Thames Water Draft Water Resources Management Plan 2024

Statement of Response

Appendix J: Statement of Response for Severn Thames Transfer

August 2023

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Section 1

Introduction response to consultation

1.1 Thames Water received around 320 responses from individuals and organisations in relation to the Severn Thames Transfer (STT).

1.2 The majority of these responses set out their support for a transfer of water from the Severn to the Thames via the restoration of sections of the Cotswold Canals.

1.3 Many of the responses follow similar themes and this appendix provides information in response to the comments received.

1.4 Key issues addressed in this response include:

- How the Severn Thames Transfer (STT) conveyance options have been evaluated and how wider economic and social benefits have been taken into account in the assessment of options
- How feedback from supporters of the restoration of the Cotswold Canals has been taken into account
- How the relative costs of the Deerhurst to Culham direct pipeline and pipeline with restored sections of the Cotswold Canals alternatives have been compared
- How the pipeline and pipeline with restored sections of the Cotswold Canals alternatives compare in terms of energy
- The water transfer capacity of a pipeline with restored sections of the Cotswold Canals option
- Constructing the Cotswold Canals network
- Opportunities the restoration of the Cotswold Canals could bring to provide extra water resource resilience

1.5 This response also summarises the other factors raised by respondents in relation to the restoration of the Cotswold Canals and STT more generally.

STT within the revised draft WRMP

1.6 We have undertaken detailed work to review and assess a large number of potential water resource options, to both manage demand for water and to provide additional water supply, in order that we can continue to provide a secure and reliable supply of drinking water to customers over the next 50 years.

1.7 STT is one of five potential Strategic Resource Options we have been considering and our feasibility work is being over seen by The Regulators' Alliance for Progressing Infrastructure Development (RAPID), a joint team made up of the three water regulators: Ofwat, the Environment Agency and the Drinking Water Inspectorate. RAPID has introduced a new regulatory process which sets out the activities that need to be completed, allows comparison of the solutions at regular intervals, and has clear checkpoints, or gates, to assess progress and determine which solutions should be taken forward for further work.

You can find out more about how STT fits within this process on our website: https://www.thameswater.co.uk/about-us/regulation/strategic-water-resource-solutions

1.8 During the development of the draft regional plans and our draft Water Resource Management Plans (dWRMP), STT was selected as part of the Water Resources South East (WRSE) regional solution, in conjunction with other schemes, in 2050. This was also reflected in Water Resources West (WRW's) plans.

1.9 In March 2023 the regional groups undertook a reconciliation process carrying out their latest round of modelling sensitivity analysis of water resource options. This scenario modelling reflected updated water resource option data, including on STT, alongside other relevant new information and reflecting latest government requirements, including the requirement for all water companies to meet a 110 l/p/d PCC target.

1.10 Through this latest testing of options to meet regional demand, STT is not selected in the reported regional pathway (preferred plans) for WRSE or WRW. For more detail on the selection of options in the preferred plan please refer to Thames Water rdWRMP24, section 11 – The Overall Best Value Plan.

1.11 Whilst STT is not now in the preferred regional plans, STT is selected in the adaptive pathway regional plans as early as 2040, if the South East Strategic Reservoir Option (SESRO) could not be developed, or if government water efficiency policies do not reduce demand to the levels anticipated.

1.12 We are therefore proposing to continue development of the STT system in our revised draft WRMP, and draft business plan, to ensure our plans are robust and can adapt to meet our statutory duties in the future.

STT conveyance options

1.13 For STT we considered conveyance of water from the River Severn into the River Thames catchment via a new pipeline from Deerhurst to Culham or options that included restoration of sections of the Cotswold Canals. Work undertaken on these options builds on work undertaken in WRMP19.

1.14 The majority of STT responses set out their support for a transfer of water from the Severn to the Thames via the restoration of the Cotswold Canals. Below we set out our response to the issues raised by respondents on the conveyance options.

How the Severn Thames Transfer (STT) conveyance options have been evaluated and how wider environmental, economic and social benefits have been taken into account in the assessment of options

1.15 A large number of responses supported the option of transferring water from the Severn to the Thames through the full or partial restoration of the Cotswold Canals, highlighting that they considered restoring the canals would be best value, referring to the additional benefits a restoration of the canal network could bring.

1.16 Respondents highlighted the benefit a restored Cotswold Canals network would bring in connecting up with other existing canal networks whilst others put forward a variety of

hybrid and phased options that combined restoring the canal with new pipelines and reservoirs. Respondents also questioned how the options have been evaluated.

1.17 Supporters of the full restoration of the Cotswold Canals network referred to potential sustainability benefits of constructing and operating a canal network compared to a pipeline, alongside suggesting wider environmental, economic and social benefits that a canal between the Severn and Thames could bring. They stated the wider sustainability benefits would help to meet national, regional and local environmental and social obligations, including conservation enhancement, and suggested that a solution should be more than transferring water from A to B.

1.18 The responses highlighted potential wider benefits included recreation, tourism, biodiversity, public amenity, public health, property value generation and local, regional and national economic benefits, for example new employment, training and apprenticeships.

1.19 Other non-tangible benefits were raised, including the suggestion that a canal based solution to convey flows from the Severn to the Thames would reflect well on the water industry and could be visionary, inspirational, innovative and provide a lasting legacy for local communities.

1.20 **Response:** For STT we have considered conveyance of water from the River Severn into the River Thames catchment via a new pipeline from Deerhurst to Culham or options that included restoration of sections of the Cotswold Canals.

1.21 Our work has built on the water resource option feasibility assessments developed for WRMP19, when a Cotswold Canal option was considered in detail, but rejected.

1.22 As part of its SRO Gate 2 submission to RAPID in November 2022, the STT project team developed an Interconnector Options Appraisal which assessed the cost and benefits of a direct pipeline and options that included the Cotswold Canals. The Interconnector Options Appraisal Summary Report can be found here:

- https://www.thameswater.co.uk/media-library/home/about-us/regulation/regional-water-resources/water-transfer-from-the-river-severn-to-the-river-thames/gate-2-reports/STT-G2-S3-302-Interconnector-Options-Appraisal-Summary-Report.pdf

1.23 The conveyance options considered in the Interconnector Options Appraisal were:

- a direct pipeline option
- options using a combination of pipelines and reconstructed canal pounds, and
- options that provide a full restoration of the canal network

1.24 A multi criteria assessment methodology identified a preferred solution that would be technically feasible and deliver best value to water company customers.

1.25 The Interconnector Options Appraisal consisted of two distinct phases: the first of which focussed on the provision of a resilient water transfer; the second focussed on assessing potential synergies of providing a navigational canal in addition to a water transfer.

1.26 The conclusions from this assessment were that a water transfer from the River Severn to the River Thames would be best delivered by a direct pipeline.

1.27 In summary, a canal transfer option is more costly, has a greater carbon and environmental impact, and is more complex to procure, construct and operate.

1.28 The Interconnector Options Appraisal concluded that the best way to fully and effectively deliver both a water transfer and a navigable canal would be to separately deliver them. This is irrespective of the size of the transfer required.

1.29 For the drafting of the WRMP an investment model was used to review, assess and select a preferred combination of options to develop a preferred plan. The investment model consistently selected the pipeline interconnector in preference to the canal interconnector.

1.30 The Annex to this SoR Appendix (located at the end of this document) provides a summary of the Interconnector Options Appraisal work undertaken as part of the RAPID Gate 2 work, with a particular emphasis on responding to feedback from the dWRMP consultation.

