) and ultimately paid for. Therefore, we used the extended methods options appraisal process to develop a plan for an assumed trade starting in the 2030's to prevent deterioration from this position. However, it is important to note that we have not developed the options set under the water trading pathway to maintain a surplus supply-demand position per se, but rather, prevent deterioration of the metrics used in the extended methods process (as shown in Figure 34 and Table 20 of the draft WRMP). These metrics represented water resources performance reflecting customer and stakeholder feedback / impacts (i.e. levels of service, resilience and the environment).

While this feedback relates to the selection of options, and was addressed, it has never been suggested that no supporting water resources options would be required to mitigate the redeployment of water from Vyrnwy.

1.4. Robustness and efficiency of costs

In the IAP, Ofwat estimated the cost of the design and development activity using a high level approach. This gave an estimate of £77.1m, which was based on a percentage (6.4%) of capex costs (£1.3bn) taken from Thames Water's WRMP tables.

We believe that the total cost used in the IAP was not the appropriate value and therefore needs to be revised. In particular the capex did not include Severn Trent Water and United Utilities elements of the scheme because these were represented in the opex to reflect payments that will be made under bulk supply contracts.

We also believe that the percentage applied was based on insufficient and partly inappropriate benchmarking data and also needs to be revised.

A more robust approach to estimating the cost needed for development of this scheme is to combine a range of estimating methods, both top down and bottom up and consider this against updated benchmarking evidence. This is the approach we took with Severn Trent and Thames Water to respond to the IAP action. Below, we set out a summary of our approach for joint costs (interconnector) and individual United Utilities costs (water resources).

1.4.1. Robustness and efficiency of joint costs

Working with Severn Trent and Thames Water, we identified the appropriate scope of joint activity (i.e. the interconnector) consistent with the option selected in Thames Water's WRMP. Each of the three companies derived new estimates of the total capex for the interconnector element using each of the three companies' standard estimating methodologies.

The total project costs ranged from £724m to £973m in 2017/18 CPIH deflated prices. Differences in these estimates reflect differences in methodology, for example the approach to treatment of risk

and uncertainty. All three estimates are within +/- 30% of the median estimate, which is a range expected at this stage of the scheme⁹.

All these estimates are lower than the number quoted by Ofwat in the IAP.

Each company then used a top down estimating method to identify the element of the total cost in the development phase. United Utilities also prepared a bottom up estimate of the development phase costs. Severn Trent and Thames Water’s estimating methodologies include optimism bias, however working together as three companies we challenged ourselves to put forwards an estimate for AMP7 development costs excluding any allowance for optimism bias.

When optimism bias is excluded, the four estimates prepared by the companies for AMP7 are very close as shown in Figure 2. This gives confidence in the robustness of the cost estimates.

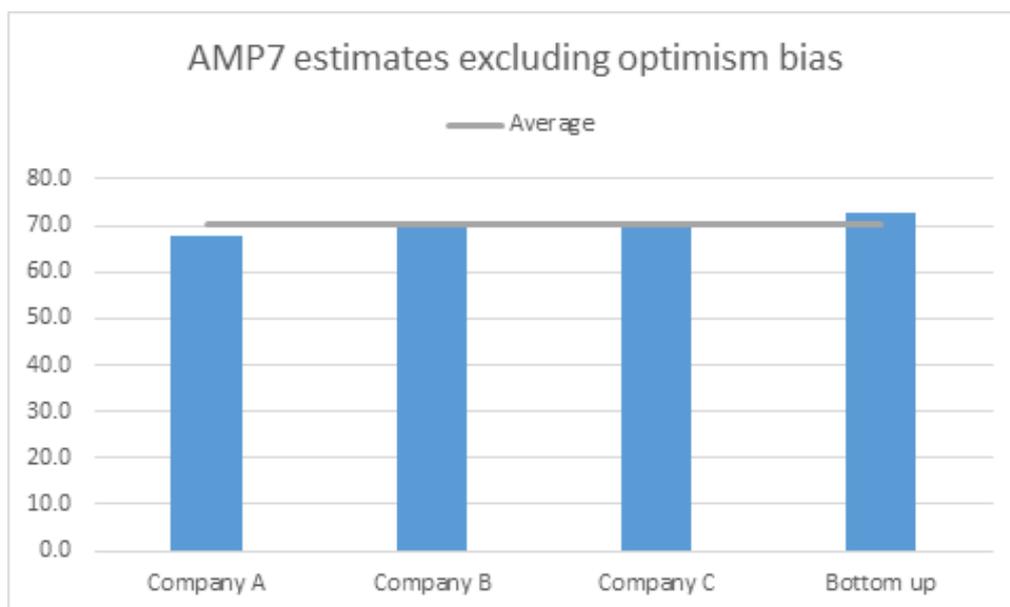


Figure 2. Top down and bottom up estimates of AMP7 cost for the STT interconnector excluding optimism bias (£m).

Our proposal is to use the average of these four estimates which is **£70.1m total AMP7 costs** for the joint scope of work.

We also undertook an updated benchmarking exercise. We included more comparators and excluded the East Midlands Raw Water Storage scheme as the development costs for that project were set at a level to only cover the high level feasibility costs needed for early engagement with the DPC process. This update gives a revised assessment of development costs of 12.5% (Table 1).

⁹ OFWAT Development of Capital Expenditure Estimating Assessment, Final Report for All Deliverables, Faithful and Gould, 31 July 2007

Project	Company	Development spend (£m)	Total project cost (£m)	Percentage
Mott Macdonald benchmarking for SVE (15 schemes) ^A	Multiple	893	4,250	14%
Thames Tideway ^A	TMS/Tideway	✂	✂	21%
Birmingham resilience scheme ^A	SVE	✂	✂	17.7%
Abingdon reservoir development ^E	TMS/AFW	300	2,056	14.6%
South Lincs Reservoir ^E	ANH	35	648	5.4%
Deephams ^E	TMS	15	352	4.4%
Thirlmere transfer to West Cumbria ^A	UUW	30	283	10.5%
Total (weighted average)		975	7,589	12.9%
Average				12.5%

^A = based on actual expenditure; ^E = based on estimated expenditure

Table 1. Updated benchmarking assessment of the proportion of project expenditure in the development phase.

Since our estimates also include £9.6m development cost in AMP8, we need to include this when comparing against the benchmark evidence. The development cost estimate of £79.7m is 11.0% of the lowest of the three total project cost estimates and 8.2% of the higher total project cost estimate. Either way it is lower than the 12.5% suggested by the benchmarking evidence. This gives confidence in the efficiency of the cost estimates.

By combining a range of estimating methods, both top down and bottom up and considering this against a fuller set of benchmarking evidence gives much more confidence in the cost estimate than the high level approach adopted for the IAP.

1.4.2. Robustness and efficiency of United Utilities costs for water resources

Totex cost estimates for the United Utilities water resources options and enabling works were prepared using the same estimating methodology as our PR19 business plan. Section 4 of business document S6001¹⁰ summarises the work we undertook to ensure that options have a robust cost estimate. It also sets out our approach to cost assurance through industry benchmarking and third party assurance reports¹¹. Overall, United Utilities business plan was assessed as being efficient in the IAP.

Development phase work was estimated using two methods, which may be thought of as “bottom-up” and “top-down”. We then benchmarked these two estimates against actual cost data from our most relevant comparator project. Each of these three methods give cost estimates from project start-up to contract award.

¹⁰ PR19 Business Plan, United Utilities September 2018, Chapter 7, Supplementary Document, S6001

¹¹ PR19 Business Plan, United Utilities September 2018, Third Party Documents: T6002 “Costing Methodology Assurance – Mott MacDonald report Stage 1”, T6006 “Cost Curve Benchmarking Stage 2 Mott MacDonald”, “Independent Estimating of UU Selected Solutions Mott MacDonald Stage 3 report”

Development phase work was estimated using two methods, which may be thought of as “bottom-up” and “top-down”. We then benchmarked these two estimates against actual cost data from our most relevant comparator project (the Thirlmere transfer to West Cumbria) and bottom-up estimates for our Manchester & Pennines resilience scheme.

The range of estimates is shown in Figure 3 below. In the interest of protecting customers from setting a higher than necessary cost estimate into price limits, our proposal is to use the lowest of these estimates for the development phase. This gives £22.2m in total for the development phase, of which £21.9m is in AMP7.

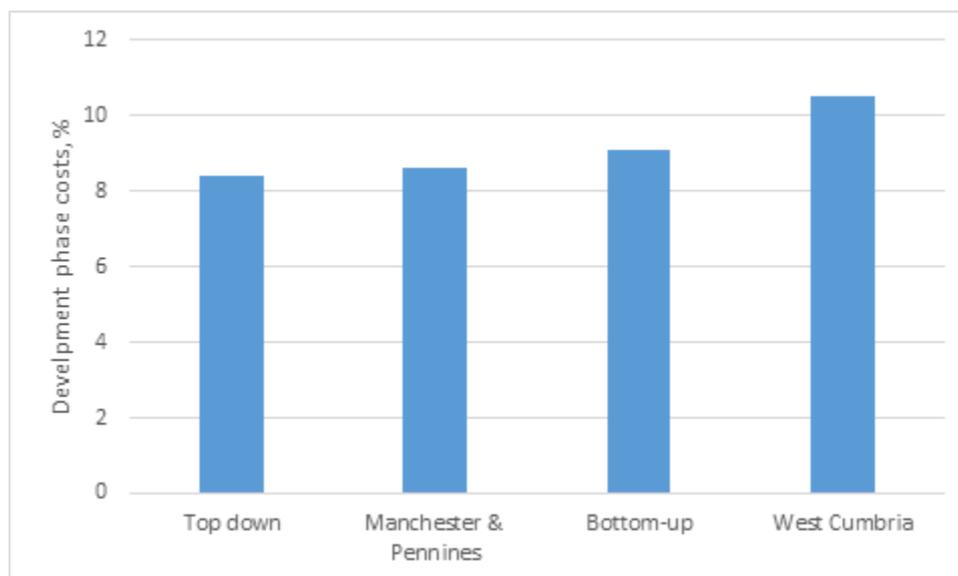


Figure 3. Range of development phase cost estimates used to inform United Utilities individual company AMP7 costs.

The total project cost for United Utilities elements is £263m, so the development phase is 8.4% of this. This is lower than the 12.5% suggested by the benchmarking evidence presented in the previous section. This gives confidence in the efficiency of the cost estimates.

1.5. Best option for customers

Options appraisal has been carried out by Water Resources South East and Thames Water for the 2019 Water Resources Management Plans. These show that an STT is selected as the best option in a variety of scenarios. Work by Water UK in 2015 also selected the transfer in the majority of scenarios.

Water resources options within the North West to make water available to transfer were selected through extensive analysis and public consultation in United Utilities revised draft WRMP 2019.

The proposal is effectively a real options mechanism, and as such generates “option value” so that a choice between options is available in the future for the benefit of customers. Progressing these options in AMP7 will support the selection of an optimal solution to the significant water resources needs of South East England. Our proposal is a means of managing uncertainty that avoids pushing up customer bills unduly through the use of gate reviews and an ODI mechanism.

If appropriate allowances are not included within the totex baseline, United Utilities will not be able to participate in the work to develop the STT. This means that the option value for customers in the South East would be reduced and United Utilities customers would forgo the opportunity to benefit from bill reductions arising from bulk exports via the transfer scheme.

It is therefore the better option for customers across the UK to allow expenditure for the scheme to progress subject to gateway and ODI protections as we have proposed.

1.6. Conclusion

In previous submissions to Ofwat, and in this document, United Utilities has provided evidence that the robust and efficient cost estimate for the Severn Thames transfer comprises:

£23.4m (one third share of £70.1m joint expenditure) + £21.9m individual expenditure = £45.3m

We request that this total of **£45.3m** is added into our water resources totex baseline. The £25.7m identified in the IAP is clearly inadequate to meet the need. If appropriate costs are not included in our totex baseline, United Utilities will not be able to participate in the work to develop the Severn Thames transfer.

2. Cost of the enhancement

Our cost estimate for this programme in AMP7 is a gross totex value of **£45.277m**. This comprises zero opex and £45.277m capex. None of these costs were included in our September business plan submission totex. They are all additional costs that we expect to incur if the Severn Thames transfer scheme progresses through AMP7.

Our estimate is higher than the £25.7m from the IAP and included in our Draft Determination. Based on the high level methodology used in the IAP using capex costs from Thames Water’s WRMP, we have no reason to assume that United Utilities water resource development costs are included in the Draft Determination. Our costs were included in the opex in Thames Water’s WRMP because they would ultimately be recovered from Thames Water through a bulk supply contract.

Our totex estimate therefore comprises two elements of scope (Table 2):

£m	2020/21*	2021/22	2022/23	2023/24	2024/25	PR19 total
One third share of £70.1m joint scope**	1.546	1.667	5.612	10.077	4.466	23.368
United Utilities individual company scope	4.605	2.001	7.615	6.031	1.657	21.909
Total enhancement claim	6.152	3.668	13.226	16.108	6.123	45.277

Table 2. Cost of the enhancement claim. (Notes: * 2020/21 joint expenditure includes £0.5m for 2019/20 transition expenditure; ** One third share of joint scope as agreed with Seven Trent and Thames Water, see document I015a.i, 3 May 2019.)

These joint and individual costs are also illustrated in Figure 4 below. Our understanding of the method used in the IAP is that it only accounted for the joint costs represented in the left hand pot in the illustration, however all the components of the scheme need to progress in AMP7 for there to be a viable STT.

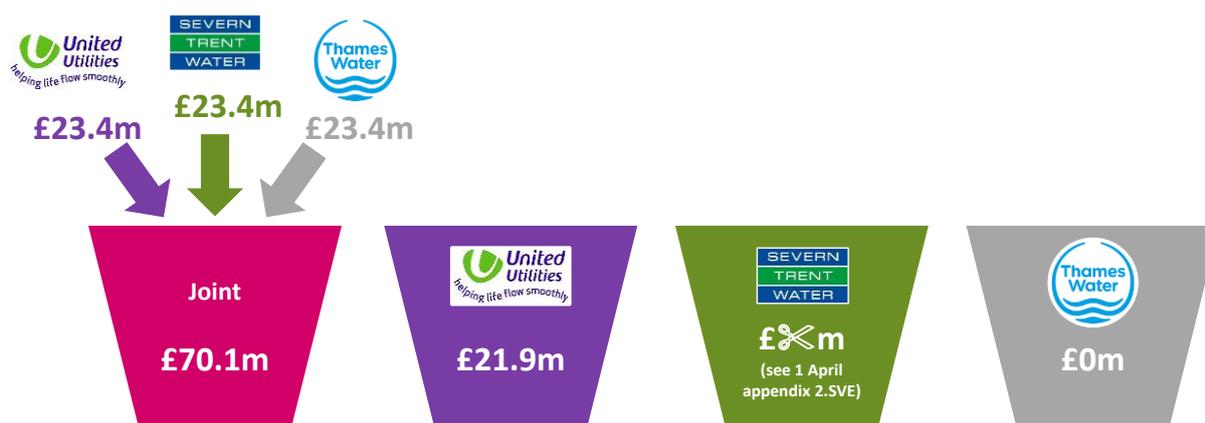


Figure 4. Components of the STT scheme.

Although we have not been party to the Severn Trent individual costs, we would expect that its costs are proportionally smaller than the United Utilities costs based on evidence in Thames Water’s WRMP. Therefore we would expect that the total costs are of the same order of magnitude as indicated in previous engagement with Ofwat (Section 1.1).

3. Management Control

3.1. Need for investment is outside United Utilities control

The need for the Severn Thames transfer (STT) arises because of an external factor outside United Utilities control, namely a significant supply demand deficit in South East England. That a future supply for the South East should come from United Utilities is within management control. As such, a specific adjustment to include these enhancement costs in the totex baseline is required to allow a scheme which is in the national interest to progress. Management control will be exercised through collaborative working and a gated process to protect customers from unnecessary investment during AMP7.

Defra’s guiding principles for water resources management plans states that companies “should demonstrate within your plans that you have considered ... collaborating with neighbouring water companies, e.g. transfers between water companies to free up surplus water and improve resilience, or sharing of joint resource developments, especially if there is a multi-company or regional benefit”. It also states that “The guideline sets out the minimum you must demonstrate you have done to investigate such options. ... The Secretary of State may cause an inquiry or hearing to be held and/or direct you to change your plan if options have not been given sufficient consideration or insufficient evidence is provided to support the proposal.”

We recognise the benefit to the water sector of more trading and transfers and have sought to promote this further. We have therefore considered exports from our area to improve resilience and provide regional benefits to South East England. As such the fundamental basis and need in terms of drought and resilience drivers, for a national water transfer, is outside of United Utilities management control, however the following are within United Utilities management control:

- Ensuring that work on the national water transfer option only progresses if there is a reasonable probability of success in delivering benefits for customers and shareholders, risks have been mitigated and managed, customers and stakeholders have been consulted with and there is sufficient evidence to support the project.
- Ensuring that the controls and mechanisms are in place to ensure there is efficient and successful delivery, which is via a proposed gated process customer protection performance commitment.
- Ensuring that costs are managed and controlled with an appropriate level of assurance and Board sign off.
- Ensuring that the resilience, costs of supply to our customers and the environment in the North West are protected.
- Ensuring that the drinking water quality and aesthetic acceptability (specifically hardness) is protected and maintained at current levels for those customers currently supplied from Lake Vyrnwy.

The following evidence demonstrates management controls of costs:

- Robust Water Resources Management Plan (WRMP) processes with use of new ‘extended methods’ to test the national water transfer option alongside a range of future scenarios to ensure best value for customers. There has been robust internal and external assurance of the draft WRMP.¹²
- Clear proposals for **collaborative working** (see section 3.2 of this document).
- Proposing a **gated process** and **performance commitment** to protect customers (see section 3.3 for the gated process and section 7 for the performance commitment).

¹² United Utilities draft Water Resources Management Plan, 2018

- Cost estimates for design and planning costs associated with the interconnector pipeline are based on both internal and independent external cost estimates (see section 6 of this document).

Through development of regional plans and WRMPs for the next planning round it will be necessary to confirm the timing of a national water transfer, its scope and likelihood of success. In order to include these enhancement costs in the Final Determination and protect customer interests, there needs to be a method to reflect changes. This is proposed to be through a gated process and ODI performance commitment.

3.2. Collaborative working

This section recapitulates evidence submitted for 1 April 2019 in document I015a (Section 4), which responded to IAP action UUW.CE.A3.

In this section, we outline our current proposals for collaborative working, including how consistent assumptions and decisions may be made both within the STT joint working group and also between it and equivalent groups for other strategic supply solution schemes identified by Ofwat in its IAP feedback.

As discussed further in Section 6, we have identified areas to be covered as **Joint Activities** or **Individual Activities**. Plans will continue to develop, including in relation to activities into AMP8, but this work is beyond the scope of this submission which is intended to cover only the work needed within AMP7 to progress the scheme.

1.6.1. Joint Activities

These activities will include all the core work-streams to design and obtain planning approval for a workable scheme, including:

- Overall programme management and demonstrating achievement of milestones;
- Evidencing the feasibility of the whole scheme in terms of reliability, environmental impacts, cost efficiency;
- Demonstrating compliance with Welsh Government guidelines, well-being goals and Environment Act (Wales);
- Stakeholder and customer engagement;
- Design, planning, consenting and identification of procurement needs for the interconnector and associated assets;
- Developing the proposal for system operation of the combined scheme; and
- Entering into contracts with third parties to deliver these joint programmes of work.

Companies will be collectively responsible for these and their nature will include activities of common interest between the three companies (rather than individual company interest or concern). We have considered a number of options to ensure joint activities are suitably structured and managed. The options include the parties entering into a more formal arrangement, such as an unincorporated joint venture or a separate legal entity (“T-Co”) jointly owned and financed by Severn Trent, Thames Water and United Utilities. Options also include less formal structures such as the parties entering into a Memorandum of Understanding or a voluntary alliancing type arrangement, similar to that employed by Water Resources in the South East group (WRSE).