How feedback from supporters of the Cotswold Canals has been taken into account in the evaluation

1.31 Feedback from supporters of the Cotswold Canals suggested that the support for the Cotswolds canal restoration should be taken into account in the evaluation of options and their advice and suggestions considered in assessing the interconnector options.

1.32 **Response.** Supporters of the restoration of the Cotswold Canals were offered the opportunity to discuss our optioneering work, including with members of the Cotswolds Canal Trust (CCT) during the drafting of the options appraisal. We have taken into account and applied relevant information provided by CCT in the options appraisal. Following additional information presented at the dWRMP24 consultation stage by supporters of the Cotswold Canals option, we have assessed this information and back checked our findings from our Interconnector Options Appraisal study work. We will continue to engage with supporters of the Cotswolds Canals and present our findings to them.

How the relative costs of the pipeline and restoration of the canal alternative have been compared on developing the draft WRMP

1.33 Many of the respondents supporting the canal restoration suggested the financial benefits of restoring the Cotswold Canals had been undervalued. They highlighted research from a variety of studies, including from the Inland Waterways Association (IWA) and Canals & Rivers Trust (CRT) on the wider financial benefit of restoring canal networks. For example, respondents suggested that restoring the Cotswold Canals would provide £800 million of financial benefit over an 80-year period and that additional benefit would more than offset the difference in cost between the pipeline and canal options.

1.34 Some respondents suggested the extra cost of completing the restoration and making the canal fully operational could be covered by local government, canal trusts, private funds or the wider public. Others suggested that the cost of planning, land and environmental assessment costs would be greater for a pipeline compared to the restoration of the Cotswold Canals.

1.35 **Response:** CCT and other respondents highlighted a range of studies that reported significant monetised benefits from the creation of canal networks.

1.36 Whilst the local impacts identified by respondents are likely to be significant to the local communities in which those studies are based, they are not directly transferable to this project or to an analysis that assesses impacts at the national level. A detailed response is provided in the Annex to this Appendix.

How the pipeline and restoration of the canal alternatives compare in terms of energy and carbon required to convey flows and carbon emissions generated by construction and operation

1.37 Respondents suggested the pumping of flows from the River Severn to the River Thames via a direct pipeline would require more energy than an option that utilised the restored Cotswold Canals, with a canal solution requiring less pumping of water and creating less water friction than a pipeline. Others highlighted that renewable energy could be created from hydro-turbines along the route of the canal. In relation to construction, several respondents suggested that the embedded carbon and greenhouse gas emissions required for construction of the pipeline would be greater than that required to restore the Cotswolds Canals.

1.38 **Response:** We have assessed the energy and carbon requirements of a direct pipeline and through options that utilise the restoration of sections of the Cotswold Canals.

Pumping of water over the Cotswolds:

1.39 The historic route of the Cotswold Canals from Saul junction on the Gloucester and Sharpness canal, follows the Stroudwater navigation to Stroud, where it joins the Thames & Severn Canal which passes along the Frome River Valley to Daneway portal where it enters the Sapperton Tunnel. The Sapperton tunnel passes through the high point of the Cotswold hills, reducing the peak elevation of the canal. Where the water transfer requires flow to travel uphill it will need to be pumped between canal pounds bypassing locks.

1.40 A route from Saul Junction to Daneway portal has been considered. This option consisted of two pumping stations and the use of Newton Pound, with stretches of piped rising mains between. This option was assessed against buildability and construction impacts. The review concluded that the option would be difficult to build in the constrained river valley and there were environmental constraints with the route running through irreplaceable priority habitat.

1.41 Alternative conveyance options were sought to address these impacts. The option selected that uses the Sapperton tunnel passes to the north of the Chalford valley, across the Cotswold hills. This route would have less construction constraints, and hence would be of lower capital cost than the previous option. It would also avoid key environmental constraints. However, it passes over the higher elevation hills. In this area the hills are higher than the selected direct pipeline route, and, as such, the pumping cost for the option is higher.

1.42 It should be noted that STT is a resilience scheme, and, as such, it will operate intermittently, resulting in the difference in pumping cost between the options being of low significance compared to the capital cost differences.

Renewable energy

1.43 Opportunities for renewable energy capture exist for both the pipeline and canal options and have not been included in either core option for appraisal. Opportunities will be further considered in future design development of the preferred option.

Carbon

1.44 A carbon assessment formed part of our Interconnector Options Appraisal, this concluded that the direct pipeline option has the lowest whole life carbon. This was driven by the overall length of the transfer option. The direct pipeline option was more carbon intensive per metre of transfer constructed than the options involving canal elements but due to the additional overall length of the canal options these options had a higher total capital carbon. The canal options had higher operational emissions from power due to the higher pumping cost (detailed above) and marginally lower emissions due to treatment chemicals due to differences in water quality at abstraction locations.

The water transfer capacity of the Cotswold Canals option

1.45 The size of the water transfer was questioned. Respondents suggested a 300Ml/d water transfer would be adequate and that 500Ml/d of water to be transferred would not be available in Severn.

1.46 A small number of respondents suggested the use of Netheridge Sewage Treatment Works (STW) and pipeline to support the canal would not be required, others suggested taking water from Netheridge STW would be advantageous and could add additional flow to the canal.

1.47 **Response:** STT's need and capacity is established through the regional planning and company water resource management plans. In the revised WRSE and WRW regional plans STT is not selected in the reported pathway. STT is selected in the adaptive pathway regional plans if the South East Strategic Reservoir Option (SESRO) could not be developed, or if government water efficiency policies do not reduce demand to the levels anticipated.

1.48 There would be significant periods of time when it would be possible to convey flows in excess of 300Ml/d and restricting the pipe size reduces the water resource benefit of STT. We are not convinced that a decision to reduce the transfer capacity, to enable the reconstruction of limited sections of the Cotswold Canal pounds would be in the best interests of providing long term water resilience for customers.

1.49 The additional treatment plant at Netheridge STW is required for all Interconnector conveyance options as it provides supported flow as well as a sweetening flow for the pipelines. This includes the pipelines that form part of the canal options. A sweetening flow is required to keep the water in the pipelines fresh, and is a common requirement in large scale water transfers. In addition, if the canal pounds constructed as part of the water transfer were subsequently joined together by others to enable navigation, the sweetening flow would provide a water supply for the canal, ensuring enough water is available for lockage.

Constructing the Cotswold Canal network

1.50 Respondents suggested the construction of the canal network would benefit from

- Experience from constructing the sections already built
- The use of new technology
- Taking lessons learnt from recent canals constructed, including at Stroud and current work being undertaken to assess the use of other canals for water transfer, for example, the Grand Union Canal
- CCT experience of working with land owners and local agencies in partnership to build the canal network
- Support from local volunteers and other organisations, for example Network Rail and National Highways
- Scope to provide offline habitat creation adjacent to locks and pounds to mitigate effects of construction of the canal
- Constructing a canal would be less challenging than a pipeline construction as the pipeline would need to be constructed over the Cotswold escarpment.
- The benefit of reusing existing infrastructure

1.51 **Response:** It is acknowledged that the construction of the water transfer, irrespective of the option selected, would benefit from lessons learned on similar projects and in all cases would take advantage of the latest construction technology. The STT project team have already liaised with the Canals and Rivers Trust and those working on the Grand Union Canal water transfer and have taken advice from the Cotswold Canals Trust following their experiences from the sections already built for the Cotswold Canals.

1.52 The support of volunteers and other organisations for restoring the canal is noted, including their experience of working with landowners and local agencies, however although welcomed, this scale of help is considered of marginal benefit compared to the scale of work required to deliver the water transfer including a large water treatment works and at least 58km of large diameter pipework. The water transfer would be a major and nationally significant engineering project and would be delivered by a commercial organisation. Any volunteering would also likely focus on elements of the project that are not essential to the water transfer but required to supplement water transfer elements to provide a navigational canal.

1.53 Both a canal transfer and direct pipeline transfer would necessitate significant environmental mitigation measures, including new habitat creation. Mitigation options would be considered in the detailed design stage, but it would be expected that additional land take would be required to provide this mitigation in either case.

1.54 The construction of a water transfer of this scale over the Cotswolds landscape will be a challenging project, irrespective of the option selected. The pipelines for all options cover challenging ground in places with the route corridors considered seeking to reduce the risks where possible. Open water transfer elements i.e, the canal pounds within the canal options, have their own challenges, such as bridge widening and bypasses, incorporating bank raising with existing historical assets etc. The existing condition of the pounds used within the water transfer options considered have been assessed and the work required to

make these suitable for use for water transfer has been evaluated and included within the cost estimates.

1.55 In conclusion it is considered that the challenge to construct a transfer scheme incorporating either a partial or fully restored Canal network would still be greater than a direct pipeline from the River Severn to the River Thames.

Opportunities the restoration of the Cotswold canals could bring to provide extra water resource resilience

Respondents highlighted that by restoring the Cotswold Canals network there were potential opportunities for additional water resilience. Opportunities referred to in responses included:

- The old gravel workings in Latton and the Cotswold water park to provide additional water storage / back up reservoirs, with the potential for floating solar panels
- A restored Cotswold Canals network could discharge into Upper Thames tributaries, like the Churn to support local resources
- A restored Cotswold Canals could provide water resources to communities along the route of the canal, for example at Lechlade
- The Wiltshire and Berkshire canal could be connected to the Cotswold Canals and be utilised to provide extra resilience

1.56 **Response:** The old gravel workings in Latton and the Cotswold Water Park could provide additional water storage for the canal network. However, the effects of river flow changes in Ampney Brook, the River Churn and the River Thames due to this proposed water source, were assessed in the Interconnector Options Appraisal Report to be a major constraint.

1.57 The opportunities of a restored Cotswold Canal providing water resources to the upper Thames tributaries or to communities along the route of a restored canal have not been appraised in the Interconnector Options Appraisal as the water resource requirements for these areas has already been appraised through the WRMP process.

1.58 The benefits of connectivity with the Wiltshire and Berkshire canal have not been investigated at this stage of STT optioneering. Should a restored Cotswold Canals option be selected as the preferred option at a subsequent later stage then the potential benefits to connect to the Wiltshire and Berkshire could be investigated in the detailed design stage.

The timing of when STT is needed in the Plan

1.59 Respondents suggested that providing the water transfer from the Severn to the Thames via the restoration of sections of the Cotswold Canals should be brought forward earlier in the plan, and be delivered ahead of other options, for example SESRO and Teddington Direct River Abstraction. They suggested a canal based transfer could be brought forward in shorter timescales compared to other options, and highlighted the large amount of water it could provide to address the shortfall.

1.60 **Response:** The WRSE best value planning process has evaluated an adaptive programme and preferred pathway, carrying out a series of sensitivity modelling to confirm the timing of water resource options to meet regional demand.

1.61 Through its regional reconciliation WRSE has identified an updated sequencing of options to meet demand requirements. The outcome of this work is that STT is not selected in the reported pathway (preferred plan) for WRSE or WRW. Whilst STT is not in the preferred regional plans, STT is selected in the adaptive pathway regional plans, if the South East Strategic Reservoir Option (SESRO) could not be developed, or if government water efficiency policies do not reduce demand to the levels anticipated. The earliest STT maybe required under the adaptive pathway is from 2040.

Other factors raised by respondents in relation to restoring the Cotswold Canals

Other reasons respondents prefer a restored canal option

1.62 Respondents highlighted other reasons that the canal should be selected as the option to convey flows from the Severn to the Thames. These included:

- Would have less loss of countryside than a pipeline construction
- Has significant support and less controversial than a pipeline
- Would require fewer consents than a pipeline option
- Could act as environmental mitigation for other strategic resource schemes
- Water could be discharged at Lechlade rather than Culham

1.63 **Response:** The extent of construction and operational effects on the countryside and landscape, including national designations (National Parks / Areas of Outstanding Natural Beauty) were considered in the Interconnector Options Appraisal. For both pipeline and canal options there will be a necessity for significant construction activity within the open countryside and AONB, including the laying of pipes and the creation of embankments for canal pounds. The construction area required for the canal pounds is likely to be larger than for pipeline elements due to the additional width of the canal pounds compared to enclosed pipelines and by their very nature, the canal elements result in a larger permanent above ground asset compared to the pipeline elements. Both of these characteristics result in a bigger landscape impact.

1.64 The ongoing and depth of support from canal groups and other interested stakeholders for a canal solution to convey the flows from the Severn to the Thames is acknowledged. However, there is no evidence to agree with the view that an option including canal pounds would be less controversial than a pipeline. A large water transfer option including canal pounds will have similar consenting requirements to a direct pipeline option, including a Development Consent Order as required under the Planning Act 2008.

1.65 Like the pipeline option, an option including canal pounds would have its own environmental impacts to mitigate, for example, addressing the impact of constructing the embankments for the canal pounds, and therefore the opportunity to provide wider mitigation beyond its own scheme is likely to be limited. Furthermore, each strategic resource scheme will be developed separately, most likely to different timescales, thereby

further limiting the opportunity for a canal-based option to act as mitigation for other strategic resource schemes.

1.66 From the environmental assessment carried out to date, it is unlikely the full discharge of transfer flows at Lechlade would be permitted as discharging of STT flows into the Thames at Lechlade has a potential impact on Oxford Meadows Special Area for Conservation (SAC), downstream of Lechlade. The European Site Conservation Objectives, and Natural England's supplementary advice provide specific targets for water levels and frequency of flooding including "no inundations during March – August". As this is the most likely time of operation of the STT scheme this would have implications under the Habitats Regulations and it is considered it would be extremely difficult for STT to demonstrate 'beyond reasonable scientific doubt' that sustained operation of the STT during these periods will not increase the risk of inundations. There is a possibility of a partial discharge, but a pipeline would still be needed to take the balance of flows to Culham. This is not a differentiator as it would provide a benefit to both pipeline and canal options.

Operation of a canal network with water transfer

1.67 Several responses provided feedback on the experience, opportunities and constraints of having a dual-purpose canal network, which provided navigation for boats and the transfer of water from the River Severn to the River Thames for water supply.

1.68 Respondents suggested that as Bristol uses water from the River Severn via the Gloucester and Sharpness canal that the canal is sufficiently wide and deep to cater for a conveyance of water to the Thames. They highlighted that desilting of the canal is undertaken by Bristol Water.

1.69 The experience of water companies and CRT in operating canal networks which have a dual use as a water resource transfer were referenced and the work being undertaken to develop up a water resource transfer to London from the Grand Union Canal.