We have agreed that until such time as a more formal arrangement is needed, Thames Water, Severn Trent and United Utilities will consider working under a Memorandum of Understanding. This will be developed in consideration of existing industry structures, and could for example, involve similar arrangements to WRSE. Individual appointees could carry out work for the good of all parties according to a scope of work agreed by all. Technical work carried out by external contractors, could be procured through competitive tender by a single appointee acting on behalf of all three parties.

We have also started to think about what would be the most appropriate and feasible structure for a more formalised arrangement. We have agreed that the timing of a future, more formal structure would be contingent on a set of triggers, requirements and considerations rather than an arbitrary date or scheme 'event'. Considerations include:

- Statutory powers – the ongoing need for statutory powers in undertaking work and the availability of/access to those powers other than through the three statutory undertakers is a key consideration;
- Separate representation/standing – as the scheme develops, there will increasingly be a need for the 'joint' element of the venture to have a voice in the scheme and related negotiations, focussed on its own interests;
- Contractual arrangements – as the scheme develops various works will need to be procured and relationships between providers/suppliers and beneficiaries will need to be considered;
- Information flows – some sensitive or confidential information relating to the scheme or other schemes cannot be shared freely between the three companies. Suitable governance will be required to protect against this risk; and
- Cost – there are different costs associated with the various potential arrangements being considered.

1.6.2. Individual Activities

Water companies also have their own individual responsibilities in this scheme. Donor companies will need to ensure their participation in the transfer scheme does not cause detriment to customers in their regions, that they can still comply with their obligations in relation to drinking water quality, security of supply and environmental consents. This will include appraisal of the scheme in 2023 WRMPs.

Since enabling water resource options from United Utilities and Severn Trent Water primarily relates to the re-use or reconfiguration of existing assets, they will need to be individually responsible for:

- Evidencing the feasibility of their support options in terms of reliability, environmental impacts, cost efficiency; and
- Design, planning, consenting and procurement for the support options.

The individual water companies will also need to deliver these individual responsibilities in a way that integrates into the overall plan for the scheme.

1.6.3. Overall governance and consistency for the Severn Thames Transfer

Overall governance and ways of working will be informed by the terms of reference for the STT, which we previously shared with Ofwat in January 2019 through CEO engagement. This provides evidence of our ongoing joint working for the STT.

Underpinning this approach will be an overall programme board. This will have responsibility for the successful delivery of the overall STT programme including the **Joint Activities** and the **Individual Activities**. United Utilities, Severn Trent Water, and Thames Water will each nominate two members to the programme board. The chair and secretariat responsibilities should rotate between members.

The programme board will guide the programme. Its terms of reference will include the following:

- To understand and ensure that risks to success are assessed appropriately and have effective management plans associated with them;
- To approve consistent assumptions and principles for use across the programme;
- To approve integrated programme plans and assess progress against them;

- To commission assurance reviews and other work to be undertaken, including by external providers;
- To authorise the submission of evidence into gateway reviews;
- To broker and maintain relationships with stakeholders across the organisations involved in the programme, including the regulators; and
- That members of the board should have authority to commit funding and resources from their respective organisations.

We welcome further discussion with Ofwat and the Regulatory Alliance for Progressing Infrastructure Development (RAPID) regarding regulatory oversight and integration of programme management activities.

1.6.4. Governance to ensure consistency with other South-East strategic water resources options

United Utilities, Severn Trent Water and Thames Water have worked with the other three companies who also have IAP actions relating to strategic water resources options: Anglian Water, Affinity Water and Southern Water. Together we have set up a joint governance group, which also includes Water Resources South East. We are committing to work with this group to progress the STT in a consistent way with other strategic schemes. Therefore the Terms of Reference for the six company working group in Appendix B of the six company Joint Statement¹³ should be taken as evidence for how consistent assumptions and decisions will be made between the STT and other schemes.

Whilst it is assumed that different approaches to joint working may be adopted within different schemes, for companies involved in more than one scheme it may make sense for them to adopt the same approach to each scheme they are involved in. To facilitate this, we have shared and will continue to share our approach to evolving our plan, its structure and the governance that we propose will underpin it. We will also continue to reflect on any similar proposals shared by those other companies/schemes to ensure appropriate commonality is adopted where appropriate.

3.3. Gated process

This section recapitulates evidence submitted for 1 April 2019 in document I015a (Section 5), which responded to IAP action UUW.CE.A3.

In this section we provide more detail on the gated process, the deliverables, timings and expenditure allocations at each gate. The section is structured to cover each of the interrelated aspects in turn. We therefore set out the gated process at a high level to explain the principles of how we see this working first, before examining the other aspects. We then follow with a more detailed proposal for the gated process.

3.3.1. Gated process - principles

There are a number of key questions relating to the gated process and how it might function. These relate to the deliverables, timing and the ODI mechanism, and include:

- What decision is made at each gate?
- Who makes the decision at each gate? and
- What criteria are the decision made on?

These questions are discussed in Section 6.5 of the Joint Statement we prepared with the other five companies who also have a strategic water resources scheme¹³.

We recognise that the ultimate decision at each gate is whether development expenditure should be recognised in price limits. The gate process should enable agile working allowing developing work to progress in a flexible way: pausing, stopping or changing scope as evidence is developed. This is

¹³ As submitted in document I015c for 1 April 2019.

particularly important for the STT as new evidence will emerge through environmental investigation, iteration of design and interdependencies with other options.

It is important to recognise the gate decision relating to recognising expenditure in price limits is separate from the statutory WRMP process, which determines the content of WRMPs. Decisions on expenditure and prices should be made in the context of the developing WRMPs, however gate decisions should not be considered in any way binding on the WRMP.

We therefore recognise that all relevant regulators should have a role in decision making at gates. However as decisions are made about the extent that development expenditure is reflected in customers' bills, Ofwat could chair the gateway review and make the final decision on whether to continue to allow customers to pay for the development expenditure based on input and advice from the other organisations. Ideally a decision would be by agreement of all the participants in the gateway, but there needs to be a mechanism in place if a collective decision cannot be reached. This may be appropriate because the decision at a gateway will affect the prices paid by customers, but will not be binding on other statutory processes including the WRMP.

Given the need for agile working and the likelihood that new evidence will emerge, it is important for gate decisions be taken in the round based on an assessment of evidence against a range of criteria. This will allow decisions always to be taken in the customers' best interest, acknowledging that some risks and uncertainties will remain at various gates. This also means that at each gate, the plan and criteria for the subsequent gate should be reviewed and changed if necessary in light of emerging evidence.

Although the NIC describes development of transfers as "low regrets", this gate process recognises that there remains some uncertainty around environmental feasibility, scheme selection in the next WRMP and the requirements of the planning process. A gated process enables the need and viability of the scheme to be reassessed and changes incorporated at each gate. There is no commitment for customers to pay for later expenditure until the evidence is assessed at the appropriate gate. Involving all the key regulators to determine whether milestones have been passed allows the output from dependencies to be incorporated. Should the scheme prove unfeasible then the project can be stopped at any milestone, with a limited cost incurred by customers. The gated process therefore protects customers from incurring unwarranted expenditure.

3.3.2. Gated definitions and timings

This section recapitulates evidence submitted for 1 April 2019 in document I015b (Section 5), which responded to IAP action UUW.CE.A3.

We have worked together with Severn Trent and Thames Water to develop a programme of activity to progress the STT (described in more detail below) and used this to define gates and a timeline. We have also shared this with the other companies with strategic water resources schemes, so that there is overall consistency with the gates shown here and in the six company Joint Statement.

Our proposal on the gates and activities are shown at a high level in Table 3 below. We consider it appropriate to align development activity to the five case model in the Treasury Green Book¹⁴, this will provide evidence to support the assessment of any resulting DPC.

¹⁴ The Green Book, Central Government Guidance on Appraisal and Evaluation, HM Treasury, 2018.

		Gate 1	Gate 2	Gate 3	Gate 4	
Activity between gates	2020 to 2022	2022 to 2023	2023 to 2024			
	Agree high level SEA for all scheme elements Develop consistent, robust costs Scheme deliverability; e.g. losses, environmental, river regulation, UU/SVT supply schemes Cost benefit with other options (WRMP / WRSE)	Deliver DCO pre-application; iterative detailed design, scoping phase of EIA Revise SEA from feedback on dWRMP/regional plan Develop procurement strategy Land preparation	Continue DCO pre-application investigations Continue DPC 5 business case development	Deliver DCO Application activities Procurement implementation Land purchase		Build
Gate decision		Need met, proceed to DCO pre-app	Need confirmed, continue DCO pre-app	Proceed to DCO App Start Procurement		
Dependency		dWRMP23 regional plan	fWRMP23	PR24 FD		

Table 3. Proposed gates for the STT scheme.

Each gate is described below, but in line with the principle of agile working, at each gate the timing and definitions of subsequent gates will be reviewed.

Gate 0 – at final determination

This will determine whether development expenditure for the period up to gate 1 is allowed in price limits and determine the timing and assessment criteria for gate 1.

Gate 1 - 31 August 2022

The timing and criteria for this gate will be confirmed at gate 0.

This will determine whether development expenditure for the period between gates 1 and 2 is allowed in price limits and determine the timing and assessment criteria for gate 2. This will be based on whether there is a need for the scheme confirmed in the draft WRMP23 regional plan, and will allow the scheme to proceed into a pre-application phase for the Development Consent Order (DCO).

Gate 2 - 30 September 2023

The timing and criteria for this gate will be confirmed at gate 1.

This will determine whether development expenditure for the period between gates 2 and 3 is allowed in price limits and determine the timing and assessment criteria for gate 3. This will be based on whether there is a need for the scheme confirmed in the final WRMP23 regional plan, and

will allow the scheme to proceed into a pre-application phase for the Development Consent Order (DCO).

Gate 3 - 31 August 2024

The timing and criteria for this gate will be confirmed at gate 2.

This will determine whether development expenditure for the period between gates 3 and 4 is allowed in price limits and determine the timing and assessment criteria for gate 4. This will be based on the completion of the pre-application phase of the DCO, and will allow the scheme to proceed into a formal DCO application.

Gate 4 - 2026

The timing and criteria for this gate will be confirmed at gate 3 and will determine whether construction costs will be included in price limits. This will be based on the outcome of the DCO application and will allow contracts to be let to allow the scheme to proceed into construction.

3.3.3. Detail of work programme

This section recapitulates evidence submitted for 1 April 2019 in document I015b (Appendix 1), which responded to IAP action UUW.CE.A3.

On the following page, Figure 5, is a high-level programme of activity for the joint work on the STT. It shows how activity fits into phases of work between the four proposed gates. It also highlights alignment with the WRMP and PR24 timelines. This is aligned to the deliverables for each gate shown in the following two sections.

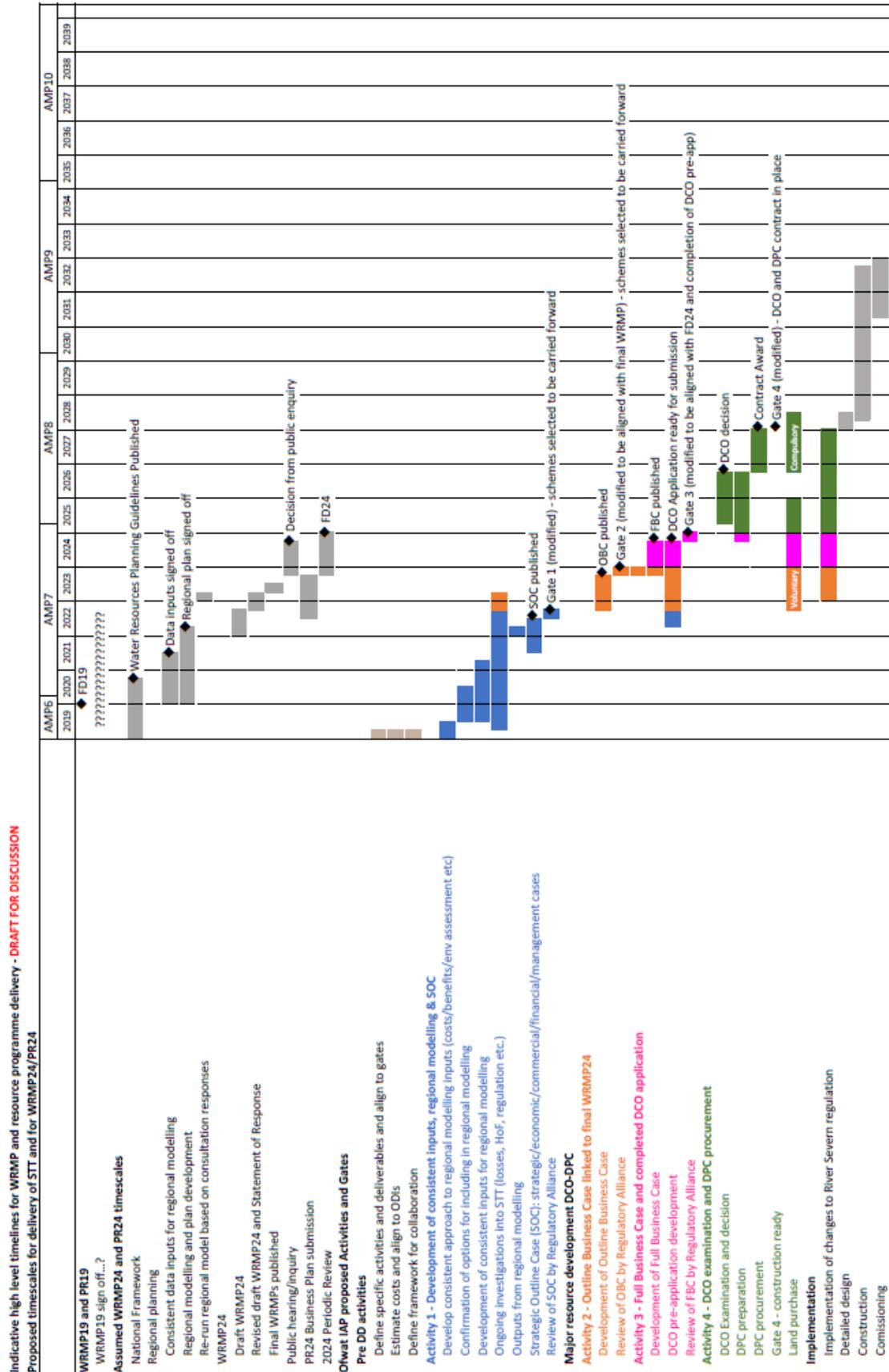


Figure 5. Joint work programme for the STT.

3.3.4. Joint deliverables for each gate

This section recapitulates evidence submitted for 1 April 2019 in document I015b (Section 5), which responded to IAP action UUW.CE.A3.

Below we set out deliverables which we anticipate will be available at each gate to inform the decision. As we noted above, at each gate the decision to proceed will be taken by looking at the evidence in the round. At each gate the deliverables and work programme for subsequent gates will also be reviewed.

Gate 1 joint deliverables, due by 31 August 2022

The following deliverables will provide evidence on the need for the STT to progress into the DCO pre-application phase. These deliverables will be aligned to the draft WRMP and regional plan which is expected in August 2022.

1. Report on high level assessment of environmental constraints; SEA HRA WFD, Environment Act (Wales)
2. Ecology and environmental impact assessment reports for River Severn and River Vyrnwy
3. Report on changes to drinking water quality on donor and recipient customers
4. Scheme costs and benefits agreed (consistent basis)
5. Conceptual scheme design (pipeline, treatment and other assets)
6. Inputs for regional plan and WRMP
7. Outline strategic business case (five case model) and procurement strategy
8. Land reference and field survey reports
9. Stakeholder and customer engagement plan and report on acceptability

There will also be a dependency on the following Environment Agency work with Natural Resources Wales:

- Report to quantify the amount of losses during conveyance and impact on existing abstraction rights
- Outline proposal for changes to River Severn regulation arrangements

Gate 2 joint deliverables, due by 30 September 2023

The following deliverables will provide evidence on the need for the STT to continue with the DCO pre-application phase. These deliverables will be aligned to the final WRMP regional plan which is expected in September 2023.

10. DCO pre-application
11. Environment Impact Assessment (EIA) report (draft)
12. Land noticing for access (first phase)
13. Topography, ground investigations, land drainage reports from detailed site investigation surveys (first phase)
14. Archaeological, ecological and environmental survey reports (first phase)
15. Design of pipeline route, abstraction and discharge facilities, treatment works etc.
16. Pre-application for relevant permits and discharge notices
17. Strategic Outline Case (five case model) and costed procurement strategy
18. Stakeholder consultation sessions and reports

Gate 3 joint deliverables, due by 31 August 2024

The following deliverables will provide evidence on the need for the STT to progress with the DCO application and commence procurement activity. These deliverables will be aligned to the

companies responses to the draft PR24 determination, and allow time for gate decisions to be made consistently with the PR24 final determination.

19. Complete/finalise deliverables 10 through 18
20. Production of employers work information (EWI)
21. Outline Business Case (five case model)
22. Tender documents for DPC
23. Land purchase (voluntary)
24. System operation and model contracts between donor and recipient companies

Gate 4 joint deliverables, expected in 2026

The following deliverables will provide evidence on the need for the STT to progress into the construction phase.

25. DCO application granted
26. Preferred bidder for CAP identified and contracts prepared
27. Statutory notices issued and necessary land purchased
28. Full Business Case (five case model)

3.3.5. United Utilities deliverables for each gate

This section recapitulates evidence submitted for 1 April 2019 in document I015b (Appendix 2.UUW), which responded to IAP action UUW.CE.A3.

The gateway dates for the STT are set out above¹⁵. Aligned to these gateways the United Utilities' deliverables, relating to the individual scheme components above, are as follows. Note that our assumption is that the United Utilities components of the scheme can have planning consents determined under the Town and Country Planning Act 1990, which will be more efficient than a DCO.

Gate 1 United Utilities deliverables, due by 31 August 2022

The following deliverables will provide evidence on the United Utilities options to support the assessment of the need for the STT to progress into the DCO pre-application phase. These deliverables will be aligned to the draft WRMP regional plan which is expected in August 2022.

1. Input into the Report on high level assessment of environmental constraints; SEA, HRA WFD, Environment Act (Wales)
2. Ecology and environmental impact assessment reports & surveys for United Utilities options
3. Report on potential changes to drinking water quality on United Utilities customers
4. Scheme costs and benefits agreed
5. Conceptual scheme design (pipeline, treatment and other assets)
6. Inputs for regional plan and WRMP
7. United Utilities contributions to STT outline strategic business case (five case model) and procurement strategy
8. Stakeholder and customer engagement plan and report on acceptability

Gate 2 United Utilities deliverables, due by 30 September 2023

The following deliverables will provide evidence on the United Utilities options to support the assessment of need for the STT to continue with the DCO pre-application phase. These deliverables will be aligned to the draft WRMP regional plan which is expected in September 2023.

9. Environment Impact Assessment (EIA) report (draft)

¹⁵ Originally submitted in Section 5 of the joint document (I015a).

10. Land noticing for access (first phase)
11. Topography, ground investigations, land drainage reports from detailed site investigation surveys (first phase)
12. Archaeological, ecological and environmental survey reports (first phase)
13. Design of pipeline route, abstraction and discharge facilities, and treatment works etc.
14. Pre-application for relevant permits and discharge notices
15. United Utilities contributions to STT Strategic Outline Case (five case model) and costed procurement strategy
16. Stakeholder consultation sessions and reports

Gate 3 United Utilities deliverables, due by 31 August 2024

The following deliverables will provide evidence on the United Utilities options to support the assessment of need for whole scheme to progress with the DCO/planning applications and commence procurement activity. These deliverables will be aligned to the companies responses to the draft PR24 determination, and allow time for gate decisions to be made consistently with the PR24 final determination.

17. Complete/finalise deliverables 9 through 16
18. Production of employers work information (EWI);
19. United Utilities contributions to STT Outline Business Case (five case model)
20. Tender documents for United Utilities options
21. Land purchase (voluntary)
22. System operation of United Utilities assets and interface with STT operator

Gate 4 United Utilities deliverables, expected in 2026

The following deliverables will provide evidence on the United Utilities elements, an essential contribution to the evidence that the whole STT scheme should progress into the construction phase.

23. Planning applications granted
24. Preferred bidder for CAP identified and contracts prepared
25. Statutory notices issued and necessary land purchased
26. Full Business Case (five case model)

4. Need for investment

4.1. Proposed incremental improvement

The proposal is to provide to commence preparatory work in the 2020 to 2025 period, so that a Severn Thames transfer (STT) option is available for water companies in the South East of England to select in their water resources management plans. This meets a need for new water resource in the Upper Thames identified in the draft Water Resources Management Plans of Thames Water, Affinity Water and South East Water, and also considered by Southern Water.

This proposal is consistent with an STT interconnector pipeline capacity of 300 MI/d, with 195 MI/d support provided into the River Severn, which is an option selected in various scenarios in Thames Water's draft and revised draft Water Resources Management Plans. A summary of the relative costs of different levels of support and pipeline capacity was presented by Thames Water at their stakeholder meeting in April 2017 as shown in Figure 6. At the same meeting Atkins presented results of a stochastic evaluation which indicated a 200 MI/d benefit from this option¹⁶.

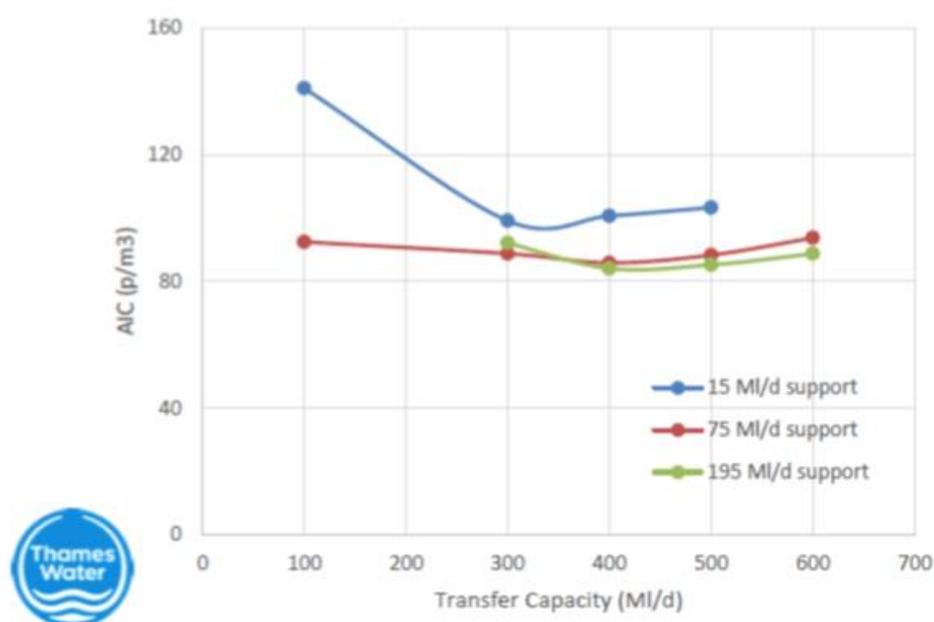


Figure 6. Thames Water's assessment of the relative costs of different levels of support and pipeline capacity presented to stakeholders in April 2017¹⁶.

Of the 195 MI/d support, up to 180 MI/d would come from Vyrnwy reservoir in North Wales. Vyrnwy is currently used by United Utilities to supply parts of Cheshire, Liverpool and elsewhere in North West England. In stochastic analysis, the water from Vyrnwy would be needed for transfer to the South East less than 15 per cent of the time¹². To maintain resilience of supplies to the North West, water resources management options will need to be developed, and these have been identified in United Utilities revised draft Water Resources Management Plan. As detailed above, additional investment may be required to ensure no detriment for customers in the North West with regard to resilience, water quality and customer acceptability for aesthetic parameters (primarily hardness). The remaining circa 15 MI/d of support would come from Severn Trent Water at Mythe on the River Severn. We also note that a number of other options to provide water into the River Severn have been identified and assessed by Thames Water in developing its draft Water Resources Management

¹⁶ <https://corporate.thameswater.co.uk/-/media/Site-Content/Thames-Water/Corporate/AboutUs/Our-strategies-and-plans/Water-resources/Document-library/Past-meetings/TSM-28-April-2017-Presentation-Final.pdf>

plan. Severn Trent Water also provided evidence in response to the IAP action relating to the costs of their contribution to this project.

Because of the complexities of multiple trading partners, requiring operational interactions and financial transactions, we are proposing that work is undertaken to develop the concept of a system operator for water trades between the Severn and Thames catchments. This would mitigate risks around security of supply, losses and environmental impact of the transfer. In November 2017, we published a paper proposing an approach to system operation which was developed jointly with Severn Trent and Thames Water¹⁷. This work needs taking forwards to establish the requirements for effective operation of the STT, including access arrangements, coordination arrangements and mitigation of the risks highlighted above.

Our enhancement claim is therefore based on the following elements:

- Development, design and pre-construction planning of the interconnector between the River Severn and River Thames. This is envisaged as a three way joint venture with Severn Trent and Thames Water, with costs in this claim representing a third of the total. Ultimately we expect the interconnector would be delivered through direct procurement for customers.
- Establishing requirements for system operation of the STT. This is envisaged as part of the three way joint venture.
- A programme of environmental investigations in relation to the STT. This is also envisaged as part of the three way joint venture.
- Development, design and pre-construction planning for enabling works and alternative resources for United Utilities to maintain supply to customers and resilience in the North West.

This is summarised in Figure 7. In addition to the costs in this claim, we would expect Severn Trent Water and Thames Water to contribute to the development of the interconnector, system operator and development of related changes in their systems. By completing this work we will have a construction-ready option for 2025, which could be contributing to resilience in the South East in the 2030s.

¹⁷ What role for System Operators in the water sector? November 2017
https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/looking-to-the-future/what-role-for-system-operators-in-the-water-sector-november-2017.pdf

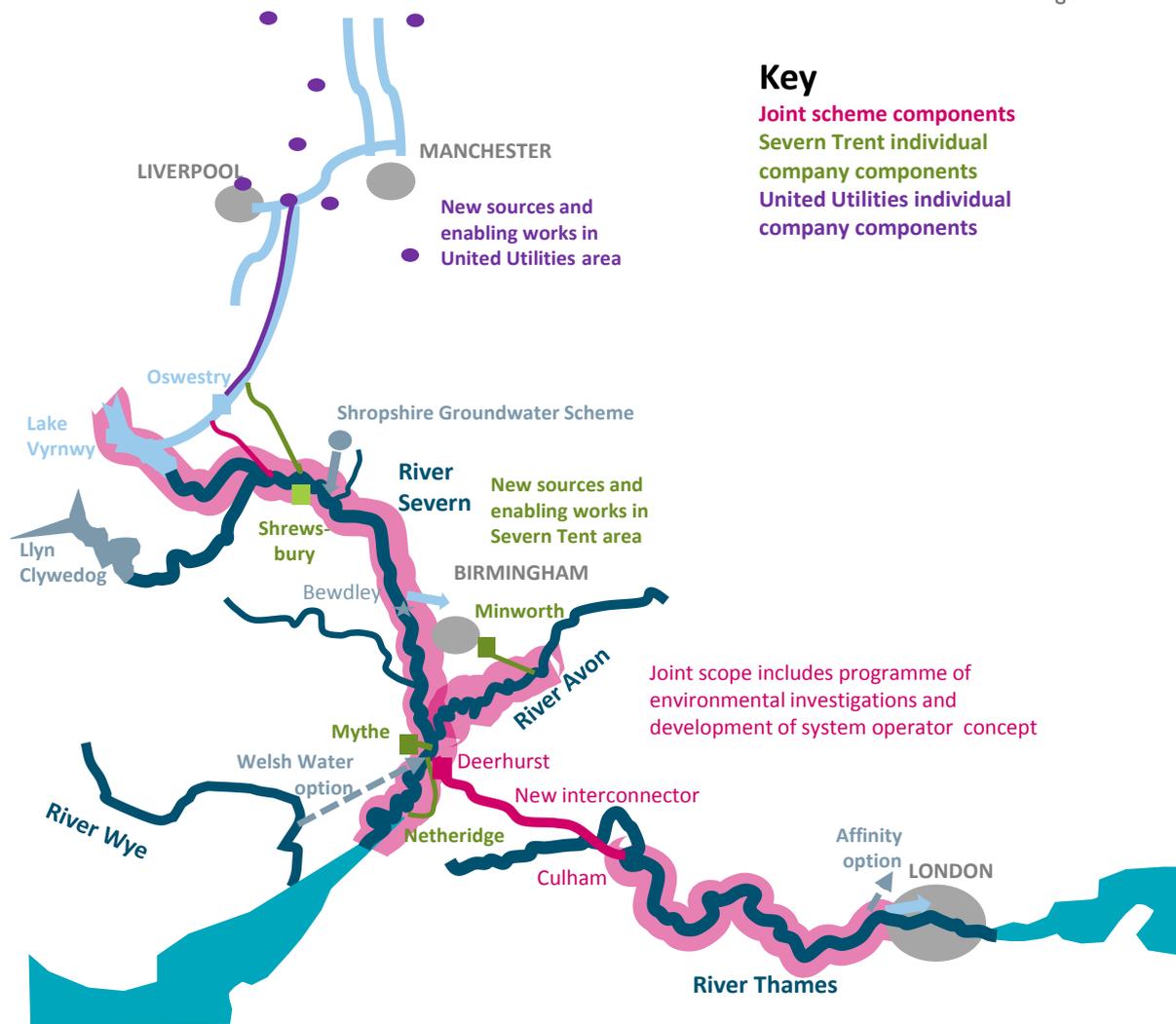


Figure 7. Overview of the scope for the STT and allocation between joint and individual company responsibility.

4.2. Evidence that the investment is required

The fundamental basis and need for this enhancement claim is driven by the longer term water resources needs of the South East region. The potential for longer term increases in drought risk, and potential for deficits across the South East, were set out in 2015 by Water UK¹⁸. The Water UK study and other earlier work has identified significant benefits from more interconnection and trading between water companies. Examples of work on the need for more upstream trading includes:

- In 2010 Ofwat estimated a net present value (NPV) of £959m efficiency savings available to the water industry in England and Wales by 2035, from 31 different trades of which 14 are within an individual company’s area and 17 are between companies¹⁹
- In 2015 Ofwat updated this work and estimated NPV benefits of £532m over 30 years, with scenarios suggesting a range between £416m and £810m²⁰.

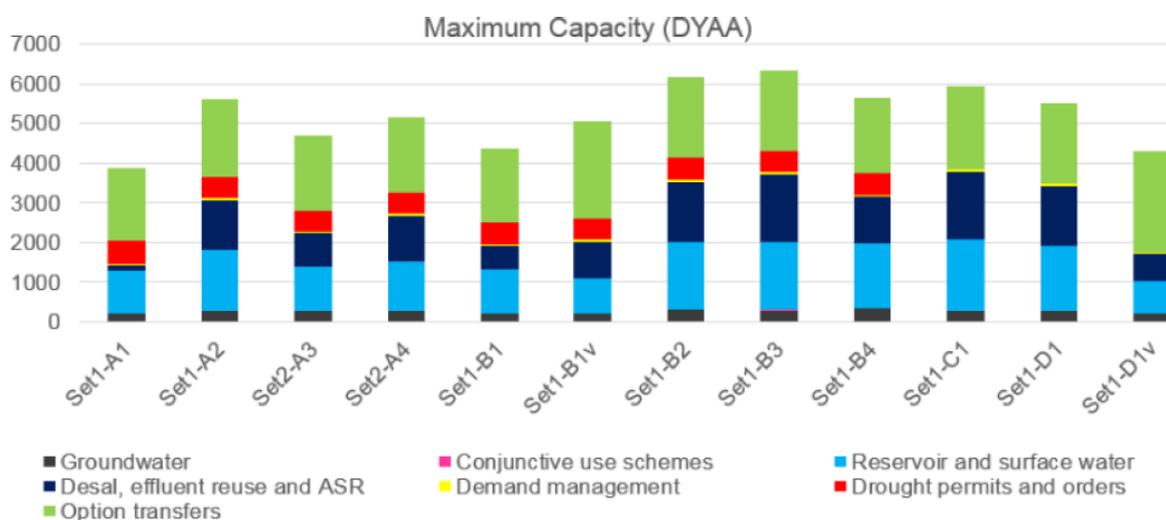
¹⁸ Water Resources Long Term Planning Framework, Water UK, 2015.

¹⁹ A study on potential benefits of upstream markets in the water sector in England and Wales, Ofwat, March 2010.

²⁰ Water 2020: our regulatory approach for water and wastewater services in England and Wales Appendix 3 Tackling water scarcity – further evidence and analysis, Ofwat, May 2016.

- Cave (2009) undertook a cost benefit analysis on five different scenarios, comparing the NPV of each against a business as usual net present cost. Cave recommended upstream competition models with an estimated benefit of £1.2 to £2.3bn over 30 years²¹.
- In 2010 the Environment Agency published the results of modelling that the Water Resources in the South East (WRSE) group had carried out. The findings indicated that optimisation and greater sharing of resources in the south east could lead to savings of approximately £501 million by 2035.²²
- Modelling by Ernst & Young and Severn Trent Water examined differences in the marginal cost of water across companies, using the Average Incremental Environmental and Social Cost ('AISC'). This suggested that there are differences between regions' marginal supply costs which could make for efficient trading.²³
- In 2018 the National Infrastructure Commission concluded that a network of strategic transfers could potentially provide about 700 MI/day more capacity, out of 1,300 MI/d needed, at costs comparable with other options and increased adaptability of the overall system.⁴

Individual water companies Water Resources Management Plans will provide the detailed justification and basis for selecting the water transfer option, either in preferred plans or as potential alternative options. It is in companies' final WRMPs that the case will be made as to why national water trading is selected from a suite of supply and demand options and this justification is not replicated in this enhancement claim. At the draft WRMP stage Thames Water, Affinity Water and South East Water have identified a need for new water resource in the upper Thames catchment, which could come from the STT or a new reservoir²⁴. Work by Water Resources South East also shows a need for more water transfers in optimised model outputs (see Figure 8 and Figure 9). In draft WRMPs, the timing of the need varies in different scenarios as does the selection between a new reservoir and an STT.



²¹ Independent Review of Competition and Innovation in Water Markets: Final report, Professor Martin Cave, April 2009.

²² Water Resources in the South East Group: Progress towards a shared water resources strategy in the South East of England, Environment Agency, WRSE, April 2010.

²³ Changing course through water trading, Ernst & Young and Severn Trent Water, June 2011.

²⁴ See for example Figure 55 on page 256 of Affinity Water's draft Water Resources Management Plan 2018.

Figure 8. Volume of different option types to meet water demand in 2080 (MI/d) under various scenarios from Water Resources South East²⁵

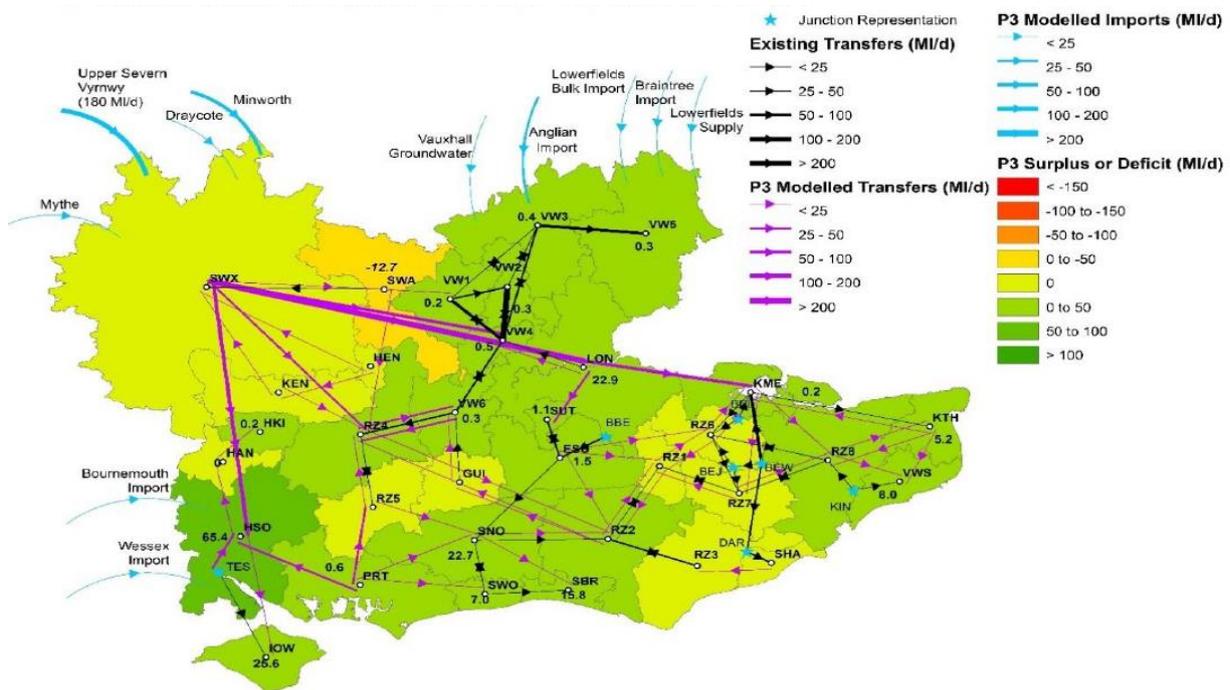


Figure 9. Map of South East England showing existing and modelled transfer options in 2079 for one example portfolio of options considered by Water Resources South East²⁶. The STT is represented by the blue arrows in the upper right hand corner of the map and in the long purple transfer arrows from SWOX to other parts of the South East.

The information and detail set out below starts from an assumed position of commencing the initial design and planning phases between 2020 and 2025, and the delivery phase from 2025 onwards to allow the transfer water to be available for use in the 2030s. This is consistent with the evidence put forward by the National Infrastructure Commission⁴. The need and timing will be confirmed during AMP7 through regional plans and WRMPs.

United Utilities has produced an adaptive revised draft WRMP that can enable water trading to progress should the need be confirmed. In the adaptive plan, United Utilities considers the options needed to mitigate the risk of deterioration in levels of service and resilience to its customers, if the trading option is selected by Thames or a wider consortium of companies across the South East.

For major infrastructure projects there is a need to undertake significant work on design, planning and preconstruction activity. This allows significant uncertainties in the final deliverability of the project to be resolved and allows the necessary legal consents to be obtained. This work can take around five years. For example, for United Utilities’ Thirlmere transfer scheme we established a project team in 2013 and construction started on site in 2017. The proposed national water transfer is significantly larger than the Thirlmere scheme. Construction may then take up to five years. Therefore to allow the transferred water to be available in the 2030’s there is a need carry out preparatory work during 2020-2025.

²⁵ <https://www.cwater.org.uk/wp-content/uploads/2017/10/Meeting-Presentations--Water-Resources-in-the-South-East-10-October-2017-1.pdf>

²⁶ <https://www.cwater.org.uk/wp-content/uploads/2017/10/Meeting-Presentations--Water-Resources-in-the-South-East-10-October-2017-1.pdf>

4.3. Customer support for the scheme

United Utilities relative priorities customer research²⁷ has shown that while water trading was seen as less of a priority than other service areas, 45% of customers thought that a focus on water trading was an important issue. A similar number (48%) were neutral on the issue, with only 7% saying it was not an important issue. Separate qualitative focus group research highlighted the following customer views²⁸:

- The view of many United Utilities customers in the survey, when it comes to the idea of water trading, is that it is good in principle. There is also an aspect of concern which also kicks in for many, however – “as long as we don’t suffer as a result of it”.
- There were some isolated views that the water in the North West belongs to the region and should not be exported at all – however this does not represent the views of the majority.