1.70 The IWA highlighted that when considering the use of a water transfer for canal navigation the operational requirements of boat users should be considered, and that this should take into consideration amongst other things flow rates, pump failure, level changes, air draft, monitoring and control.

1.71 **Response:** STT will be required to deliver resilient water supplies for the future, so that water companies in the south-east will be able to meet their statutory obligations in times of drought and therefore the transfer of water to help deliver a resilient water supply will need to take priority over navigation. However, the design concept for the option involving the use of existing and reconstructed canal pounds has considered the dual use of the canal sections for navigation and water supply. The Interconnector Options Appraisal included options that utilised the Gloucester and Sharpness canal.

1.72 The ownership model of the transfer and restored canal assets would need to be agreed; however, the assets may not rest with the water companies, but any contractual arrangements for water transfer would require the transfer infrastructure to be operated and maintained to resiliently deliver the water supply need when it arises. The advice of CRT, water companies and canal interest groups would be sought should a canal option be preferred.

1.73 In assessing the different canal restoration options, limits of in-channel velocities were set to enable navigation and water transfer to occur simultaneously (with the exception of Sapperton Tunnel which would need to be closed to navigation during water transfer operations). Where required to ensure acceptable channel velocities, bank raising, channel deepening, bridge widening and bypass facilities have been included within the option design and costed appropriately.

1.74 It is agreed that the combined operation of a water transfer with a canal for navigation would require enhanced engineering of elements of the canal as well as monitoring and control to ensure the scheme would deliver the appropriate level of resilience for water supply assets and navigational benefits. This will be included in the operating strategy for the scheme if the option is developed further.

Concerns over impacts of utilising sections of canal network

1.75 A small number of respondents highlighted concerns with restoring the Cotswold Canals network. These included risk of flooding and loss of ecology, with reference to the potential ecological impacts between Brimscombe and Sapperton.

1.76 **Response:** The Interconnector Options Appraisal reviewed the potential ecological impact of construction within the Chalford Valley, this resulted in the selection of an alternative route for the rising main for options including canal elements to Daneway portal – avoiding the ecological constraints and reducing potential impacts.

1.77 The restoration of the Cotswold Canal network is not our current preferred option to transfer flows from the River Severn to the River Thames. Should this option be taken forward at a later stage an Environmental Impact Assessment would be undertaken to assess the risk of flooding and impacts on ecology from restoring the canal network. From our early assessments we consider these issues could be overcome through design development and mitigation.

Other respondent themes in relation to STT

Support for STT

1.78 Respondents set out their general support for STT, including a preference for a pipeline over a restored canal option. Many respondents suggested that STT should be prioritised over SESRO and be brought forwarded earlier in the Plan. Their reasons for support included:

- Makes sense
- Safe
- Proven technology
- Limited impact on the environment
- Less carbon used to construct and operate
- Flexible to address future water needs
- Resilient to droughts by providing water from different catchments and sources
- Would only be used when required

- Quick, cheap and easy to build
- Would result in less need to take water from the ground in the South East (i.e. abstraction)
- Provides a significant amount of water
- Would provide economic benefits
- Would benefit from renewable energy opportunities, e.g. through hydro turbines
- Could act as an insurance policy if other schemes were delayed
- Aligns with National Infrastructure Commission recommendations
- Supports the creation of a national water grid

1.79 **Response:** The support for STT is noted. The WRSE and WRW regional groups have undertaken their latest round of modelling sensitivity analysis of water resource options. Through this latest testing of options to meet regional demand, STT is not selected in the reported regional pathway (preferred plans) for WRSE or WRW.

1.80 Whilst STT is not now in the preferred regional plans, STT is selected in the adaptive pathway regional plans if the South East Strategic Reservoir Option (SESRO) could not be developed, or if government water efficiency policies do not reduce demand to the levels anticipated.

1.81 We are therefore proposing to continue development of the STT system in our revised draft WRMP, and draft business plan to ensure our plans are robust and can adapt to meet our statutory duties in the future.

Consideration of possible benefits for Wales for water transfers

1.82 Several responses suggested that for water to be transferred from Wales to England, there should be benefits for Wales as part of the water transfer plans. Suggestions included that the UK and Welsh Governments should put in place the necessary legislative frameworks to raise a levy on water supply companies on transferring water outside of Wales.

1.83 **Response:** There are no plans to take any additional water from Wales to England, STT would use water that currently goes to North West England from Lake Vyrnwy and this would be diverted at times to the South East via a transfer from the River Severn to the River Thames.

1.84 Whilst a change in legislative frameworks to raise a levy on water supply companies on transferring water outside of Wales would be a matter for the UK and Welsh government, should STT progress we would work with stakeholders across Wales to determine what benefits can be achieved in Wales, including Powys.

1.85 Initial work has already been undertaken with a wider benefits investigation undertaken to identify potential multiple environmental and societal benefits across the project. The work aligns to the Sustainable Management of Natural Resources and associated Well Being Goals for Wales.

1.86 Potential opportunities include river restoration; creation and improvement of habitats, including wetlands and tree planting; improvements to footpath access and outdoor educational spaces.

1.87 These could provide improvements to water quality; reduction in downstream flood risk; biodiversity enhancements; enhanced carbon sequestration and storage and recreation,

health, fitness and wellbeing. We are also working with Water Resources West (WRW) and other water companies in the West of England and Wales, who are already progressing nature-based solutions to support local water catchments. Their plans include creating extra value for Wales through land management work around the Upper Severn and the Dee catchments which would improve water quality and biodiversity and reduce flood risk.

Concerns with STT

1.88 A small number of respondents opposed or raised concerns with transfer flows from the River Severn to the River Thames via either pipeline or canal. They highlighted the following:

- Concern that the River Severn would run dry with population increase
- Concerns regarding increased risk of flooding along the Severn
- Concerns over disruption during construction
- Need for high voltage power lines to power scheme
- Concerns that the pipework would leak
- Lack of benefits, including natural capital benefits
- Concerns over environmental impacts, including risk of Invasive Non-Native Species (INNS), ecology and ancient woodlands

Response:

Concern that the River Severn would run dry

1.89 The amount of flow available to be transferred to the River Thames will be agreed with the Environment Agency and Natural Resource Wales to protect flow levels in the Severn.

1.90 Abstractions of River Severn water would only occur when flows are higher and there is available water to transfer. This would be subject to 'Hands-off Flow' (HoF) restrictions and would therefore not affect the lowest flows and would not result in significant change to wetted habitat or water level at locally important hydraulic features. Due to the risk of concurrent low flow periods in both river catchments, additional sources of water, apart from those naturally occurring in the River Severn, have been identified to augment the baseline flows. These multiple diverse sources of water are provided by Severn Trent Water and United Utilities and include treated water from Severn Trent Water's Minworth STW and Netheridge STW to provide resilience in the provision of raw water transfer to the River Thames. The additional water sources would only operate when there are low flows in the River Severn and would not cause an increase in flood risk.

1.91 A range of future operating scenarios are being developed with STT partners and regulators for further investigation. These will include modelling of changes in river flows, changes in demand for water, and a range of other variables to verify that the introduction STT would not adversely affect the environment or flow regime in the rivers.

Concerns regarding risk of flooding along the River Severn

1.92 The operation of STT would not impact flooding. The STT scheme would only add additional support water from Lake Vyrnwy and other sources during low flow conditions. These sources would not be operational during a flood event.