There were also some concerns raised about risks associated with water trading – these are discussed in Section 5.1. We have commissioned, jointly with Severn Trent Water and Thames Water, additional customer research. This was carried out by Verve in April, May and June 2018 considering the views of customers of importing and exporting companies, and also including the views of the people of Wales. This provided a consistent and more detailed assessment that builds on previous research. It included qualitative and quantitative elements and a mixture of household and non-household customers. The research was subject to review by the Customer Challenge Groups of the three companies. The full report²⁹ is published on United Utilities’ website²⁹.

It showed support to continue exploring water trading. Despite concerns, 74% of all customers agree they support water trading as part of the solution (Figure 10).

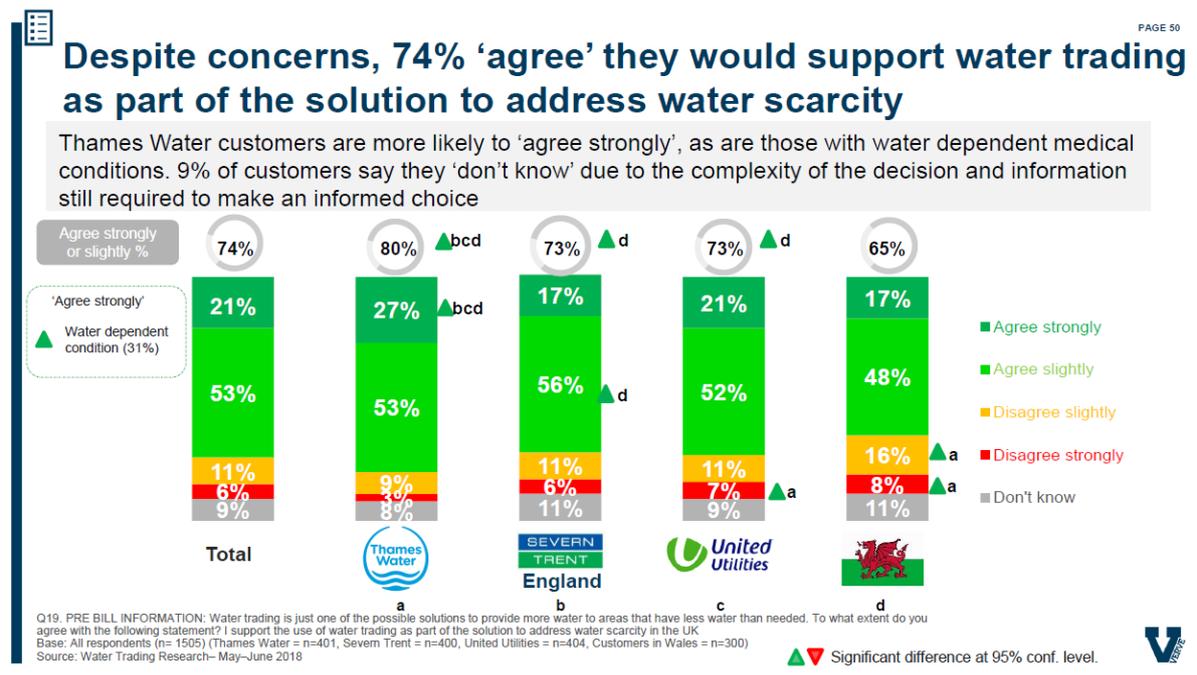


Figure 10. Levels of support for water trading.

Verve has provided the summary statement in the box below for the three companies to consistently report the findings of the research.

²⁷ UU Customer Priorities, Boxclever, November 2016

²⁸ UU WRMP19 Research: Phase 1 - DJS, September 2016

²⁹ https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/water-resources/water-trading-report--july-2018.pdf

Key points – Water trading customer research, July 2018

Customers have limited knowledge about the water scarcity issue, but quickly recognise the need for long term sustainable solutions

Informed reaction to water scarcity: 7 in 10 are concerned about water scarcity, particularly those in the Thames Water catchment area. Customers recognise that water scarcity is a long term issue requiring immediate nationally co-ordinated action. Customers call for widespread education on the issue. They assume that fixing leaks will be the major priority for water companies – the preferred demand management solution for all customers irrespective of region.

Preference for supply solutions: Water reuse is the most preferred supply solution across all water company regions, closely followed by building new reservoirs. Whilst regional transfer is the least preferred of the three solutions, 62% rank it as their first or second choice. Customers see sustainability (ability to provide water for the long term), environmental impact and the volume of water produced as the key evaluation criteria when choosing solutions to put in place.

Water trading, delivered cost effectively with assurances, works for customers

Level of support for water trading: Customers raise multiple concerns about water trading - the security of supply, environmental and financial impacts. Potential 'donor' customers are concerned as to the impact on their own supply, whilst Thames Water customers ask whether water will be available when needed. Despite concerns, 74% of all customers *agree they support water trading as part of the solution - it's logical to share. Support declines for a proportion of Thames Water customers (from 80% to 70%) on being told the cost will be paid back through the bill over a long period of time – they are unable to assess fully without a figure. In donor regions, 40p is seen as better reinvested into future water resource management.

Key assurances required: Eight assurance statements have been developed to help mitigate core areas of concern with water trading

1. Companies selling the water only do so if they can ensure they have a reliable source in the future
2. Water will only be taken when it is needed by Thames Water and the wider South-East region
3. There are plans in place to maintain new pipework
4. The 40p per donor customer is used for the improvement and upgrade of water services, with no impact on bills
5. Impact on bills for recipient regions will be kept to a minimum by spreading the cost over a long period
6. The regulator ensures water is traded at a fair price, and any cost to customers fairly reflects the level of investment made
7. External bodies will be involved in monitoring processes which could pose a risk to the environment
8. Water companies will be regulated on environmental impacts and must conduct due diligence checks

Assurances are also required about the continued improvement of demand management.

The Welsh perspective: Customers in Wales, whilst still concerned, have lower levels of support for water trading than observed in other potential donor regions.

- Their preference for demand and supply solutions is consistent with other water company regions – reducing leakage, water reuse and building new reservoirs are most preferred
- Wariness remains about supply slide solutions given the history of issues such as the Tryweryn Reservoir
- They are the most concerned to know that there is enough water left within 'donor' region post transfer (61% raise this as a concern compared with 54% of all customers)

- Whilst 65% support water trading as part of the solution, those in Wales have the lowest levels of support (65% *agree they support water trading compared with 73% for Severn Trent England and
- United Utilities).

*agree is a total of those who agree strongly or slightly with the statement “I support water trading as part of the solution to the water scarcity in the UK”

5. Best option for customers

5.1. Customers' priorities

United Utilities' approach to its WRMP has customer priorities at its heart. It is based on extensive customer research, and appropriate planning methods were chosen to ensure that customer priorities in terms of affordability, environment, water quality, customer acceptability and resilience were reflected in the selection of the preferred plan. To ensure that our WRMP stakeholder engagement and customer research was appropriate it was discussed with our Customer Challenge Group at various stages. Reflecting uncertainties and dependencies on other companies, the preferred plan is an adaptive plan, which can include or exclude the national water transfer. To identify alternative resources needed to maintain levels of service and resilience, and enable the transfer, we adopted an extended methods approach to the WRMP, which has intrinsically selected the best value options for customers. Further to this, extensive customer and stakeholder engagement has taken place, and more is in progress through ongoing research and consultation.

Cost-benefit analysis demonstrates longer term benefits for United Utilities customers, with an indicative benefit of circa £0.40 per household per annum reduction in annual bills being assessed at this stage³⁰. We consider that there will be similar benefits for Severn Trent customers, as another exporter into the Severn Thames transfer (STT). In our view there should also be benefits for customers of companies in the South East as a number of studies have shown that transfers are cost effective and resilient (see section 4.2).

Ofwat has introduced a water trading incentive. We have not taken account of this in our appraisals to date – our assessments are based on the underlying economic costs and benefits of the trade. Depending on details of the incentive in effect at the time the transfer becomes operational it could affect the sharing of benefits between companies and their customers.

There are also expected to be benefits for customers in Wales as the Wellbeing for Future Generations Act requires a net social/environmental benefit.

Customer research and stakeholder engagement has identified a number of concerns and risks that have to be managed and mitigated. These are explained in Table 4 below. Mitigation of these concerns could be aided by the use of the eight mitigation statements identified in the box on page 35.

Customer concern	Proposed mitigation
Customers might be paying to solve a problem in another company or different part of the UK	Costs incurred by United Utilities will ultimately be recovered from importing companies through bulk supply contracts.
Customers might be paying too much	Costs will ultimately be paid for by customers of importing companies. Those companies have water resources management plans which select the best value options for their customers.
Customers might pay for sunk costs if problems occur or the need changes before the transfer becomes operational	A customer protection performance commitment will ensure money is only spent when there is consensus that there is a high probability of success (see section 7).

³⁰ United Utilities draft Water Resources Management Plan, 2018.

Customer concern	Proposed mitigation
Water might not arrive in recipient areas	<p>Contractual terms will provide protection so that the exporting company does not use water allocated to the importing company.</p> <p>System operator requirements will be defined in AMP7 to manage the risk of losses en-route.</p>
The transfer could result in increased risk of drought in donor areas	<p>Water resources management plans have assessed the risk of extreme drought and identified options that will need to be developed to ensure that the risk of drought does not increase as a result of the transfer.</p> <p>Appraisals will be updated in the next round of WRMPs and regional plans and be taken into account in the gated process (section 3.2).</p>
The trade might result in a lowering of drinking water quality	<p>Water quality has been considered in the identification, scoping and selections of the options in United Utilities WRMP to ensure no deterioration in both water quality and customer acceptability. As further work on this is carried out through design and development in AMP7 there may be the need for additional investment which would be considered through the gated process (section 3.2).</p>
There might be an environmental impact, including causing harm to the ecosystem	<p>Water resources management plans have included extensive assessments of environmental impacts (referenced in Section 5.5 for United Utilities). United Utilities plans included an extended methods approach to ensure selection of options maintained environmental performance of the supply system.</p>
The trade might result in a lower level of resilience of supplies to customers currently supplied by Lake Vyrnwy	<p>Resilience to water supply to customers has been considered and will be assessed in detail as part of the design work during AMP7.</p>
Customers might be paying to solve a problem in another company or different part of the UK	<p>Costs incurred by United Utilities will ultimately be recovered from importing companies through bulk supply contracts.</p>
Adding more water to rivers might increase the risk of flooding	<p>The Strategic Environmental Assessment of the option in United Utilities draft WRMP concluded that operation of the option is not expected to cause or exacerbate flooding. This will be considered again in future updates to the SEA.</p>
Disruption from construction works might impact local areas	<p>Customers recognise that some disruption is necessary to ensure we have enough water for the future. The Strategic Environmental Assessment identifies issues likely to arise including noise, dust and vibrations during construction associated with construction activities and vehicles as well as landscape and visual</p>

Customer concern	Proposed mitigation
	amenity. We will consider all best practice mitigation measures to address these concerns.

Table 4. Customer concerns, based on joint research and UU qualitative focus group research³¹, and proposed mitigation.

The risk to customers can be somewhat mitigated by carrying out the project as a form of joint venture with both donor and recipient company involvement and commitment to the project (Section 3.2). This is further supported by the proposed customer protection performance commitment that is designed to protect customers (section 7). The extended methods approach used in the WRMP is designed to ensure that, through enabling works and alternative resources in United Utilities, the transfer does not reduce resilience, detriment the environment, water quality, customer acceptability or increase the drought risks for customers.

The potential for longer term increases in drought risk, and potential for deficits across the South East, were set out in 2015 by Water UK³² and it will be important to link the requirements with different company WRMPs. Water trading reduces the risk of single point of failure, or dependence upon resources in a particular area or region, and therefore at a national level increases the options available to deal with long-term pressures such as population growth and climate change. Increasing interconnectivity can improve resilience not just for customers but also the environment. The basis for the investment need is not driven by United Utilities customers, but by Thames Water and/or the wider South East region as a whole. The benefit for United Utilities customers is an economic one, and this links closely with affordability, as national water transfers offer a bill reduction for the long term.

United Utilities has produced an adaptive WRMP that can enable either path to be taken at WRMP19. It is therefore considered prudent to include the enhancement cost at this stage, which can be removed or modified through the gated process and ODI. In the adaptive plan, United Utilities considers the options needed to mitigate the risk of deterioration in levels of service and resilience to its customers, if the trading option is selected by Thames or a wider consortium of companies across the South East. The proposed performance commitment (Section 7) also allows adaptive planning. It ensures that money will not be spent progressing the scheme unless it is in the benefit of customers.

5.2. Options, costs and benefit analysis

The assumption in relation to the selection of a national water transfer is that if it is in a preferred plan of Thames Water or across a wider consortium in the South East, that this has been selected through a rigorous selection process as part of the WRMP. The focus for this enhancement claim in relation to costs, is therefore to demonstrate that the solution having been selected, is being managed and delivered in a cost efficient manner to represent best value.

At this stage, costs and benefits have been assessed to enable the scheme to be considered in 2019 WRMPs. In United Utilities’ draft WRMP stage we included a water export from the region in the preferred plan for consultation, as we recommended that we continue to work towards a future trade from our region in the best interests of customers. In developing those proposals we took the concerns of customers and stakeholders into account. We developed an extended methods (sophisticated and improved options appraisal) process (Section 7.2 of our revised draft WRMP) specifically to address these concerns. This allowed us to select options to enable an export which at least maintains resilience at the levels expected by customers, and protect the environment (this is shown in Section 8 of our revised draft WRMP).

³¹ UU WRMP19 Research: Phase 1 - DJS, September 2016

³² Water Resources Long Term Planning Framework, Water UK, 2015

In the extended methods assessment for the Vyrnwy export, system performance (captured via the metrics in Section 4.4) was always determined by comparison against a baseline. In the 2030s model runs, performance was compared against the scenario in which 133 Ml/d of leakage reduction had taken place. When selecting the preferred portfolio, it was necessary to at least match the performance in this scenario, so that customers and the environment would not suffer any detriment through the strategic choices being considered (noting that customers would previously have paid for this investment to reduce leakage, with the resultant benefits this provides). Our approach was driven by the clear customer and stakeholder concern that water trading would result in impacts to customers (e.g. levels of service, resilience) and the environment. Feedback indicated a requirement that these be protected. This guided our approach at the pre-consultation stage of the WRMP process. This was an important part of our extended methods options appraisal approach to developing a plan that would provide the necessary reassurance, whilst also preventing barriers to water trading that would otherwise occur (with the resulting loss of benefit to customers in other regions). Recognising that a surplus has an inherent value, for example, greater drought resilience, we do not feel that it is appropriate that customers lose this benefit (particularly noting that they would have paid for reduced leakage through their bills to get to that position).

In selecting the preferred portfolio the lowest cost set of options that would provide the desired performance were sought. Performance was measured using the metrics in Table 5 and they are explained further in Revised Draft WRMP Technical Report – Options Appraisal. This means that some options which were not necessarily the cheapest were selected to serve specific purposes, such as protecting sensitive groundwater sources and reducing abstraction, i.e. they provided “best value” to meet our objectives.

Metric type	Initial metric category	Metric	Why is this a metric?
Primary	Customer	Change in the likelihood of temporary use bans	This is measure of the frequency of the implementation of temporary use bans, previously “hosepipe bans”, the impact of which directly affects customers.
Primary	Customer	Change in drought resilience	This is a measure of the risk of drought that customers are under, the impact of which directly affects customers
Primary	Environment	Change in river flows and implementation length of drought permits	This is a measure of the length of time drought permits are implemented for, the impact of which directly affects the environment.
Contributory	Environment	Change in abstraction from environmentally sensitive groundwater sources	This is a measure of the potential impact on the amount of water abstracted from several Water Framework Directive (WFD) sensitive groundwater sources.
Contributory	Customer	Change in spill from reservoirs	A key concern for North West customers and stakeholders, while a full flooding impact assessment is being carried out separately as part of our resilience review, this spill metric allows us to understand if our actions are likely to lead to an increase (or decrease) in spill from reservoirs. Conversely, greater

Metric type	Initial metric category	Metric	Why is this a metric?
			spill, and spill variability, can benefit downstream habitats.
Contributory	Customer	Climate change resilience – change in the likelihood of temporary use bans	Helps us understand if our primary metric of “change in the likelihood of temporary use bans” is impacted under different potential climate change scenarios.
Contributory	Customer	Climate change resilience – change in drought resilience	Helps us understand if our primary metric of “change in drought resilience” is impacted under different potential climate change scenarios.

Table 5. Metrics used in extended methods appraisal in United Utilities’ WRMP.

The current assessment of costs and benefits are demonstrated below for United Utilities.

Based on the selected portfolio of options (detailed in Section 6.2.2), costs include alternative resources capex of £111m and enabling works capex of £152m for United Utilities. Further details on robustness and efficiency of costs are given in Section 6. This portfolio of options maintains drought and climate change resilience and shows modest improvement in the other metrics in Table 5.

The national benefit of this is that releases 180 MI/d of water resource from Vyrnwy reservoir for transfer use by Thames Water and others in the South East. The benefit to United Utilities’ customers is revenue from Thames and based on indicative pricing provided to Thames Water in April 2017 we estimated in the draft WRMP that this would be equivalent to a net 40 pence reduction in the annual average bill. Customer research indicates that customers may prefer to see this reinvested in improved service or resilience but that would be a choice for PR24.

The costs and benefits are subject to some change if the timing of the selection of the option changes, or if there are changes to the pricing methodology.

The benefit for the UK overall should be clearer following completion of regional plans and WRMPs for 2023 (i.e. at gate 3), and depends largely on whether the national water transfer option is deemed better value than a suite of other supply or demand options in other companies. As noted in Section 4.2 a number of studies have shown significant benefits of water trading and interconnection.

A more detailed breakdown of costs is provided in Section 6.

5.3. Best value for customers in the long term

The direct costs of these new water resources and associated works incurred by United Utilities will ultimately be recovered from the importing companies under a bulk supply contract. In addition, because the bulk supply contract will also cover a proportionate contribution to the general costs of running a water company, bills for customers in the North West will be slightly lower as a result of the trade. This bill reduction is estimated to be around 40 pence per annum for every household.

Because of this enhancement claim, there would be a short term increase to United Utilities customer bills. We calculate this short term effect on customer bills to be 22p on average over AMP7, which translates to less than 2p per month on customer bills over the next five years. Once bulk supply revenues from the importing companies commence there would be the long term net reduction in bills for United Utilities customers noted above. We acknowledge that there is a risk of customers paying for sunk costs if the trade did not progress, this is discussed in Section 5.4 with customer protection proposed in Section 7.

Since, by participating in the trade there is a bill reduction to United Utilities customers and we will ensure that there is no service detriment, it represents best value for customers in the long term compared to the do nothing option. Risks around recovery of costs incurred during 2020-2025 are discussed in the following section.

5.4. Assessment of risks

The proposed trade will enhance system resilience for UK water supplies. For importing companies, water trading reduces the risk of single point of failure, or dependence upon resources in a particular area or region, and therefore at a national level increases the options available to deal with long-term pressures such as population growth and climate change. In addition the risk of coincident drought is much lower across the North West and South East than other potential transfers, further enhancing system resilience. Increasing interconnectivity can improve resilience not just for customers but also the environment. The basis for the investment need is not driven by United Utilities customers, but by Thames Water and/or the wider South East region as a whole. In Thames Water's draft WRMP, the Vyrnwy supported STT is favoured in scenarios which optimise for resilience and environmental benefit³³.

The lowest risk approach for United Utilities customers is not to participate in a national water transfer, however affordability is a key driver for customers, and this option represents an economic opportunity with a potential long term bill reduction in the region of £0.40 per household per annum. To do nothing, and not progress with any national water transfer scheme, would miss the economic opportunity for customers and shareholders that a potential transfer of water to the South East can bring.

Customers face the risk of extensive design, planning and pre-construction costs being sunk if a party unilaterally pulls out or changes direction before contracts are signed, or if other variables result in an unsuccessful outcome. Customers face upfront costs associated with design and planning, along with investments in infrastructure before the realisation of longer term benefits through revenues collected through standing charges and variable charges.

There are a number of key elements related to managing the uncertainty and risk that could provide the necessary confidence:

- Undertake the joint design work in 2020-25 through a joint venture, so the risk is shared between donor and recipient companies (Section 3.2).
- Review the need for the scheme in WRMPs and regional plans to determine the likelihood or needs in other companies over the longer term and reflect this in the gated process (Section 3.2).
- Understanding regulatory and stakeholder support for the transfer through the Water Resources Management Plan / regional planning process and the gated process (Section 3.2).
- Understand and address the impact on the water quality, customer acceptability for aesthetic parameters (primarily hardness) and resilience of the alternative water before any change is made (Section 5.1).
- Undertake further negotiations and discussions with recipient companies in the South East through our collaborative working (Section 3.2).
- Proposed performance commitment to protect customers (see Section 7).

³³ See for example Table 10-16 on page 43 of Section 10 of Thames Water's draft Water Resources Management Plan 2018.

There will always be some uncertainty and risk with such large scale infrastructure projects, and unforeseen issues such as technical or environmental factors over time could delay or result in such a project being abandoned.

5.5. Natural capital and the environment

Natural capital³⁴ and ecosystems are considered as water trading is assessed as an option as part of the remit of the WRMP, with associated regulation, and stakeholder engagement. In developing our WRMP our objective has been to ensure that both customers and the environment are protected from the impacts of water trading in the most sustainable way, with the minimum possible overall level of investment. If we were to introduce the water transfer without options in place, there could be a detrimental impact to customers and the environment. Therefore, our preferred plan recovers the performance of the system with the lowest possible level of investment that we were able to find to avoid deterioration against the performance metrics (see Section 7 of United Utilities draft WRMP).

Our plan development includes environmental and social costing, as well as the following environmental appraisals:

- [Revised Draft Water Resources Management Plan 2019 Habitats Regulation Assessment](#)
- [Revised Draft Water Resources Management Plan 2019 Water Framework Directive](#)
- [Strategic Environmental Assessment of the Revised Draft Water Resources Management Plan 2019](#)

In summary, the draft WRMP Preferred Plan is expected to generate significant positive effects across several of the Strategic Environmental Assessment objectives including water quantity and quality, climate change, health, wellbeing, water resources and resource use. Where negative effects have been identified, these are expected to be minor only. Adverse effects associated with the construction/implementation of water management measures would be short term and temporary and it is expected that best practice construction techniques and methods could be implemented at the project stage to help reduce the likelihood of such effects occurring and their magnitude. Similarly, it is expected that negative operational effects could be managed to an acceptable level at the project stage, with appropriate mitigation identified through further detailed assessment of environmental impacts. The exception to this is in respect of climate change and resource use where significant negative effects have been identified during construction. However, these effects reflect the energy and resource use associated with the implementation of the water management measures which is to a large extent unavoidable (although effects may be reduced at the project stage through, for example, the use of renewable energy and sustainably sourced construction materials).

³⁴ Natural capital is defined as the elements of nature that directly and indirectly produce value or benefits to people, including ecosystems, species, freshwater, land, minerals, the air and oceans, as well as natural processes and functions (Natural Capital Committee, Working Paper 1, March 2014).

6. Robustness and efficiency of costs

6.1. Introduction

As set out in Chapter 7 of our PR19 business plan, we have undertaken significant improvements in our delivery of efficient totex solutions:

- We have embraced the totex and outcomes approach, delivering significant improvements from innovative approaches and technologies
- Through our Market Engagement Methodology (MEM), we have improved the sophistication with which we engage with markets to deliver more efficient solutions and services
- We have improved our approach to totex, by better challenging both needs and solutions

The introduction of a risk and value (R&V) assessment across all our major projects has supported better challenge of our expenditure requirements, including enhancements. This ensures that when we decide projects are necessary, we only do what we need to do, that our decisions are based on strong evidence, and the value to both business and customers is clear. The process ensures that we keep challenging and validating both the need for our projects and the way we deliver them.

Whilst we have a good track record of delivery, we are continuously exploring ways to increase efficiency. Full details of market testing activity are given in the Market Engagement Methodology supplementary document to our main Price Control submission. Through the AMP we will continue to explore efficient delivery methods, and we will explore further partnership delivery approaches wherever that can achieve an efficiency.

United Utilities' enhancement claim of £45.3m for the Severn Thames transfer (STT) includes two elements:

- **Joint scope:** Development, design and pre-construction planning of the interconnector between the River Severn and River Thames: £23.4m. This is envisaged as a three way joint venture with Severn Trent and Thames Water, with these costs representing a third of the total. Ultimately we expect the interconnector would be delivered through direct procurement for customers.
- **Individual scope:** Development, design and pre-construction planning for enabling works and alternative resources for United Utilities: £21.9m. This is needed to protect the resilience, water quality, customer acceptability for aesthetic parameters (primarily hardness) of the alternative water source to our customers before any change is made. Although Severn Trent also has individual scope to provide water resource for the STT, we have not been party to those costs.

The build-up of these costs is shown in Table 6 and Figure 4, and discussed in turn below.

Further details of how we have appraised and selected options included in the individual scope are available in:

- [Revised Draft Water Resources Management Plan 2019 Technical Report – Options identification](#)
- [Revised Draft Water Resources Management Plan 2019 Technical Report – Options appraisal](#)

The joint scope includes the environmental investigations needed during 2020-2025 to inform the development of the STT and provide option specific evidence into 2023 WRMPs and regional plans.

In addition we have also considered the costs of developing a system operator. This the system operator may be responsible for monitoring and modelling River Severn flows, and coordinating operational activity between the trading parties, the operator of the STT assets, other abstractors in

the Severn and Thames catchments, the Environment Agency and Natural Resources Wales. It may also handle the coordination of financial transactions related to the trade(s). For the design and development phase we plan to establish the requirements for system operation as a joint activity and we expect to be able to accommodate these costs within the estimates of costs for the interconnector.

We have considered the potential for the proposed transfer were to develop into a bilateral trade when attributing to price controls. In this case it is appropriate to allocate 100% to water resources and then have a recharge from water resources to water network plus for investment needed in that price control to enable the transfer.

Component	Joint / individual	Total £m	Preparatory work AMP7 £m	United Utilities Enhancement Claim* £m	Source
United Utilities water resources	individual	111	21.9	21.9	I015b, 1 April submission
United Utilities water network enabling works	individual	152			
STT interconnector	joint	724	70.1	23.3	1015a, 3 May submission
Environmental investigations **	joint		2		ibid
System operator **	joint		3		ibid
Severn Trent enabling works ***	individual	?	?	-	N/A
Thames Water enabling works	individual	-	-	-	I015a, 1 April submission
Total		>987		45.3	

* Includes 100% of United Utilities costs and one third of joint costs.

** Assumed to be implicitly included with the estimating method for the interconnector.

*** United Utilities has not been party to these costs; they are detailed in Severn Trent's submissions.

Table 6. Build-up of costs for the whole STT scheme.

6.2. Scope of work

6.2.1. Joint scope to be delivered by all three companies

This section recapitulates evidence submitted for 1 April 2019 in document I015a (Section 3), which responded to IAP action UUW.CE.A3.

Interconnector (joint component)

For its WRMP, Thames Water assessed a number of options for the transfer of water between the two rivers. This explored pipeline and canal transfer routes. The canal option was discounted due to it being less feasible than the pipeline option (it performed worse on the key criteria of water resources and water quality, normalised cost, constructability and operability)³⁵. A number of

³⁵ Thames Water WRMP19 resource options – raw water transfers feasibility report, Thames Water, Mott Macdonald and Cascade Consulting, July 2018.

pipeline capacities were considered and a 300 MI/d capacity was identified as optimal in Thames Water's WRMP. Environmental risks were considered, including water quality and invasive non-native species³⁶ and mitigation for these risks were identified and included in the scope³⁵.

The scope of the interconnector works is therefore:

- A river intake structure at Deerhurst including inlet screens and a twin culvert to a low lift pumping station
- A low lift pumping station and a pipeline to treatment works
- Treatment works at Deerhurst to treat for phosphorous, mussels, suspended solids and algae
- A high lift pumping station
- A rising main
- A break pressure tank at the high point
- A gravity main to discharge
- An outfall at Culham with an actuated valve and a cascade structure
- Washouts along the route provided with permanent discharge pipework to adjacent watercourses
- Pipe diameter 1.5m, total length 87.5km

There are also potential risks due to releases from Vyrnwy reservoir affecting the River Vyrnwy downstream of Vyrnwy dam to the River Severn confluence. A mitigation option for this risk is a pipeline (180 MI/d, 22.3km, 1200mm diameter) from the Vyrnwy Aqueduct upstream of Oswestry to the River Severn. This option is therefore also included within the joint overall scope, but its need will be confirmed by further environmental investigations. Assuming that this potential change can be accommodated by the gate process and ODI, we have not included this element of scope in the cost estimates used for this enhancement claim.

Environmental investigations (joint)

To confirm the viability of the scheme, and confirm appropriate mitigation for various risks a programme of environmental investigations has been identified by the companies in the WRMPs. This is shown in Table 7 below:

	Name	Outline scope
1	River Severn Losses	Understanding the magnitude of water losses that could occur during transfer. Scope is available in Annex J3 of Thames Water's WRMP.
2	River Severn regulation	The changes that would be required to the regulation of the River Severn to ensure water is available for transfer when required and that the Severn Estuary Special Area of Conservation is not detrimentally impacted by the increased upstream abstraction.
3	Environmental studies on downstream impacts of supporting options	Environmental Investigations and Survey Requirements for STT flow augmentation options, including impacts on the River Vyrnwy of the Vyrnwy options (which will confirm whether a raw water pipeline is needed as mitigation) and impacts on the River Avon and River Tame. Scope is available in Annex J4 of Thames Water's WRMP.

³⁶ The parameters of concern were: suspended solids, zinc, dissolved oxygen, phosphorous, copper, algal biomass from the River Severn, drinking water safety parameters, invasive species spread, fish protection.

4	Algal studies	Understanding water quality issues associated with how River Severn algae behave when transferred into the River Thames. Scope is available in Annex J5 of Thames Water’s WRMP.
5	Environmental studies on support options	Environmental studies for a number of supporting options, including a United Utilities screening phase and more detailed investigations at a smaller number of sites.
6	Well-being in Wales	A study to assess the contribution the Vyrnwy options will make to the well-being goals for Wales contained in the Well-being of Future Generations (Wales) Act 2015.
7	Vyrnwy water levels	A study to assess whether changes to the magnitude of timing of River Severn support would affect water levels at Vyrnwy reservoir and the environmental effects of any changes to water level.

Table 7. Programme of environmental investigations identified in the companies’ WRMPs.

In addition, the Environment Agency water transfers team has identified a further programme of investigations and related work for the STT (Table 8). The EA has advised³⁷ that as this programme of work is specific to the STT scheme it will need funding by the companies. The funds are needed to provide EA resource and/or consultancy support to the EA. The activity in the Environment Agency transfers programme is shown in Table 8 below.

³⁷ Email correspondence between David Preston and Richard Blackwell, March 2019.

A	Communications and engagement work (Area, National, external stakeholder engagement)
B	Supporting collaborative reviews and agreeing naturalised flows series
C	Supporting collaborative reviews of water resources model baseline parameters
D	Develop EA Water Resource Model/s for the River Severn and catchments
E	Gauging station QA and rating curve review work programmes to support transfers - English sites
F	Gauging station QA and rating curve review work programmes to support transfers - Welsh sites
G	Technical appraisal of river asset performance due to potential flow change e.g. FCRM / fish passes
H	Supporting River Severn Flow losses investigation work
I	Undertake flow monitoring on catchments (in response to gap analysis)
J	Develop model to understand saline intrusion
K	Update to modelling based on latest datasets
L	Collaboratively review drought and baseline monitoring sites and requirements in context of transfer
M	Gap analysis of ecological monitoring
N	Undertake further ecological appraisal work in catchments
O	Review potential mitigation and biodiversity net gain
P	Review ecological flow requirements for the Severn estuary and regulated main River Severn
Q	Review prescribed flow requirement for Severn
R	Full collaborative review of River Severn Drought Order (RSDO) Environmental Report in context of transfer
S	Develop new low flow forecasting model
T	Control curve review
U	Water Transfer resilience - stress test
V	Severn corridor CAMS / ALS 2023 including updated HOF in context of transfer

Table 8. Additional investigations identified by Environment Agency water transfers team

We are proposing that all of this investigatory work is managed by the companies working through the River Severn Working group. The Environment Agency will maintain technical oversight on delivery as the work plan progress.

A significant proportion of this investigatory work needs completing by the first gate (see section 3.3 above) and will need to start in financial year 2019/20. Therefore we propose that there is an element of transition expenditure included for this activity. This is further detailed in Section 6.3.6.

System Operation

Because of the complexities of multiple trading partners, requiring operational interactions and financial transactions, it could be helpful to undertake work to develop a model of system operation and a commercial model for water trades between the Severn and Thames catchments. Having clearly developed proposals for physical and commercial flows will be important for the progression of the scheme. A system operator model could contribute to the mitigation of risks around security of supply, losses and environmental impact of the transfer. In November 2017 we published a paper, highlighting different aspects of system operation which was developed jointly by United

Utilities, Severn Trent Water and Thames Water³⁸. This work will aim to establish the requirements for effective operation of the STT, including access arrangements, coordination arrangements and mitigation of the risks highlighted above.

6.2.2. United Utilities individual company scope

This section recapitulates evidence submitted for 1 April 2019 in document I015a (Section 3) and I015b (Appendix 2.UUW), which responded to IAP action UUW.CE.A3.

United Utilities has put forward a number of options for the release of water into the River Severn. These were based on notional sizes to provide a range for consideration by Thames Water in its WRMP. All the water offered by United Utilities for the transfer is sourced from Vyrnwy reservoir in Wales and in principle any volume of export could be selected up to a maximum determined by the yield of Vyrnwy. Our assessment of the yield, and therefore the maximum support volume from United Utilities, is 180 MI/d.

Vyrnwy reservoir is the sole source for Oswestry water treatment works, which supplies parts of Cheshire, Merseyside and (through interconnection in our regional supply system) can also support Greater Manchester. In order to maintain resilience of supplies to United Utilities customers in the North West, various enabling works and supply-demand enhancements will be needed. The selection of these enabling works and supply-demand enhancements will depend on the volume to be exported. In turn the volume to be exported will depend on the costs of the various options.

To inform the selection, the menu of export sizes proposed to Thames for their WRMP were (referencing Thames Waters' option codes):

- 12 MI/d, facilitated by a potable water export to Severn Trent from the large diameter trunk main (LDTM) downstream of Oswestry offsetting a Severn Trent abstraction from the River Severn (RES-RWTS-SHR-12)
- 30 MI/d, facilitated by a potable water export to Severn Trent from the large diameter trunk main (LDTM) downstream of Oswestry offsetting a Severn Trent abstraction from the River Severn (RES-RWTS-SHR-30)
- 60 MI/d, facilitated by a raw water release from Vyrnwy reservoir and reduced abstraction to Oswestry WTW (RES-RWTS-VYR-60)
- 148 MI/d, facilitated by a raw water release from Vyrnwy reservoir and reduced abstraction to Oswestry WTW (RES-RWTS-VYR-148)
- 180 MI/d, facilitated by a raw water release from Vyrnwy reservoir and, at times, zero abstraction to Oswestry WTW (RES-RWTS-VYR-180)

In Thames Water's draft WRMP³⁹ a number of scenarios were presented which selected the 180 MI/d Vyrnwy option. In Thames Water's revised draft WRMP⁴⁰, different scenarios were presented which selected the 148 MI/d option in conjunction with either the 12 MI/d or 30 MI/d option. This indicates that there is potential for any size Vyrnwy export to be selected in the 2023 WRMP up to the maximum of 180 MI/d. Therefore it is necessary to plan for the development of options to provide up to the full 180 MI/d from Vyrnwy.

Enabling works and resources for the 180 MI/d release were selected using an extensive process documented in United Utilities WRMP. The preferred plan in the WRMP recovers the performance

³⁸ What role for System Operators in the water sector? November 2017.

https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/looking-to-the-future/what-role-for-system-operators-in-the-water-sector-november-2017.pdf

³⁹ Draft Water Resources Management Plan 2019 Appendix X: Programme appraisal outputs, Thames Water, December 2017

⁴⁰ Revised draft Water Resources Management Plan 2019 Appendix X: Programme appraisal outputs, Thames Water, October 2018

of the system with the lowest possible level of investment that the company was able to find to avoid deterioration against the performance metrics⁴¹. The scope of works must enable drinking water quality to be maintained, customer acceptability, resilience, security of supply and environmental performance.

The scope of works includes:

- WR610b Enhanced water efficiency education programme (1 MI/d)
- WR620b Provision of free water efficiency goods and advice to all newly metered customers (5 MI/d)
- WR062b Worthington Reservoir (12 MI/d)
- WR107b Randles Bridge groundwater enhancement (12 MI/d)
- WR160 Improved resource efficiency by compensation flow control (9 MI/d)
- WR159 Improved resource efficiency by compensation flow (13 MI/d)
- WR113 Tytherington groundwater enhancement (3MI/d)
- WR099b Worsthorne groundwater enhancement (4 MI/d)
- WR102e Bold Heath groundwater enhancement (9 MI/d)
- WR101 Franklaw groundwater enhancement (30 MI/d)
- B2 Enabling Works – rezoning and Vyrnwy Aqueduct flow reversal (for 180 MI/d option) (or Option A5 for 148 MI/d export)

A description and capital cost estimate for each of these components is shown in Table 9 below. Note that the replacement volume of water from these schemes is less than 180 MI/d. Schemes have not been selected on the basis of a simple supply demand balance, but in a system simulation model to maintain resilience of supplies. This selection has been on the basis of utilisation estimates informed by joint stochastic analysis which we commissioned with Thames Water. This analysis considers the risk of coincident drought between the North West and South East, and shows that the Vyrnwy export would be need to be used on average less than 15% of the time.

WRMP19 Ref	Capacity (MI/d)	Total capex estimate ⁴² £m	Description (BH = borehole)	Location	Significant Site Specific Issues
WR159	13	6.3	Improved reservoir compensation release control	76 individual Reservoirs	Y (National Park etc.)
WR160	9	0.3	Improved reservoir compensation release control	Thirlmere, Vyrnwy, Haweswater & Rivington	Y (National Park etc.)
WR610b	1	0	Water efficiency education programme	N/A	N/A
WR620b	5	0	Free water saving devices	N/A	N/A
WR099b	4	1.2	Commission BH & 1km pipeline	Worsthorne	N

⁴¹ Revised draft resources management plan, United Utilities, August 2018, Section 7.

⁴² LBE Estimates are Level 1 (+/-30%) and based upon historic outturn cost curves for UU AMP 4, 5 & 6 delivered projects

WRMP19 Ref	Capacity (Ml/d)	Total capex estimate ⁴² £m	Description (BH = borehole)	Location	Significant Site Specific Issues
WR062b	12	12.4	Primary treatment at impounding reservoir abstraction & 7km pipeline	Worthington Reservoir to Rivington WTW	Y (M61 crossing)
WR113	3	4.1	2 x New BHs & 3km pipeline	Tytherington	N
WR105a	9	16.5	Commission 2 x BHs & new WTW & 1km pipeline	Lymm	Y (Canal crossing)
WR107b	12	22.3	Commission 2 x BHs & 9km pipeline	Primrose Hill BHs to Royal Oak WTW	N
			Commission 2 x BHs & 10km pipeline	Knowsley Bhs to Royal Oak WTW	Y (Rail, M58 crossing)
			Commission 2 x BHs & 5km pipeline	Randles Bridge Bhs to Knowsley Bhs	N
WR102d	5	3.3	Commission 2 x BHs & 2km pipeline	Eccleston Hill	N
WR102e	9	9.4	Commission 2 x BHs & 10km pipeline	Bold Heath	Y (M62, 2xRail crossings)
WR101	30	34.7	2 x Refurbish BHs & 10 x new BHs & new WTW	Franklaw	N
B2	185	152.2	4 new pumping stations & >26km new pipeline (1000mm) & structural resilience enhancement of a 21km length (1000mm) to utilise Dee abstraction & existing WTWs	Oswestry to Norton Tower	Y (England/Wales E&S interface, 2xRail, 3xMAHP, 1xRiver crossing)
TOTAL		263m			

Table 9. Scope and total capex estimates for the United Utilities components of the STT. An AMP7 cost estimate for this scope of work is given in Section 6.4.