Disruption during construction

1.93 The pipeline design is at early conceptual stage with the routing, siting of the treatment works and pumping station, power supply and other aspects of the scheme's requirements still to be developed. Working with stakeholders, we will seek to locate structures and associated services appropriately to minimise and mitigate construction and operational impacts, including on the public. Trenchless construction techniques will also be required in some areas, for example to cross large rivers and under major roads and railways. Should STT proceed to a formal application for consent, these details will be subject to further design development, public consultation and engagement with affected parties.

1.94 Should STT progress through the planning process, as part of the planning conditions set out in the Development Consent Order, we will clearly set out our working methods and how it will minimise its potential installation impacts. This will include the preparation of a Code of Construction Practice, which will represent our commitment to communities along the route. The Code of Construction Practice will describe methods to minimise construction impacts. This may include measures such as changing installation timings to avoid peak periods of use; environmental management, for example how land drainage systems would be crossed; good housekeeping of installation sites, such as dust reduction; minimising evening and weekend working hours and noise levels, including using low-noise equipment; and carefully managing traffic to minimise disruption and delays.

High voltage power lines

1.95 We will work with the electricity supplier to understand any additional electricity demands on the network from STT. Local electricity upgrades maybe necessary, and where practical these power cables would be buried. This will need to be considered further as the scheme is developed.

Concern that the pipework would leak

1.96 The current design assumes a lined steel pipe option with a lifespan of 100 years. The pipeline will be pressure tested as part of the commissioning process and monitored during its operation. The risk of a cement lined steel pipe leaking is considered very low.

Lack of benefits, including natural capital benefits

1.97 Working with local communities and organisations, STT could offer significant opportunities to support projects that enhanced biodiversity value, the wider environment, and local economies.

1.98 For example, STT could help and support the delivery of local river restoration projects; improving water quality and provide opportunities to reduce flood risk and carbon. Improvements to water quality would also improve the biodiversity of terrestrial and aquatic habitats. Reducing downstream flood risk with potential enhancement of wetlands and peatlands could benefit both climate and flood hazards. Restoring habitats for the purpose of recreation could also have improvements for education and biodiversity, for example setting up outdoor educational spaces within recreational areas and installing a higher diversity of habitats within an area which was once a uniform habitat.

1.99 There may also be opportunities to support local river recreational activities including angling and wild swimming.

1.100 Local economies could benefit through the use of local suppliers and staff.

1.101 Respondents questioned whether there would be any additional benefits to upstream local rivers that flow into the River Thames, for example the River Kennet. The rdWRMP incorporates proposals to reduce abstraction on sensitive chalk streams and at the heads of rivers, although there would be no direct benefit from STT, as the discharge point for the transfer is proposed at Culham in Oxfordshire, chosen because there is sufficient flow in the Thames at this point to take the additional flow from the Severn without adverse environmental impact.

Concerns over environmental impacts, including on INNS, ecology and ancient woodlands.

1.102 We are working with environmental regulators and other stakeholders to identify the sensitivity and importance of different aspects of the natural environment and have begun collecting information on the baseline condition of the environment. In determining the routing and siting of infrastructure we will seek to avoid sensitive environmental sites, including ancient woodlands.

1.103 Baseline monitoring undertaken to date has included water quality, plants and animals in the rivers, habitats and species on land, presence of non-native invasive species, ground conditions and potential for archaeology.

1.104 In relation to INNS a water treatment works would be constructed close to the abstraction point on the River Severn. The treatment works will pre-treat the raw water from the River Severn before it is transferred to the River Thames. The treatment is to ensure that there is a barrier to INNS and that there is no deterioration of the raw water quality in the River Thames as a result of the transfer. The treated raw water would be discharged into the River Thames sufficiently downstream to ensure there was sufficient dilution to avoid any significant changes in water quality in the River Thames.

1.105 If this scheme is taken forward for a DCO submission, we will need to complete an Environmental Impact Assessment (EIA), which will include a detailed ecological impact assessment. The EIA will consider the current environment along the route of the scheme and assess what impact construction and operation will have. It will look at ways to reduce any significant impact and how the scheme can improve the local environment, including on ecology. The results of this will be provided in an Environmental Statement. The Statement will be provided as part of the Development Consent Order application to inform any future planning decision.

Cost of STT

1.106 Respondents suggested the costs for STT would be lower than set out in the draft WRMP, and in particular less than SESRO. Respondents raised concerns that STT costs were likely to escalate, highlighting HS2 an example.

1.107 **Response:** The costs established for STT for inclusion in the WRSE regional and WRMP24 best value plan selection were appraised from a Capital (CAPEX) and Operational (OPEX) perspective.

1.108 CAPEX costs were generated using United Utilities, Thames Water and Severn Trent Water cost databases. The approach to CAPEX costing was consistent with the approach used at WRMP19. Costs were produced in accordance with the ACWG Cost Consistency Methodology Revision E, issued February 2022. This provides guidance for all water resource options to ensure option costs are developed in a consistent way and are comparable with option costs developed by other companies in the region and country. Outline designs have been developed and costed using company costs where available, or industry costs for items such as the large pipelines.

1.109 Operational (OPEX) costs include labour, power, chemicals, and an allowance for operational maintenance. OPEX has been calculated using the minimal operational regime and also for maximum capacity for comparison.

1.110 STT costs have been presented to RAPID through the Gated reporting process. The main OPEX costs for STT are the energy costs to pump the water across to the Thames.

1.111 To help assess and manage the potential for cost escalation, optimism bias (unknown unknowns) has been calculated in conjunction with a Quantitative Risk Analysis as detailed in the ACWG Cost Consistency Methodology, this includes price volatility. Known unknowns have been identified in the costed risk register and include allocations for ground conditions, land agreements and planning requirements. Risks are quantified and allocated minimum and maximum expected budgets, and the probability of that risk occurring is assessed. Risk costs can be linked to delays to construction activities and the impact can be estimated using previous experience.

What are the plans beyond the Severn Thames Transfer to transfer water from other regions

1.112 A small number of respondents asked what are the plans beyond the Severn to Thames Transfer to transfer water from other regions and whether there was an opportunity to create a wider water national grid.

1.113 **Response:** The regional water resource plans set out the need and preferred plan for transferring water between regions. Beyond STT and other regional water transfers, the development of a wider water national grid would be a matter for Government to consider.

Section 2

Overview of the Interconnector Options Appraisal Methodology and Findings

2.1 This overview is based on work undertaken for the Gate 2 SRO submission. It provides additional detail on the Interconnector Options Appraisal to support the Statement of Response. The Interconnector Options Appraisal Report is available on the TW website using the following link.

https://www.thameswater.co.uk/media-library/home/about-us/regulation/regional-water-resources/water-transfer-from-the-river-severn-to-the-river-thames/gate-2-reports/STT-G2-S3-302-Interconnector-Options-Appraisal-Summary-Report.pdf

Introduction

2.2 Our Interconnector Options Appraisal considered whether a water transfer from the River Severn to the River Thames would be best delivered by a direct pipeline or by a combination of pipelines and open water channels (canal pounds). A subsequent validation study was also undertaken, building on the work already completed and using the same assessment methods, identifying and assessing the additional benefits that could be achieved with the provision of a canal for navigation.

Interconnector options considered

2.3 Following an initial longlist exercise four options were chosen to characterise the possible interconnector options types. These consisted of the following:

2.4 Option 1: Pipeline – A direct pipeline from the Deerhurst area on the River Severn to Culham on the River Thames – a number of different pipeline options were identified, from which one was chosen to represent a pipeline option.

2.5 Option 2: Canal_Sapperton – A transfer option from the Gloucester area on the River Severn to Culham on the River Thames including a mixture of pipelines and open water transfer elements and the use of the Sapperton Tunnel.

2.6 Option 3: Canal ExSapperton - A transfer option from the Gloucester area on the River Severn to Culham on the River Thames including a mixture of pipelines and open water transfer elements with a pipeline that bypasses Sapperton Tunnel.

2.7 Option 4: Combined - A transfer option from the Deerhurst area on the River Severn to Culham on the River Thames including a mixture of pipelines and open water transfer elements.

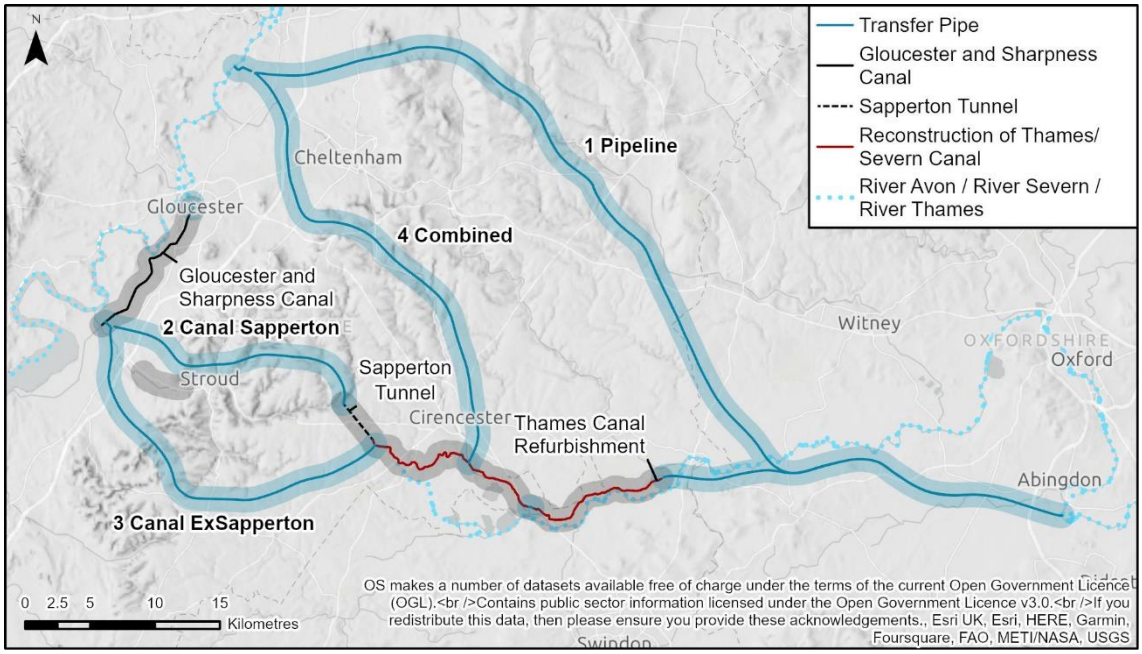

Figure App 1: Map showing indicative shortlist of options

2.8 All options include a water treatment works close to the River Severn to remove Invasive Non-Native Species before transfer to the River Thames. All options in the study considered a transfer capacity of 300Ml/d. This is considered to be the maximum flow that could be transferred using a reconstructed canal option due to hydraulic constraints.

2.9 The focus of the study was to identify a preferred option to provide a resilient water supply to the South East of England. Therefore, the engineering design and scope of all options is limited to the infrastructure required to transmit water. In the case of the options involving canal pounds, this means that it includes a number of discrete pounds, linked by the required lock bypass infrastructure. As the base scheme, it did not include locks linking the pounds, and in some cases would bypass whole pounds, or sections of pounds that are constrained. To open the canal to enable navigation between the River Severn and the River Thames additional work will be needed to join up the discrete sections.

2.10 Options 2, 3 and 4 all involve the redesign and reconstruction of sections of the Severn Thames Canal. In order to convey such large volumes of water the historic design of the canal in many areas will need to be altered. In long pounds the canal banks will need to be raised by a maximum of 1 metre to enable the flow pass, some bridges will need to be widened or bypassed to ensure acceptable flow velocities are achieved. To enable the future use of the water transfer pounds for navigation some bridges will need to be raised to enable sufficient headroom above canal boats during high flows. Locks will need specially designed bypasses to enable the transfer of these large flows, with long weirs to limit cross flows to those considered acceptable to navigation.

2.11 The operation of the water transfer will have an effect on navigational boat traffic passing along the canal at the time, with a noticeable velocity within the water travelling ‘upstream’, against the flow will become more difficult, taking additional time and energy. Water levels within the canal will vary significantly during flow conditions and moorings will need to be able to adjust.

2.12 Due to the cross section of the Sapperton tunnel, the operation of the transfer at peak capacity will result in high velocities within the tunnel and therefore, for options using the tunnel for transfer (Option 2), Sapperton Tunnel would not be available for use by navigational traffic at times of transfer. Option 3 provides an alternative option to the use of Sapperton tunnel. This would join the canal on the Thames end of the tunnel and would not renovate the tunnel. However, if the tunnel was subsequently refurbished by others, navigation could be maintained during water transfer periods. Both options were considered during options appraisal to enable an understanding of impact of Sapperton Tunnel on the assessment. Options 2 and 3 performed similarly during options appraisal.

2.13 The STT project is designed to be a drought resilience scheme, meaning that it is not intended to be used as a 'everyday' source of water, instead it will be used when other sources are in stress or drought conditions. However, this may still mean that it is operated for significant durations of time when needed. This could mean STT operation affect navigation and canal usage for several months at a time through to longer periods of, for example, Spring and into Autumn and beyond in more severe droughts.

What we concluded in our assessment

2.14 Based on the assessment results the direct pipeline option was chosen as the preferred solution to deliver a 300 Ml/d water supply transfer for the following reasons:

- The option performs better overall in the qualitative assessments than the three alternative shortlisted options:
  - It was the best performing shortlist option against the nineteen qualitative environmental criteria considered. It has no major environmental constraints and fewer moderate constraints than other options. It scores more favourably in criteria relating to the impact of INNS from construction and operation of the option, and the amount of flood zones 2 and 3 impacted by the option. Whereas options that abstract from the River Severn at Gloucester Docks (Options 2 and 3) have been assessed, based on currently available information, as having a major environmental constraint relating to the potential impact on water flows and the geomorphology in the Eastern Channel of the River Severn.
  - It is assessed to have the highest water supply resilience as it has fewer assets in series, would be operated by a single entity and there would be minimal opportunity for public access to the transfer infrastructure making it less susceptible to vandalism, accidental damage and pollution incidents. In contrast options that use the Gloucester and Sharpness Canal will need coordination with other entities to successfully operate the scheme and options with open water transfer will have some publicly accessible infrastructure, including the main canal channel and lock bypass offtakes.
  - The direct pipeline option has a smaller construction footprint and hence was assessed to have a lower impact on existing biodiversity than options with canal elements (which are longer and have a wider construction corridor). However, options including canal elements performed better when considering potential water purification benefits (as the additional flow in the open canal and marginal wetland emerging habitats is expected to improve dilution and water quality).
  - It is acknowledged that the direct pipeline option provides less opportunity for enhancement of tourism and recreation, however it is noted that the shortlisted options that utilise the canal (Options 2, 3 and 4) would only deliver the canal restoration needed for transfer and therefore the opportunities for such enhancements

associated with these options are also limited. On this basis the assessment of this qualitative assessment does not change the overall conclusion that Option 1 performs better overall in the qualitative assessments than the three alternative shortlisted options.