The scope of works for United Utilities includes assessment of the need and if necessary the development of additional investment to protect the resilience, water quality, customer acceptability for aesthetic parameters (primarily hardness) of the alternative water source to customers before any change is made.

6.3. Joint costs

This section recapitulates evidence submitted for 3 May 2019 in document I015a_i (Section 3), which responded to IAP action UUW.CE.A3.

In the IAP, Ofwat estimated the cost of the design and development activity using a high level approach. This gave an estimate of £77.1m, which was based on a percentage (6.4%) of capex costs (£1.3bn) taken from Thames Water’s WRMP tables.

We believe that total cost and the percentage applied were not the appropriate values and therefore need to be revised. For example the capex did not include Severn Trent Water and United Utilities elements of the scheme because these were represented in the opex to reflect payments that will be made under bulk supply contracts. The additional development costs for Severn Trent Water and United Utilities are therefore set out in Appendices 2.SVE and 2.UUW of the 1 April document. These additional, individual company, costs for United Utilities are also recapitulated in Section 6.4 below.

This section sets out the cost estimates for the joint scope of work.

In summary we propose that the gate process and ODI is used to manage the risk of scope changes and therefore that **£70.1m** total expenditure on joint scope is included for setting price limits and the ODI targets at PR19. This is based on:

- Benchmarking analysis for the proportion of total project cost in development phase (Section 6.3.1);
- Total project cost estimates for the Severn Thames interconnector consistent with Thames Water’s revised draft WRMP (Section 6.3.2);
- Company estimates of the scheme development costs using a number of methods (Section 6.3.4);
- Identifying the phasing of development costs within AMP7 by gate (Section 6.3.6); and
- Potential use of the ODI to handle risk and uncertainty in place of optimism bias (Section 6.3.5).

On this basis our proposed ex-ante expenditure allowance for PR19 is set out in Section 6.3.6. It is important to note that the £70.1m total expenditure does not include any optimism bias⁴³. If optimism bias was included, the equivalent value for total expenditure in AMP7 would be £101m. Our proposed ODI approach includes an “outperformance” mechanism for adjusting costs to cope with agreed scope increases (and decreases). This mechanism manages the risk that our initial cost profile suffers from optimism bias. If Ofwat decide not to include an “outperformance” element to the ODI to allow for scope increase then our ex-ante expenditure allowance will need to be increased to £101m to allow optimism bias as another way of managing this risk.

6.3.1. Proportion of total project cost in development phase

In the IAP, Ofwat estimated the cost of the design and development activity using a high level approach. Ofwat’s approach takes the development costs for four schemes (taken from PR19 data tables provided by Thames Water, Anglian Water and Severn Trent Water; Table 10), calculates these as a proportion of overall scheme costs, and averages these four proportions. This gave an average of 6.4% for development costs, which for the STT means a total development cost of £77.1m.

We believe this percentage does not reflect the true cost to get a scheme ‘shovel ready’. For example the development costs for the East Midlands Raw Water Storage was set at a level to only cover the high level feasibility costs needed for early engagement with the DPC process.

⁴³ HM Treasury Green Book supplementary guidance: optimism bias, April 2013
www.gov.uk/government/publications/green-book-supplementary-guidance-optimism-bias

Project	Company	Development spend (£m)	Development period	Total project cost (£m)	% of total
Abingdon reservoir development	TMS	237.1	6	1,966	12.1%
South Lincs Reservoir	ANH	35.9	8	648	5.4%
East Midlands Raw Water Storage	SVE	6.2	2	166	3.7%
Deephams	TMS	15.5	2	351	4.4%
Average % of total project cost required for project development					6.4%

Table 10. Ofwat's IAP assessment of the proportion of project expenditure in the development phase⁴⁴.

We have used benchmarking to review and propose a new, more appropriate estimate.

Birmingham Resilience. For PR14 Severn Trent Water undertook a benchmarking exercise with Mott Macdonald⁴⁵ to examine the average percentage of client indirect costs of infrastructure schemes (see Table 11 below). The study revealed that on average 21% of total project costs are non-construction costs of which approximately one third are required during construction to cover project management and other internal support.

Number of schemes	Sector	Region	Value (£bn)
10	Water	South	3.40
2	Water	Midlands	0.15
1	Water	West	0.02
1	Aviation	South	0.26
1	Rail	West	0.42

Table 11. Schemes included in Mott Macdonald study for Severn Trent.

Although not yet completed Severn Trent estimates that Birmingham Resilience will outturn development costs at 17.7%.

West Cumbria water supply. Another pertinent comparator is United Utilities' Thirlmere transfer project. This project actually spent £30m in the phase up to contract award, which is 10.5% of the current project total cost estimate of £283m. This scheme is a relevant comparator because it includes expenditure on a WTW as well as large diameter mains and smaller diameter mains. Since 2013 the company held over 35 public consultation and exhibition events which helped shape the plans. United Utilities full planning application was approved by Allerdale Borough Council, Copeland Borough Council and the Lake District National Park Authority in November 2016.

Thames Tideway tunnels. We have also included actual development phase costs from this very large infrastructure scheme.

Including these comparators gives a revised assessment of development costs of 12.5% (Table 12).

⁴⁴ Ofwat, IAP Wholesale Water Supply-demand balance enhancement – feeder model, 31 January 2019

⁴⁵ Birmingham Resilience Study Cost Estimation (August 2013) submitted to Ofwat at PR14

Project	Company	Development spend (£m)	Total project cost (£m)	Percentage
Mott Macdonald benchmarking for SVE (15 schemes) ^A	Multiple	893	4,250	14%
Thames Tideway ^A	TMS/Tideway	✂	✂	21%
Birmingham resilience scheme ^A	SVE	✂	✂	17.7%
Abingdon reservoir development ^E	TMS/AFW	300	2,056	14.6%
South Lincs Reservoir ^E	ANH	35	648	5.4%
Deephams ^E	TMS	15	352	4.4%
Thirlmere transfer to West Cumbria ^A	UUW	30	283	10.5%
Total (weighted average)		975	7,589	12.9%
Average				12.5%

^A = based on actual expenditure; ^E = based on estimated expenditure

Table 12. Updated benchmarking assessment of the proportion of project expenditure in the development phase.

We know that the Severn to Thames interconnector development costs will be spread over AMP7 and AMP8 due to the DCO planning process. Therefore the AMP7 expenditure would be expected to be less than 12.5%. We discuss expenditure phasing over time in Section 6.3.6.

6.3.2. Total project costs for joint scope

Our understanding is that the total scheme capex used by Ofwat from Thames Water's WRMP19 had a different scope. For example it:

- was based on a 500 MI/d transfer;
- included London system reinforcement costs, for example 200MI/d of new treatment capacity and ring main extensions; and
- excluded Severn Trent Water and United Utilities elements of the scheme because these were represented in the opex to reflect payments that will be made under bulk supply contracts.

We have therefore derived new estimates of the total capex for the interconnector element using each of the three companies' standard estimating methodologies. Costs for Severn Trent and United Utilities elements of the scheme were included in individual company appendices to our 1 April submission (and in Section 6.4 below for United Utilities).

The purpose of this is to estimate an appropriate level of AMP7 development cost not to produce a revised total project cost that has been developed by Thames Water (on a consistent basis with other schemes) for their WRMP analysis.

Each of the three companies produced an estimate of the total capital cost to deliver scope of the interconnector element of the STT. This used each company's standard cost estimating methodology and is therefore consistent with PR19 business plan submissions (and Thames Water's WRMP).

The total project costs ranged from £724m to £973m in 2017/18 CPIH deflated prices. Differences in these estimates reflect differences in methodology, for example the approach to treatment of risk

and uncertainty. All three estimates are within +/- 30% of the median estimate, which is a range expected at this stage of the scheme⁴⁶.

All these estimates are lower than the number quoted by Ofwat in the IAP.

6.3.3. Total development costs for joint scope

Development phase costs were estimated separately by the three companies using “top down” and “bottom up” methods. We also estimated the development phase costs applying the updated average percentage from Table 12 to the total project costs estimates. Each of these methods give cost estimates from project start-up to contract award.

Company assessment. This method gives a range of **£80m to £129m** with the higher cost including optimism bias of 44%. This includes “top down” estimates using company specific allocations to the development phase based on “norms” from recent projects delivered. It also includes a bottom up estimate developed by identifying packages of work in the development phase.

Average allocation. This method, applying a standard percentage allocation of the total based on the benchmark average 12.5% to the three total project cost estimates, gives a range of development costs of **£91m to £122m**.

These estimates are shown in Figure 11.

The top down methods do not explicitly take into account the costs of the environmental investigations identified by the Environment Agency transfers team or the costs of developing the approach to operating the STT in the context of the wider system. However we are satisfied (based on cost estimates of £2m and £3m respectively) that these costs can be absorbed within the top down estimates.

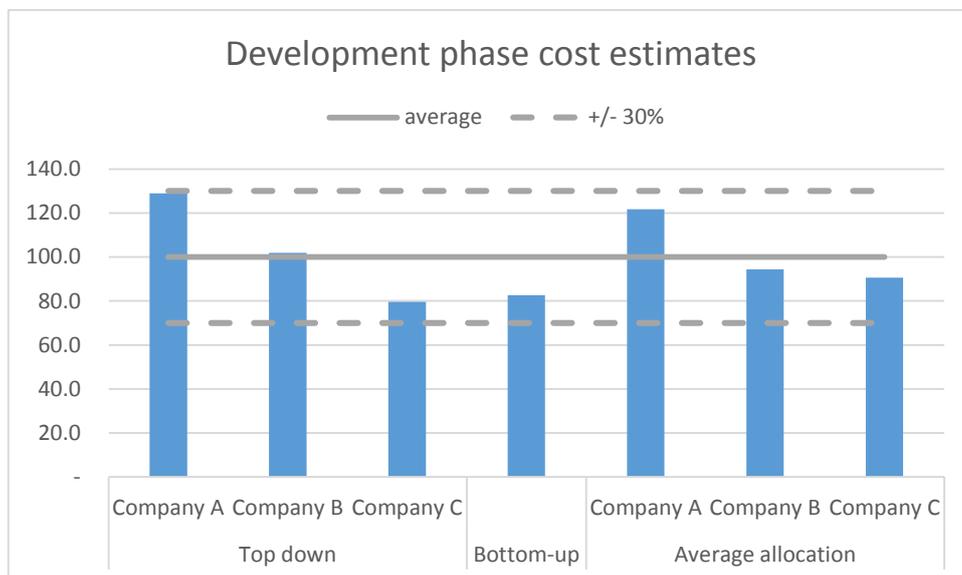


Figure 11. Cost estimates for the development phase (AMP7 and AMP8) in £m developed using a range of methods.

6.3.4. Development costs within AMP7 for joint scope

The estimates were then reviewed and the proportion of expenditure in AMP7 identified. By comparing the three companies’ estimates we identified 88% of the expenditure to contract award

⁴⁶ OFWAT Development of Capital Expenditure Estimating Assessment, Final Report for All Deliverables, Faithful and Gould, 31 July 2007

for AMP7 and 12% for AMP8. This is given that the cost in AMP7 will be to achieve Gates 1 to 3, and the remaining funding in AMP8 will be to achieve stage 4.

We have estimated that the range in development costs in AMP7 will be in the range of **£68m to £101m**. The upper estimate is the highest of all the company estimates and includes optimism bias and the lower estimate is the lowest of all the company estimates excluding optimism bias (Table 13).

£m	2019/20 transition investment	AMP7				Total PR19
		1 April 2020 up to Gate 1	Gate 1 to Gate 2	Gate 2 to Gate 3	Gate 3 to 31 March 2025	
Upper estimate (includes OB)	2.0	13.1	40.4	44.9	0.6	100.9
Lower estimate (excludes OB)	1.4	8.8	27.1	30.1	0.4	67.7

Table 13. The range of cost estimates for AMP7 / PR19 by gate. Note that the upper estimate includes optimism bias (OB) and the lower estimate is the lowest of all the company estimates excluding optimism bias. Note that transition investment is discussed below in Section 3.6.

6.3.5. Potential use of the ODI to handle risk and uncertainty (optimism bias)

Thames Water's and Severn Trent Water's total cost estimates include optimism bias as a means of managing risk and uncertainty. This is a widely used and appropriate method for projects of this size and complexity when detailed experience of similar activity is unavailable. For example Severn Trent applied optimism bias as part of its standard costing method to the Birmingham resilience project at PR14 with outturn costs forecast to be 5% above that estimate.

As most of the risks and uncertainties covered by optimism bias are realised in the construction phase there may be a case for managing these through the gated process and not including them in the AMP7 development cost profile. Information from studies and field investigation gained will allow informed decision to be made regarding appropriate changes to scope, cost and timing to be managed by the unique gate process mechanism during project development phase.

Excluding adjustments for optimism bias from the estimates to contract award gives a range of costs to contract award of £77 to £83m. This includes an element of expenditure that will be in AMP8 as well as the AMP7 expenditure.

Risks relating to the environmental impact of flow changes in the River Vyrnwy is an example of how the gated process could avoid the need for optimism bias. We highlighted in the scope section potential risks due to releases from Vyrnwy reservoir affecting the River Vyrnwy downstream of Vyrnwy dam to the River Severn confluence. A mitigation option for this risk, the need for which will be decided at Gate 1, is a pipeline (180 MI/d, 22.3km, 1200mm diameter) from the Vyrnwy Aqueduct upstream of Oswestry to the River Severn. The design and development costs for this bypass pipeline, based on a total cost estimate of £80m would be: £3m between gate 1 and 2, and £4m from gate 2 to 3.

The costs for the additional scope, if justified at gate 1, would need to be recognised through the ODI mechanism so that the companies can recover the cost.

Alternative approaches would be to either:

- recognise the cost of this potential scope up front in price limits and use the ODI to return the money to customers in the event that it is not needed; or
- recognise some of the cost up front through an allowance for optimism bias and make an upward or downward adjustment through the ODI mechanism after the event.

Option (a) is only available for risks known today, and option (b) introduces more complexity to the gate process. It may therefore be preferable to exclude optimism bias and potential scope increases from cost estimates at this stage, and for scope changes to be managed through the gated process.

If Ofwat decide not to include an “outperformance” element to the ODI to account for scope increase then our cost estimates will need to be increased to allow for other ways of managing this risk by including the optimism bias. Exclusion of optimism bias should also be taken into account when benchmarking against other company development phase cost estimates.

Optimism bias is a recommended approach by HM Treasury⁴⁷, and represents a method of assessing project costs when limited historic primary data is available. By excluding this approach from the ex-ante assessment of cost requires the gate process to manage potential scope changes. Costs recovered from customers after potential scope change through the gated process may be closer to the estimate including optimism bias. The gated process allows these risks to be managed in a way that gives confidence to companies/investors and protects customers. Below, we show AMP7 cost estimates excluding optimism bias.

6.3.6. Proposed ex-ante expenditure allowance for PR19 for joint scope

When optimism bias is excluded, the four estimates prepared by the companies for AMP7 are very close as shown in Figure 12.

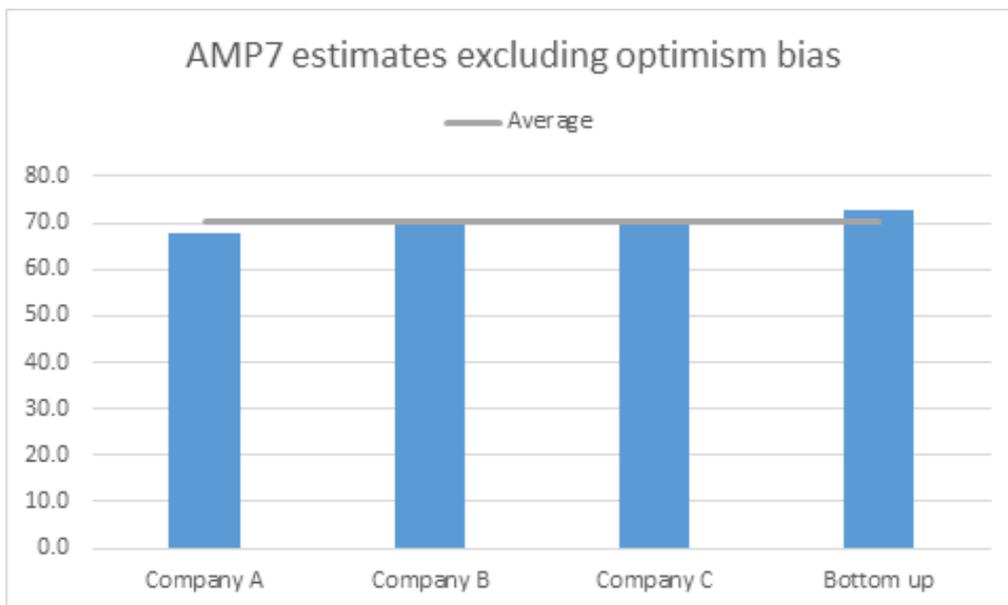


Figure 12. Top down and bottom up estimates of AMP7 cost for the STT interconnector excluding optimism bias (£m).

Considering closeness within this range of estimates and also with the benchmarking comparison, we take the average of the four cost estimates as our estimate of costs to contract award. We have then profiled this expenditure by gate and by financial year. As noted above, we estimate that 12% of the expenditure is in AMP8, leading up to gate 4; this equates to £9.6m.

This gives **£70.1m total AMP7 costs** for the joint scope of work (**this excludes optimism bias**).

We have agreed with Severn Trent and Thames Water that each company will contribute one third of the total, i.e. £23.4m.

⁴⁷ HM Treasury Green Book supplementary guidance: optimism bias, April 2013, www.gov.uk/government/publications/green-book-supplementary-guidance-optimism-bias

The expenditure profiles are shown in the tables below (Table 14 and Table 15).

This includes an element of transition investment for 2019/20. This expenditure is needed to start some of the investigatory work, including work identified by the Environment Agency transfer team, so that the outputs will be available to include in draft WRMPs and regional plans for gate 1.

£m	2019/20 transition investment	AMP7				Total PR19
		1 April 2020 up to Gate 1	Gate 1 to Gate 2	Gate 2 to Gate 3	Gate 3 to 31 March 2025	
Expenditure – joint total	1.4	9.1	28.0	31.2	0.4	70.1
Expenditure – each company contribution	0.5	3.0	9.3	10.4	0.1	23.4
Profile		15%	40%	44%	1%	100%

Table 14. Gate by gate expenditure profile for inclusion in ex ante assessment of price limits at PR19

The gate by gate profile, translates into a year by year profile as shown below:

£m	2019/20 transition investment	AMP7					Total
		2020/21	2021/22	2022/23	2023/24	2024/25	
Expenditure – joint total	1.4	3.2	5.0	16.8	30.2	13.4	70.1
Expenditure – each company contribution	0.5	1.1	1.7	5.6	10.1	4.5	23.4
Profile		6.6%	7.1%	24.0%	43.1%	19.1%	100%

Table 15. Year by year expenditure profile for inclusion in ex ante assessment of price limits at PR19

We believe that the risks which could be included in the ex-ante expenditure through optimism bias are better managed on behalf of customers through the gate process and ODI. **If Ofwat decide not to include an “outperformance” element to the ODI to account for scope increase then our ex-ante expenditure allowance will need to be increased to allow for other ways of managing this risk.**

6.3.7. Summary of joint costs

In summary we propose that the gate process and ODI is used to manage the risk of scope changes and therefore that **£70.1m** total expenditure in AMP7 is included for setting price limits and the ODI targets at PR19. This is based on the following scope:

- Development of a 300 Ml/d River Severn to River Thames interconnector as detailed on page 46;
- Environmental investigations as listed in Table 7 and Table 8;
- Developing the approach to operation of the STT in the context of the wider system.

It excludes:

- Additional individual company costs for PR19 detailed in our 1 April submissions which also need to be included in setting price limits and the ODI targets at PR19;
- Development of a pipeline from Vyrnwy aqueduct to River Severn which would need to be managed through the gate process and ODI if the need is confirmed;
- Further work in AMP8 and any other scope items.

If Ofwat decide not to include an “outperformance” element to the ODI to allow for scope increase then our ex-ante expenditure allowance will need to be increased to £101m to allow for the standard way of managing this risk.

Each of the three companies is submitting an individual company addendum alongside this document which shows how this cost estimate is reflected in their proposed ODI for the STT.

Our proposed model of a gated process with symmetric ODI allows the project to progress with confidence and reduces risks to generate an overall efficient cost. Although uncertainty exists the gated process allows it to be managed effectively during the design and development phase. Such uncertainty reduces over time. While it may be +/- 30% on the cost estimate (or greater) at this stage, change control and risk management allow maximisation of opportunities to improve value and to obtain greater predictability and therefore confidence. This is summarised in the diagram below (Figure 13) and is consistent with the principles in a report for Ofwat by Faithful and Gould⁴⁸.

⁴⁸ OFWAT Development of Capital Expenditure Estimating Assessment, Final Report for All Deliverables, Faithful and Gould, 31 July 2007

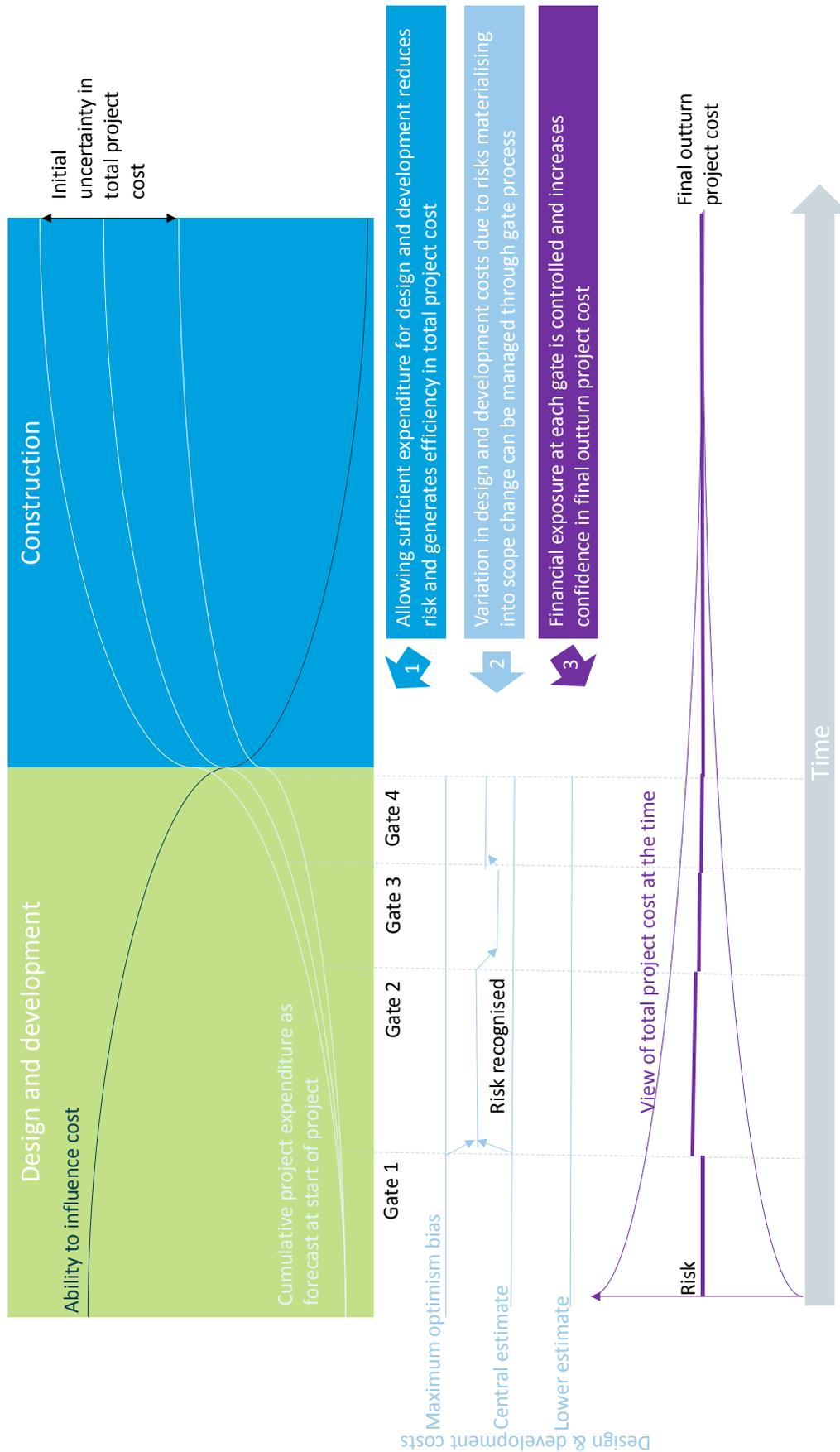


Figure 13. Using the gated process, change control and risk management to maximise opportunities, improve value and obtain greater predictability from design and development, reducing risk and protecting customers.

The estimate of total project cost needs to include an allowance for risk and uncertainty. As the project progresses through the gates risk will reduce and estimates updated accordingly. This will provide more confidence for customers and for bidders to take the work forwards into construction should gate 4 be passed.

6.4. Costs assessment for United Utilities individual company components

This section recapitulates evidence submitted for 1 April 2019 in document I015b (Appendix 2.UUW), which responded to IAP action UUW.CE.A3.

These costs relate to United Utilities individual company activities. This assessment of costs is consistent with the scope in Section 6.2.2 and United Utilities revised draft Water Resources Management Plan. It is also consistent with the deliverables for each gate specified in Section 3.3.5. The total project cost for United Utilities is **£263m** and this section sets out the part of this total that will be required in AMP7.

Totex cost estimates for the United Utilities options described above were prepared using the same estimating methodology as our PR19 business plan. This estimating process was developed to ensure a consistent approach to estimating and to facilitate a close working relationships with engineering to support the development of efficient scope and pricing. Section 4 of document S6001⁴⁹ summarises the work we undertook to ensure that options have a robust cost estimate. It also sets out our approach to cost assurance through industry benchmarking and third party assurance reports⁵⁰.

Development phase work was estimated using two methods, which may be thought of as “bottom-up” and “top-down”. We then benchmarked these two estimates against actual cost data from our most relevant comparator project. Each of these three methods give cost estimates from project start-up to contract award.

The bottom-up approach used estimating detail from whole option estimates described above and shown in Table 9. Cost estimates for AMP7 have been built by analysis of the bottom-up estimates for each scheme component. The proportion of each activity for the development phase has been identified by experienced engineering and capital programme delivery personnel.

As an example for the 30 Ml/d Franklaw option (WR101), the following work elements from the bottom-up estimate were identified for the development phase to contract award (Table 16).

⁴⁹ PR19 Business Plan, United Utilities September 2018, Chapter 7, Supplementary Document, S6001

⁵⁰ PR19 Business Plan, United Utilities September 2018, Third Party Documents: T6002 “Costing Methodology Assurance – Mott MacDonald report Stage 1”, T6006 “Cost Curve Benchmarking Stage 2 Mott MacDonald”, “Independent Estimating of UU Selected Solutions Mott MacDonald Stage 3 report”

Work element	Proportion included in the development phase	Cost £
Needs and Strategy client delivery	100%	46,058
Concept and Definition client delivery	100%	1,060,738
UU Operations (Maintenance)	50%	162,216
UU Operations (Non Maintenance)	50%	30,538
Third Party Design	75%	785,784
Surveys Non Cost Base	50%	9,818
Surveys Cost Base	100%	209,681
Planning Valuation Environmental	75%	318,191
SUB-TOTAL		2,623,024
UU Capital Overheads - 10%		262,302
Total		2,885,327

Table 16. Example showing the work elements included in the bottom-up estimate.

Compared to the total capex estimate of £34,744,502, this represents 8.3% of the capex. Across all the options these costs range from 8% to 15%.

Overall, and after allowing for programme efficiency, this gives a total “bottom up” cost to contract award of £24.5m, which is 9.1% of the total capex.

For the top-down estimate we used “norms” data from our AMP6 capital programme. This method, again after allowing for programme efficiency, gave £22.2m, which is 8.4% of total capex.

We also carried out benchmarking against a current United Utilities project to test the validity of our top down and bottom up estimates.

The most pertinent comparator is our West Cumbria water supplies project (the Thirlmere transfer). This project actually spent £30m in the phase up to contract award, which is 10.5% of the current project total cost estimate of £283m. This scheme is a relevant comparator because it includes expenditure on a WTW as well as large diameter mains and smaller diameter mains.

Another useful comparator is our Manchester & Pennines resilience scheme. The AMP7 phase is somewhat analogous to the development work required for the STT. Our bottom-up estimate for Manchester & Pennines resilience was £73m at PR19 compared to £849m total project cost. This is equivalent to 8.6%.

The level of expenditure in the development phase depends on the commercial strategy. Greater work on designs and surveys will result in greater certainty for the construction phase. Residual uncertainty within the construction phase will be passed through to the buyer, either by pricing risk into construction contracts (and therefore bulk supply contracts) or allowing a form of cost pass-through in the contracts. As an example, United Utilities commercial strategy is to pass ground risk to contractors and enable efficient prices to be obtained by providing greater certainty with current factual data from surveys. This might mean that the development phase costs appear relatively high compared to some benchmarks, but it will provide greater certainty for the buyer of the exported water and greater confidence in the WRMP assessments.

We have not included an allowance for optimism bias in any of these estimates. Optimism bias can add up to 44% to total project costs. This would have the effect of reducing the reported development phase costs from, e.g. 8.6% of the total to 6.0%. Our view is that significant changes of scope can be managed through the gate reviews and therefore it's not appropriate to include

optimism bias for this project. However when benchmarking against other company development phase cost estimates, an adjustment for optimism bias may be appropriate.

It should be noted that there is some potential for abortive work if the selection of options changes through work on the regional plan/WRMP. This is particularly the case up to gate 1, and much reduced following gate 2.

The range of estimates is shown in Figure 14 below. In the interest of protecting customers from setting a higher than necessary cost estimate into price limits, we are proposing to use the lowest of these estimates for the development phase. This gives £22.2m in total to gate 4.

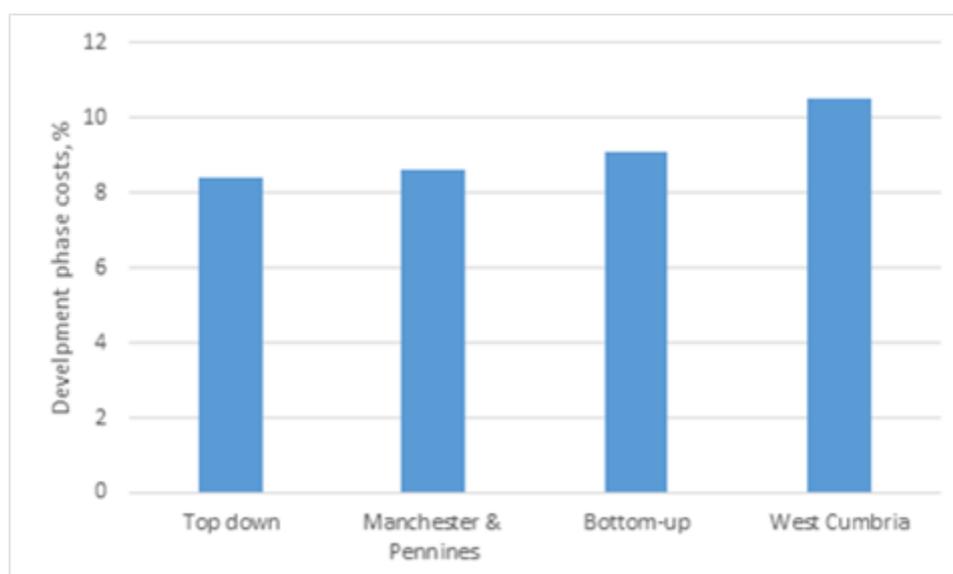


Figure 14. Range of development phase cost estimates used to inform United Utilities individual company AMP7 costs.

Expenditure profiles have been used to identify £21.9m between 1 April 2020 and 31 March 2025. This leaves £0.3m within AMP8 to complete progress to gate 4.

The expenditure is required to provide evidence that United Utilities participation in the transfer scheme does not cause detriment to its customers and that the company can still comply with its obligations in terms of drinking water quality, security of supply, environmental consents etc. This will include evidence, including updated cost estimates for the scheme, to support appraisal of the scheme in United Utilities' and Thames Water's 2023 WRMPs and regional plans. This will also include evidence to support planning applications.

6.5. Summary – total costs for AMP7

Costs have been assessed separately for elements of joint activity and individual company activity. Figure 15 shows the split of joint and individual company expenditure.

Costs to deliver the joint scope of work for the STT have been assessed as **£70.1m** (compared to £77.1m in Ofwat's IAP), i.e. **£23.4m** for each company.

In addition to the joint scope, United Utilities and Severn Trent each have individual company activities that are needed to deliver the STT, and these are not currently reflected in Ofwat's cost assessment. The additional required enhancement expenditure for United Utilities in AMP7 is

£21.9m. This is consistent with previously submitted material on the proposal⁵¹ but has not yet been reflected in the IAP cost assessment.

We propose that all variations in expenditure on the scheme should be subject to 50:50 totex sharing to align incentives between the three participating companies. This is discussed in Section 7.2.

The total expenditure attributed to United Utilities is therefore:

$$£23.4m \text{ (one third share of joint expenditure)} + £21.9m \text{ individual expenditure} = £45.3m$$

We request that this total of £45.3m is added into our water resources totex baseline. If appropriate costs are not included in our totex baseline, United Utilities will not be able to participate in the work to develop the STT.

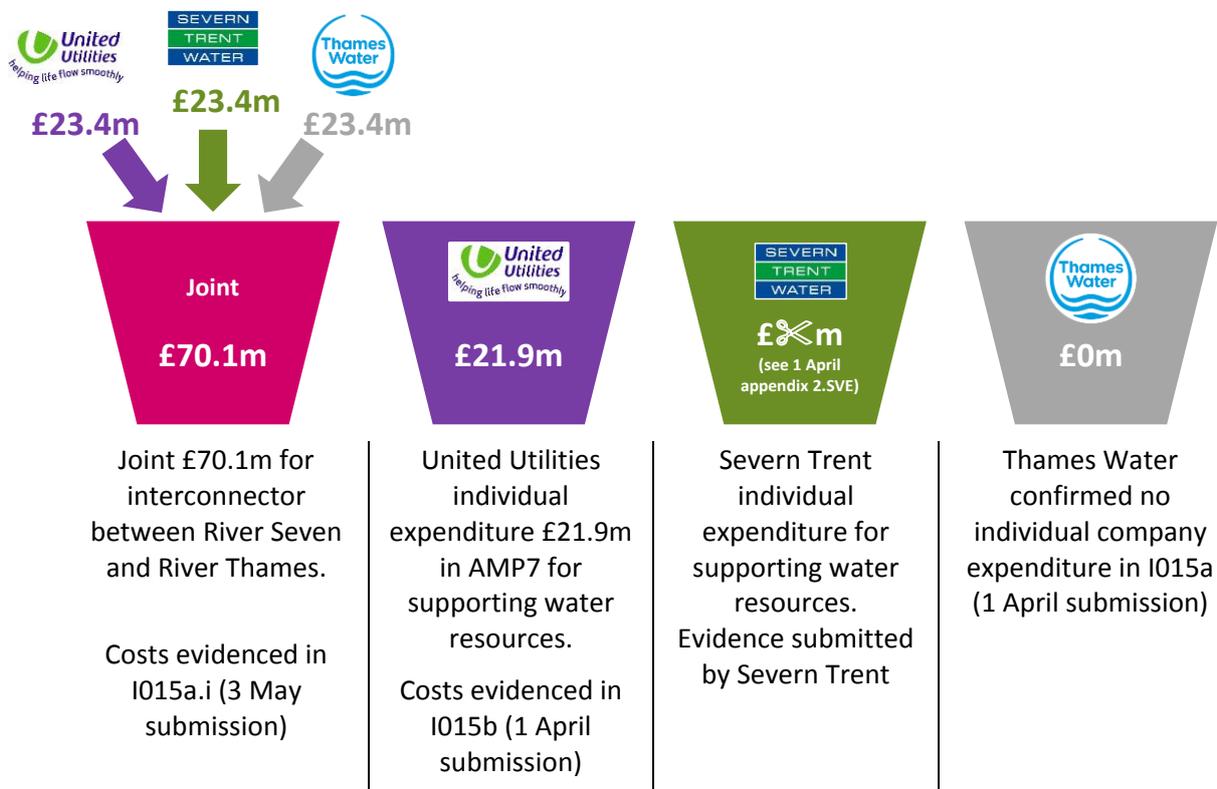


Figure 15. Split of joint and individual company expenditure in AMP7. The three companies’ assessment of the joint expenditure was evidenced in document I015a.i submitted for 3 May 2019. United Utilities individual company costs were evidenced in document I015b submitted for 1 April 2019.

⁵¹ This includes consistency with the need to develop water resources within United Utilities area identified in our draft WRMP (1 December 2017, Sections 6.5, 7.6 and 7.7); meetings with Ofwat (16 August 2017, 24 January 2018 and 25 April 2018); Terms of Reference provided to Rachel Fletcher (8 January 2019); and our response to IAP U UW.CE.A3 action (submitted 28 March 2019).

7. Customers are protected

This section recapitulates evidence submitted for 1 April and 3 May 2019 in documents I015a (Section 6), I015b (Appendix 3.UU2) and I015b.i, which responded to IAP action UUW.CE.A3.

We are proposing a performance commitment to offer protection to customers.

In this section set out our proposed ODI mechanism to allow allocated funding to be recovered by customers in the event of the scheme not progressing through each gate and for the non-delivery or late delivery of outputs. We recognise that Ofwat will want to consider taking into account different proposals for the ODI from across the schemes in the IAP.

The measure reflects each company's contribution to the development of strategic supply options that are required over the next 5-15 years to secure drought resilience in the south-east. United Utilities, Severn Trent Water and Thames Water will take forwards work to develop the STT so that the option can be considered alongside other options at various assessment gateways. Development costs are recognised in the setting of price limits and this measure protects customers if it is subsequently decided that this option should not progress further by returning money to customers.

This section generally follows the format we used in United Utilities September 2018 business plan submission for performance commitments (supplementary document S3001).

7.1. Performance commitment name

E08-WR Strategic regional solution development (Severn Thames transfer)

7.2. Customer focus

Principles for the ODI design

This measure is designed to protect customers by taking into account the following principles:

- Customers should not pay for expenditure to develop options beyond the point at which it is decided that options are not required;
- Companies should have confidence that efficient expenditure needed to develop options can be recovered from customers, otherwise there is a risk that options will not be developed by the time they are needed to supply customers;
- Companies should be incentivised to accurately forecast expenditure and to spend money efficiently;
- Companies should be incentivised to deliver outputs to sufficient time and quality to allow timely decisions to be made on the options;
- Where there are multiple beneficiaries of a shared option (in this case the three companies and their customers) the risks should be shared appropriately between them, because to do otherwise could place different incentives on the participants to the detriment of the option development; and
- In any large infrastructure project there are risks and uncertainties which change over time. Sufficient flexibility should be retained to always allow decisions at each stage of development to be taken in the customers' best interest, taking into account such risks and uncertainties understood at the time of the decision.

Interaction with efficiency incentives

We also need to consider what efficiency incentives would be appropriate for this expenditure. There are two potential approaches, and in this submission we are not stating a preference for one or the other.