- Option 1- the direct pipeline option, has the lowest capital and operating costs and the lowest Net Present Cost (i.e., the whole life cost added to monetised social, natural capital and carbon impacts and benefits) of the four shortlisted options:
  - There was a 24% and 25% difference between direct pipeline) Option 1 and Canal based Options (options 2 or 3 being the next lowest net present cost options).
  - The whole life carbon for the Option 2 was 9% higher than for Option 1 the direct pipeline option. Options 3 and 4 would result in higher carbon emissions.
  - The monetisation of benefits undertaken in the appraisal showed that, whilst the options involving the canal result in greater potential to deliver benefits, the additional whole life financial costs of the canal options are far higher than the monetised value of the benefits, and the 'additional' benefit to cost ratio of the canal options are significantly less than 1. The monetised assessment indicates that selecting an option that utilises sections of canal for water transfer (Options 2, 3 or 4) would not provide good value.
  - As discussed above the natural capital assessment indicates that Option 1 has the lowest pre-mitigation biodiversity impact. Consequently, it has a lower requirement for biodiversity net gain, which reduces the total natural capital monetised benefit that is achieved (and included in the Net Present Cost). Option 2 performs better in this respect; however, it does not impact the overall monetised assessment which finds that Option 1 has the lowest Net Present Cost.

2.15 In line with the Water Resources Planning Guidance (and as summarised above) the option appraisal considered a range of factors to identify the best value STT transfer solution for water company customers, the environment and overall society. Review of the Shortlist assessment indicates that on balance Option 1 performed better than the other shortlisted options across the criteria and would deliver the best value solution.

How we evaluated the Interconnector options

2.16 We devised a multi criteria assessment methodology that sought to identify a preferred solution that would be technically feasible and deliver best value to water company customers, where best value was considered to balance:

- Environmental and social impact
- Resilience
- Cost (including engineering risk and procurement / delivery complexity)
- Social and environmental benefits that would be delivered by the scheme

2.17 The appraisal methodology and criteria were selected to align with guidance and legislation, and enable appraisal of best value as defined above.

2.18 Guidance and legislation included:

- National Framework for Water Resources, including relevant guidance on SEA, HRA and WFD

- Water Resources Planning Guidance
- HM Treasury Green Book
- Draft National Policy Statement for Water Resources Infrastructure

2.19 Where possible, following HMT Green Book guidance, costs and benefits were monetised with other criteria assessed qualitatively supported by expert judgement.

Criteria	Quantitative (Monetised)	Qualitative
Financial	Capital and operational costs	
Carbon Impact	Capital and operational carbon costs	
Socio-economic costs and benefits	Recreational/ tourism wellbeing benefit Enhanced value for local residents Local economic benefit Negative impact on existing recreational sites	Additional tourism and recreation opportunities
Natural Capital	Climate regulations (carbon sequestration) Natural hazard regulation (flooding) Agriculture ecosystem services value	Biodiversity Water purification
Other Environmental Criteria		Nature conservation and biodiversity Land Use and Soil Water Air Quality Landscape Historic Environment Population and Human Health Tourism and Recreation Material Assets
Resilience		Reliability Adaptability Evolvability

Table App 1: Assessment Strategy for Shortlist Criteria

2.20 The monetisation of benefits has enabled the potential benefits of different options to be reported within a Net Present Cost assessment, where additional costs of options can be balanced against the potential benefits that could be realised.

How we challenged our conclusions (the validation stage)

2.21 As stated earlier, the initial assessment was undertaken to identify a preferred method of transferring water and therefore focused on the comparison of the assets required only for the water transfer. This did not consider benefits that could be achieved with an option that provided canal navigation.

2.22 Therefore, a subsequent study was undertaken, building on the work already completed and using the same assessment methods, identifying and assessing the additional benefits that could be achieved with the provision of a canal for navigation. This validation stage appraised different future scenarios including:

- The water transfer is constructed as a direct pipeline and the canal is (re)constructed for navigation by others
- The water transfer is constructed as per Option 2 with additional work undertaken by others to enable navigation
- The water transfer is constructed as per the Option 2 option with additional work also undertaken by the water company to enable navigation
- A higher flow rate is required (the canal elements can only carry up to 300Ml/d so this option looks at possibilities for providing higher flow rates).
- This helped to answer the following questions:
- If only a water transfer option is required, which scenario is preferred and why?
- If only a navigable canal is required, which scenario is preferred and why?
- If a water transfer and a navigable canal are required, which scenario is preferred?
- If a navigable canal is restored before the water supply transfer is developed, which scenario is preferred and why?

2.23 A review across all scenarios concluded that the best way to deliver both a water transfer and a navigable canal would be to separately deliver a water transfer pipeline and a navigable canal. This is irrespective of the size of the transfer required. The reasoning is explained below:

- This is the most cost effective way of delivering both objectives, and the assessment of carbon costs shows there is no significant advantage to combining the transfer and canal with navigation compared to having these occurring independently.
- This would enable the realisation of the benefits of both the pipeline for transfer in terms of operational simplicity and cost efficiencies, and the social and environmental benefits of the reinstatement of the canal for navigation, at the lowest total financial cost.
- It also provides flexibility to provide a water supply transfer with a capacity higher than 300 Ml/d.
- It would enable the canal to be constructed and operated for the sole benefit of providing a navigable waterway, avoiding the many drawbacks of a combined navigational and water transfer operation of a water transfer of this size.
- It provides better protection against the spread of INNS, with the higher volume water transfer flows treated and then contained within a pipe to prevent further contamination enroute to the River Thames.
- It enables more straightforward financing, operation and management, with both elements able to adopt the preferred methods for that asset type. For example, the water transfer

elements would be expected to be financed via the Direct Procurement for Customers route. It is uncertain the level of commercial interest that could be generated for the financing and operation of a more complex combined water transfer and canal for navigation.

- Delivering the two separately enables the goals of both water transfer and a canal for navigation to be met fully and effectively, with each project being designed and delivered for the end result in mind. A combined option requires significant compromise for both parties, with limits to boat use during transfer operations and added operational and water quality risk for water transfer.
- Furthermore, a direct pipeline is likely to be the only cost-effective solution for transfers larger than 300 Ml/d.

2.24 Many of the perceived efficiencies in combining the two purposes into a single combined water transfer and navigable waterway cannot be realised for the following reasons:

- Using the canal for water transfer significantly increases the total length of the transfer from circa 85km for a pipeline to circa 110km for a canal transfer, resulting in additional capital costs.
- The additional assets required to use the canal for transfer compared to reinstating the canal solely for navigation significantly increases the overall cost. These assets include: raising the banks along a stretch of the Gloucester & Sharpness (G&S) Canal, conventional water treatment and active monitoring of INNS in the Thames Canal, and sections of large diameter pipe to pump from the G&S canal to the canal summit pound and from the end of the canal at Lechlade to Culham for discharge into the River Thames.
- The benefit of using the canal route and Sapperton Tunnel to pass through the Cotswold Hills with a lower pumping head would not be realised as there are significant buildability constraints within the Stroud valley resulting in the need to re-route the canal bypass rising main over higher elevations.