One approach would be to retain the normal cost efficiency incentives as per the PR19 methodology (i.e. the totex incentive), which incentivises accurate forecasting as well as efficient delivery. The

totex incentive applies for all other water service expenditure and would therefore follow from the current regulatory mechanisms unless an additional mechanism is introduced (see below). An ex-ante approach to agree the ODI reporting will preserve the totex incentive. It would also give the companies sufficient confidence to incur the necessary development expenditure⁵². However it also means that an additional element is needed to protect customers in the exceptional event that a company fails to deliver; this is set out in the mitigation/exceptions section below.

An alternative approach would be to consider an ex-post true-up of efficient cost. This would involve the companies reporting actual expenditure on the scheme at regular intervals throughout the scheme development. Companies would be under a reasonable and economic purchasing obligation and Ofwat would confirm that there was no evidence that the expenditure to date had not been efficiently occurred. At the end of the regulatory period Ofwat could then apply a revenue adjustment to offset the impact of the totex incentive on any over/under-spend against the ex-ante allowance. Such an approach would be appropriate when the expenditure requirements are particularly uncertain at the time of setting price limits.

The following ODI mechanism could work with both these alternative approaches to efficiency. It will report the ex-ante commitment to recognise development expenditure in price limits. This expenditure could then be subject to totex incentives or subject to an ex post true-up.

For clarity, United Utilities' view is that the normal cost efficiency incentives (i.e. the totex incentive) should apply in this case, with a 50:50 sharing rate for variations in expenditure from the ex-ante allowance. Section 6.5 of document I015c.i – Joint statement on regional solution development – addendum submitted for 3 May confirms that all six companies with strategic water resource options favour this approach.

7.3. Measure description

This measure reflects each company's contribution to the development of strategic supply options that are required over the next 5-15 years to secure drought resilience in the south-east. United Utilities, Severn Trent Water and Thames Water will take forwards work to develop the Severn Thames transfer so that the option can be considered alongside other options at various assessment gateways. Development costs are recognised in the setting of price limits and this measure protects customers if it is subsequently decided that this option should not progress further by returning money to customers.

7.4. Measure definition

This measure would be aligned to the proportion of the development costs expected to be incurred between each gateway and measured in percentage points. The collective decision at each gate has two potential outcomes either:

- the scheme should not progress (and we will report zero percent after that date); or
- the scheme should progress to the next gateway (and we will report the ex-ante determined percentage up until the next gateway).

In either case the company will report each year the percentage as agreed by the regulators at the preceding gateway. This provides a simple mechanism to adjust level of expenditure reflected in the price customers pay.

Decision Making Process

⁵² The alternative approach would involve an ex-post assessment of the scheme. This could result in decisions being made with the benefit of hindsight and therefore not allow companies to recover costs which were incurred in good faith. Such potential could act as a disincentive for companies to participate in scheme development.

The decision making process at each gate is described in Section 3.3 above. The evidence pack submitted into the gate review will include proposed performance commitment values up to the next gate. As noted above, decisions made at the gate review will be binding on the inclusion of future development expenditure (up to the next gate) in price limits. In this proposed ODI this would be manifested in a binding decision on the company's reporting of the ODI performance up to the next gate. It would not be binding on other regulatory mechanisms or statutory processes.

7.5. Measurement units

The ODI for each company would be measured as the percentage of the company's option development costs allowed in that company's price limits for each year.

We will report performance annually, with 2020/21 being the first year of performance reporting. Performance reporting will be based on decisions taken at the gateways. The percentage performance reported in each year will be designed to ensure the correct payments will apply to recompense customers for the development costs recognised in price limits.

7.6. Mitigation/exceptions

The overriding factor in the gateway decision will be whether the customers' best interests are served. In exceptional circumstances the gateway decision could commit the company to report a percentage other than zero or the ex-ante allocation.

For example, in the event that the company fails to deliver a necessary output for a particular gateway, a lower percentage would be agreed to ensure that customers do not pay for that output. To ensure the correct percentage is reported, the company will seek assurance on the costs associated with that output and the reasons for non-delivery. Companies should not be penalised for circumstances outside their control. This assurance will be shared with the relevant companies Customer Challenge Groups prior to the gateway decision.

An alternative example may be that the gateway decision is to accelerate various aspects of the work programme. In this example it could be agreed that a higher percentage than the ex-ante assumption could be reported from that point on. This would also work symmetrically so that it could be agreed at a gateway that the work programme should proceed on a delayed schedule, for example to allow for further consultation or additional analysis.

In any of these exceptional cases the company would provide assurance on the costs and evidence that it is in the customers' interest and the gateway review would determine the percentage to be reported.

7.7. Common performance commitment

This is a bespoke measure, although we have developed the principles behind this proposed ODI with the other companies who have IAP actions relating to regional solution development.

7.8. Cost adjustment claim

This measure is associated with an enhancement claim for Strategic Regional Solution Development.

7.9. Incentive type

This would be a financial incentive with "underperformance" and "outperformance" elements.

It provides a mechanism for the company to recover different levels of expenditure from customers following decisions by regulators at the gate reviews. The financial adjustments should therefore be regarded as a "reckoning up" of necessary costs and not reflecting actual company performance.

The inclusion of an "outperformance" element will allow gate review decisions to accommodate acceleration or increase in scope if new evidence justifies the need for this. It is not intended to be a reward mechanism for companies.

7.10. Price control allocation

Water resources	Water network+	Wastewater network+	Bioresources	Residential retail	Business retail	Direct procurement
100%	0%	0%	0%	0%	0%	0%

7.11. Performance commitment for AMP7

As set out above the performance commitment will be aligned to the expenditure profile derived from the underlying programme plan.

Each company has a different expenditure profile based on the balance of development needed between joint activity and individual activity. Severn Trent Water and United Utilities set out their performance commitments in Appendices 3.UUW and 3.SVE of the 1 April submissions, updated for 3 May and repeated below for United Utilities.

The performance commitment has been derived from the expenditure profiles for the joint and individual company activity as follows (Table 17):

£m	2019/20 transition investment	AMP7				Total PR19
		1 April 2020 up to Gate 1	Gate 1 to Gate 2	Gate 2 to Gate 3	Gate 3 to 31 March 2025	
UU share of joint expenditure	0.5	3.0	9.3	10.4	0.1	23.4
UU individual expenditure	-	9.5	7.7	4.6	0.1	21.9
UU total expenditure	0.5	12.5	17.0	15.0	0.2	45.3
Profile		29%	38%	33%	1%	100%

Table 17. Profile of expenditure by gate used to derive the performance commitment.

Note that:

- Joint expenditure has been updated to align with the work carried out by three companies documented in I015a.i submitted alongside this document
- United Utilities individual company costs remain as evidenced in document I015b submitted for 1 April 2019.

The gate by gate profile, translates into a year by year profile as shown in Table 18 below:

£m	AMP6	AMP7					Total PR19
		2020/21	2021/22	2022/23	2023/24	2024/25	
UU share of joint expenditure	0.5	1.1	1.7	5.6	10.1	4.5	23.4
UU individual expenditure	N/A	4.6	2	7.6	6.0	1.7	21.9
UU total expenditure	0.5	5.7	3.7	13.2	16.1	6.2	45.3
Profile		13.6%	8.1%	29.2%	35.5%	13.6%	100.0%

Table 18. Profile of expenditure by year used to derive the performance commitment.

This gives the following performance commitment (Table 19):

	Unit	AMP6	AMP7				
			2020/21	2021/22	2022/23	2023/24	2024/25
Performance commitment	%	N/A	13.6%	8.1%	29.2%	35.5%	13.6%

Table 19. Proposed performance commitment targets for United Utilities.

7.12. Deadbands, caps and collar

There would be no deadbands, caps or collars associated with this measure.

7.13. Outcome Delivery Incentive

This measure is subject to underperformance and outperformance financial incentives, which would be reflected in the RCV at the end of AMP7.

This is a symmetric approach which reflects that the ODI is designed to reconcile a totex allowance for long term investment rather than reflect in-period service performance to customers.

7.14. Outperformance/underperformance incentive rate

As set out above the performance commitment is set for each company based on their contribution to the scheme during AMP7. An example calculation to explain the principles is set out below, followed by the calculation of United Utilities incentive rate based on an ex ante cost allowance of £45.3m.

In this example the incentive rate is £128,500 for each per cent of the project. This applies symmetrically for outperformance and underperformance.

We have calculated the rate based on the costs assumed for one company's contribution to the scheme ("company X"). Our approach is:

- Take the costs allocated to company X, which is assumed to be £25.7m in this example
- Company X has a 50:50 totex incentive rate so the £25.7m cost is multiplied by 50% to allow for the totex sharing mechanism.
- Divide by 100 to give the value for 1% delay.

We propose that, if Ofwat decide to retain the totex incentive for this expenditure, all expenditure on the Severn Thames transfer would be subject to the same 50:50 totex rate to ensure that the incentives regarding efficient delivery apply equally to all partners in a joint scheme. This would require such expenditure to be reported separately and subject to a different totex rate than the rest of the company's expenditure. If the alternative approach to efficiency is adopted, then there would not need to be any adjustment to align totex sharing rates but instead an additional ex post adjustment to revenue so offset the impact of the totex incentive so that actual costs were reflected in price limits.

We follow the methodology set out in Section 6 of the joint Severn Thames transfer document I015a to calculate the incentive rate.

- Take the total AMP7 costs allocated to United Utilities (for both joint and individual activity), which is £45.3m
- We assume a 50:50 totex incentive rate so the £45.3m cost is multiplied by 50% to allow for the totex sharing mechanism.
- Divide by 100 to give the value for 1% delay.

This gives an incentive rate of £0.2265m per percentage point. This rate will apply symmetrically for both underperformance and outperformance payments.

Please note that the incentive rate will need to be recalculated to reflect any adjustment made to the costs allowed in price limits, or the totex sharing rate, at final determinations.

7.15. Worked examples

Below we set out three examples to demonstrate how the ODI mechanism will work to protect customers. These examples use the example incentive rate from above, and the example performance commitment targets in Table 20 below. Note that for simplicity of presentation these examples assume that gateways fall at the end of a financial reporting year, however alternative gateway dates can easily be accommodated in this mechanism.

	Unit	AMP6	AMP7				
			2020/21	2021/22	2022/23	2023/24	2024/25
Performance commitment (example)	%	N/A	10%	15%	25%	25%	25%

Table 20. Example performance commitment target used for the worked examples below.

Example 1: project stops after gateway 1 in March 2022

Based on the draft/final determinations and gateway 1 decisions the scheme development progresses as planned until gateway 1 in March 2022. Evidence is reviewed at gateway 1 and it is decided not progress the scheme beyond that point. The company therefore reports zero for each subsequent year (Table 21).

	Unit	AMP6	AMP7				
			2020/21	2021/22	2022/23	2023/24	2024/25
Performance commitment	%	N/A	10%	15%	0%	0%	0%

Table 21. Example of reported performance used in Example 1.

This will therefore trigger underperformance payments of:

- Year 2022/23: $(25\% - 0\%) \times \text{£}128,500 = \text{£}3,212,500$
- Year 2023/24: $(25\% - 0\%) \times \text{£}128,500 = \text{£}3,212,500$
- Year 2024/25: $(25\% - 0\%) \times \text{£}128,500 = \text{£}3,212,500$
- Total = $\text{£}9,637,500$

It can be seen that price limits had assumed that 75% of the $\text{£}25.7\text{m}$ would be spent in these years, i.e. $\text{£}19,275,000$. Through the totex sharing mechanism half of this, i.e. $\text{£}9,637,500$, will be returned to customers. The other half is returned to customers through the ODI as above. This ensures that customers do not pay for this expenditure which is not needed.

If actual expenditure differed from that assumed in price limits at PR19, this would then either flow through the totex incentive or be captured in an ex-post true-up.

Example 2: company does not deliver output needed for gateway 1 in March 2022

In this example the company does not produce a necessary environmental assessment that is required for gateway 1. The company prepares audited evidence that the cost associated with the environmental assessment is $\text{£}500,000$. This evidence is reviewed by the CCG and at the gateway review. It is decided to accept this evidence. It is also decided that, based on the range of other evidence that the scheme should progress with the environment assessment being delivered by the next gateway.

It is therefore agreed that the company will report a lower percentage in 2021/22 to ensure that customers don't pay in full for the £500,000 environmental assessment. This percentage is calculated as follows:

- Ex-ante allowance for the year = 15%
- Environmental assessment as a proportion of ex ante scheme development cost = £500,000 / £25.7m = 1.95%
- Reported performance in 2021/22 = 15% - 1.95% = 13.05%
- Underperformance payment for 2021/22 = (15% - 13.05%) × £128,500 = £250,000

The company subsequently delivers the environment assessment and the scheme progresses through subsequent gateways. The company reports performance as shown in Table 22.

	Unit	AMP6	AMP7				
			2020/21	2021/22	2022/23	2023/24	2024/25
Performance commitment	%	N/A	10%	13.05%	25%	25%	25%

Table 22. Example of reported performance used in Example 2.

Overall, because the company incurs the cost of carrying out the environment assessment and returns money to customers through the ODI there is a net penalty. The potential for such penalties incentivises the company to deliver its contribution to the scheme in a timely and robust way.

If the company needs to incur additional expenditure to complete the same environmental assessment then this would not be reflected in the ODI reporting and would be subject to the normal totex incentive. In this example with 50:50 totex sharing, if the company had to incur an additional £500,000 the total expenditure incurred by the company would be £1m and the total recoverable from customers would be the £500,000 cost of delivering the assessment once. The company is penalised by £500,000 because it has incurred this expenditure which it cannot recover from customers.

If Ofwat decides to replace the totex incentive with an ex post true-up mechanism then these decisions would need to be taken into account in the true up.

Example 3: Acceleration of scope

In this example the scheme progresses as planned up to gate 2 in March 2022. In the run-up to gate 2 it emerges through finalisation of WRMPs and engagement with the regulatory alliance that the need for the scheme is earlier than previously anticipated. The companies involved in the scheme consider whether the scheme can be delivered earlier and share evidence with the regulators. The companies submit a proposal into the gate review evidencing the accelerated plan and expenditure requirements.

A decision is then taken at gate 2 that the scheme should be accelerated because the need arises earlier than anticipated and work up to that point has shown that the subsequent stages can be delivered earlier than previously thought. It is therefore agreed that the company requires an additional expenditure allowance of £2m for 2023/24 and (following gate 3) an additional £5m for 2024/25. The additional £5m is subsequently confirmed at gate 3 and across AMP7 the company therefore reports as follows.

For 2023/24:

- Additional expenditure required £2,000,000
- Multiply by 50% to account for the totex incentive rate
- Divide by incentive rate of £128,500 to give 7.8%

- Add this to the original target of 25% to give 32.8%

Applying the same mechanism for 2024/25 gives a figure to report of 44.5%. The company therefore reports performance as shown in Table 23.

	Unit	AMP6	AMP7				
			2020/21	2021/22	2022/23	2023/24	2024/25
Performance commitment	%	N/A	10%	15%	25%	32.8%	44.5%

Table 23. Example of reported performance used in Example 3.

This triggers an “outperformance” payments as follows:

- Year 2023/24: $(32.8\% - 25\%) \times \text{£}128,500 = \text{£}1,000,000$
- Year 2024/25: $(44.5\% - 25\%) \times \text{£}128,500 = \text{£}2,500,000$

It can be seen that this allows companies to recover 50% of the costs associated with the increased scope through the ODI. The other 50% is recovered through the totex incentive.

There is potential for an ex post true-up mechanism to remove the need for the mechanism described in example 3. However if the decision is taken to retain totex incentives, the impact is described in the following paragraph.

It can also be seen that normal totex incentives apply after the gate, so that if the company actually spends more than the £2m assessment of the efficient expenditure needed for 2023/24 it cannot recover all of that additional expenditure. Equally the company can retain a proportion of any underspend against this ex ante assessment. This ensures that the company is always incentivised to deliver the work in an efficient way.

The mechanism set out in example 3 would work symmetrically so that it could be agreed at a gateway that the work programme should proceed on a delayed schedule, for example to allow for further consultation or additional analysis.

7.16. Risks and issues

Principal risks relating to the performance commitment are external factors, for example weather conditions can limit the ability to undertake certain environmental surveys. There also risks associated with the number of parties involved in the scheme but this will be mitigated by clear terms of reference and joint venture agreement.

It should also be noted that there is no pre-determined expectation that this scheme will pass through all the gateways. The mechanism is designed to allow work to progress to create option value and to protect customers should it be subsequently determined that the work does not need to progress further. There are a number of other strategic options being considered for the water resources needs of South East England and not all of them are expected to progress through all gateways. If the Severn Thames transfer does not progress on the basis of the evidence considered at a gateway this should not be seen as a performance failure by the company.

7.17. Cost of delivery

The cost of delivery is estimated to be £45.3m

7.18. Long-term ambition

This is a bespoke, one-off, measure relating to a particular project but this could be used as a template for other future schemes.

8. Affordability

Evidence on the overall level of customer bills and their affordability was presented in Chapter 3, Section 3.4 of our September business plan. When we presented proposed AMP7 bill impacts to household customers, alongside a description of proposed service improvements. The substantial majority of customers have told us that they believe service and bill proposals are acceptable⁵³.

We undertook acceptability testing for 2020 - 25 by providing customers with two bill options (Plan A and Plan B). Plan A proposals tested nominal average household bills of £451 (£10 greater than final business plan proposals as a result of including the full bill impact of the Manchester and Pennines Resilience project in bills for the 2020 to 2025 period, which will now be realised in the 2025 to 2030 period). Plan B contained £20 lesser bill reductions and less ambitious service improvements. Plan B received overall customer acceptability of 76% (compared with 82% for Plan A).

The bill profile in the September business plan was set between the two tested bill options with an 11% bill cut for the 2020 to 2025 period. Through triangulation we concluded that our plan commanded acceptability of at least 81.6%.

In the long run, successful implementation of the Severn Thames transfer would be expected to reduce customer bills as they would benefit from the proceeds of the trade. Alternatively, the customer benefit from the trade could offset the costs of other future service improvements making them more affordable.

These proposals require a short term increase in United Utilities customer bills before costs are recovered. We calculate the bill impact of our proposed costs to be 22p on average over AMP7, which translates to less than 2p per month on customer bills over the next five years. This is not expected to have any material impact on the overall affordability assessment.

There is a risk that the scheme does not progress and that therefore there are sunk costs which will need to be recovered from United Utilities customers. This risk is mitigated by the gated process and the overall risk is therefore expected to be small.

9. Board assurance

The evidence used within this document has been based upon information developed for and used within our Water Resource Management plan, or our PR19 business plan, both of which were subject to explicit board assurance processes.

Our water resources management plan has been subject to extensive assurance, including United Utilities Water Limited Board assurance, as detailed in the following report:

- [Revised Draft Water Resources Management Plan 2019 Technical Report – Assurance and governance](#)

The development of our overall PR19 cost proposals and the proposed cost adjustment claims have been subject to detailed review throughout the business and with the United Utilities Water Limited Board. The conclusions from and summary of this review process are set out within the following report:

- [PR19 Board assurance statement](#)

To provide confidence to the Board, the development of the cost proposals within our business plan, including the enhancement expenditure, was subject to robust ‘three lines of defence’ assurance

⁵³ T1029 - Acceptability testing: Stage 2

framework. This framework included a number of broad and deep reviews, which were undertaken by independent specialist assurance partners, with these reviews covering both the process and the governance that was applied to the development of the cost and efficiency proposals set out within the plan. In addition to these targeted reviews, Deloitte undertook an overarching review of the submission to review supported by a number of deep dives onto areas such as the enhancement expenditure proposals.

The framework that was applied to build the required confidence and assurance in our business plan is set out within chapter ten of the plan, with details of the specific assurance undertaken within each section of the plan being set out within supplementary document S9001. Both of these documents are published on our web site and are available via the links below.

- [Chapter 10 Confidence and assurance](#)
- [S9001 Confidence and assurance: Process, controls and assurance of our business plan](#)