2.25 These conclusions validated the selection of the preferred water supply solution identified at the shortlist stage, of a direct pipeline from the River Severn to the River Thames.

2.26 Having regard to the primary statutory purpose, namely the development and maintenance of a best value, efficient and economical system of water supply, it is considered that a direct pipeline remains the preferred option to convey flows from the River Severn to the River Thames.

What potential benefits from the provision of a navigable canal have been assessed and considered within our assessment

2.27 Dependent on the options, the following benefits were considered:

- New opportunities for water-based activities, such as canal boating, canoeing and angling
  - Numbers of boaters and anglers suggested by Cotswold Canals Trust have been used as a starting point and benchmarked against information for other UK canals. A wellbeing value has been calculated for participants based on publicised data including figures produced by the Department for Culture, Media and Sport.

  - By their nature, canoeing and kayaking are activities that are highly sensitive to displacement, i.e., people undertaking these activities are likely to travel to a number of different destinations to undertake them, and therefore, the net additional benefit due to the reconstructed canal from such users is likely to be low, so this is unlikely to be significant. Therefore, these activities have not been included
- Enhanced opportunities for land-based opportunities such as walking and cycling
  - The lengths of canal that would be constructed are in rural areas and are not identified as potential active travel routes, therefore, it is envisaged that most of the walking and cycling along the canal towpath would be as a leisure activity. The benefits to those walking along the canal have been excluded from assessment on the basis that it is considered highly likely that these benefits would be fully displaced, as there is an abundance of alternative scenic walking routes in this area that would accommodate the same people, including the Cotswold Canals Way which runs mainly along the route of the old canal, should they choose to walk in this area.
- Enhanced value for local residents
  - Alongside the other benefits assessed here, there are additional, less tangible benefits for those living in properties close to operational canals such as improved view and water side access. Properties also benefit from added industrial heritage interest and character. The value people place on these additional benefits was assessed by measuring the added premium that properties close to canals attract over similar properties at a distance from operational canals.
- Enhanced value to the wider community
  - The wider community can also benefit from additional, less tangible benefits from projects, or projects may be viewed by the community as having inherent, immeasurable value. The value the wider community place on this additional value can be measured by assessing their potential contribution to the project. This could include financial contributions or contributions of time by way of voluntary work. The Cotswold Canals Trust have indicated that reconstruction and rehabilitation of previous stretches of the Cotswold Canals have seen significant levels of volunteering. Therefore, the potential volunteering value was assessed in options that seek to provide a navigable canal[1].
- Increased employment opportunities from both tourism and operation of the water transfer
  - As detailed below, the analysis of wider economic benefits in this study have been considered at the national level. However, it is acknowledged that local benefits are likely to accrue from this project, particularly if it facilitates full restoration of the Cotswold Canals, and it is recognised that the scheme provides an opportunity to support restoration of an historic canal route.
- Any effects on existing recreational sites, both during construction and operation were also assessed.

2.28 Since STT is regarded as a part of nationally-coordinated investment in water infrastructure, an options appraisal approach based on national-level business case development was necessary in order to meet guidance for economic appraisals set out in the Treasury's (HMT) Green Book.

[1] Relevant to Validation Stage Options.

2.29 The Green Book advises the careful consideration of additionality, that is the total impact of an intervention that is directly attributable to it, excluding all effects that have been displaced from elsewhere, lost to beneficiaries outside of the study area or which would happen anyway, without the intervention being made. The level of the three measures of additionality - generally referred to as displacement, leakage and deadweight - vary between different scheme types and different locations.

2.30 Additionality is assessed within the study area. As this project is part of a regional and national seeking funding that is also available to projects across England and Wales, it is necessary to use this geography as the study area in order to assess the value of the Scheme. To focus only on the local area would present an inaccurate view of the value of this Scheme as it would not account for the economic activity lost from elsewhere which had been translated or displaced to this area as a result of this investment.

2.31 While the appraisal approach taken for this Scheme was appropriate for the intended purpose (i.e to inform national investment, determined by the regulator), a local level analysis has also been undertaken to review the potential scale of benefits to the local community. This excludes the gross level effects displaced from elsewhere in the country and focusses solely on the impact of the scheme on the Cotswolds area.

2.32 The assessment of localised economic benefits draws on case studies, highlighting the local benefits relating to the economy, nature and the built environment, local communities and improving people's lives. Sources of information for this review included the Inland Waterways Association Benefits Report 'Waterways for Today' (September 2022). While the review identified some localised economic benefits across the range of Scheme options, the preferred option for the Scheme still provides the lowest net present cost. Therefore, the inclusion of local economic benefits in the appraisal methodology – alongside all the other appraisal criteria - does not change the decision on the preferred option for the Scheme.

Consideration of financial benefits of the canal restoration

2.33 Many of the respondents supporting the canal restoration suggested the financial benefits of restoring the Cotswold Canals had been undervalued, highlighting d a range of studies that reported significant monetised benefits from the creation of canal networks.

2.34 Each of these studies reported positive, monetised benefits for the restoration and extensions of canals across England. Each of these studies focus their analysis on the local area around each canal, with benefits being derived from spending in the local economy, health, and environmental benefits.

2.35 Whilst the local impacts identified by CCT and others are likely to be significant to the local communities in which those studies are based, they are not directly transferable to this project or to an analysis that assesses impacts at the national level.

2.36 The levels of displacement that must be considered when undertaking assessments at the national level are significant. The benefits identified by CCT and others focus on the localised impacts of the intervention whilst the Interconnector Options Appraisal Report focuses on the national level impact so as to align with the scale of the project and the priorities for the project.

2.37 Throughout this analysis, it is important to note the following:

- None of the shortlisted water transfer options will restore navigation to the canal. Three Potential Futures Options (which were also assessed) will enable the canal to be used for navigation.
- The Cotswolds is currently an affluent area with little deprivation and a thriving visitor economy. Accordingly, comparisons with areas of high levels of deprivation and health inequality is difficult as the Cotswolds does not face the same challenges which the restoration of a canal can address.
- Health impacts reported in several studies highlighted by CCT relate to how the creation of a new towpath or the restoration of a defunct towpath can create a much-needed route for walking and cycling that can help address endemic health challenges within communities that are driven by inactivity. The analysis within these studies is based on areas of deprivation and health inequality where the restoration of a canal towpath can provide a route by which people can walk and cycle to work and gain much needed exercise to improve their health outcomes. The Cotswolds on the other hand, is famed for its numerous walking and cycling routes, its natural environment that enables walking and cycling and its relative affluence that is not readily associated with high levels of health inequality and inactivity. Whilst some people may be more inclined to walk and/or cycle along the restored towpaths, there is already a great number of paths and spaces in which people can walk and cycle without the towpaths being restored. This severely impacts the additionality of the impacts of restoration of the towpaths and as a result, it is not possible to accurately estimate the possible number of people who would increase their levels of activity solely as a result of the towpaths being restored. Accordingly, this impact has been excluded from the analysis and sensitivity testing below.

2.38 When these aspects and potential displacement are taken into consideration the level of benefits assessed on a national level within the Interconnector Options Appraisal are of a similar scale to those quoted. A sensitivity analysis was carried out to ascertain whether the inclusion of local benefits would change the conclusion that the direct pipeline option delivered a best value water transfer. This concluded that the inclusion of local benefits did not change the outcome of the appraisal.


Thames
Water