Thames Water

Revised draft Water Resources Management Plan 2019

Statement of Response No. 2

Main Report

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Glossary

Term	Description
Abstraction	The removal of water from the ground or rivers. Abstractions are licensed by the Environment Agency.
Business Plan	Business Plans are produced by water companies every 5 years. They set out their investment programme to ensure delivery of water and wastewater services to customers. These plans are drawn up through consultation with the regulators, stakeholders and customers and submitted to Ofwat for detailed scrutiny and review.
Customer Challenge Group (CCG)	An independent body that challenges both our current performance and our engagement with customers on building our future plans.
Department for Environment, Food and Rural Affairs (Defra)	UK government department responsible for safeguarding the natural environment, food and farming industry, and the rural economy.
Demand management	The implementation of policies or measures which aim to control or influence the consumption or waste of water (this definition can be applied at any point along the chain of supply).

Term	Description
Deployable Output (DO)	A measure of the available water resource during a drought year for a given level of service.
Economics of Balancing Supply and Demand (EBSD)	A method to assess the balance between a company's available water resource and the demand for water by customers. Any imbalance between supply and demand can be met either by demand management strategies, such as selective metering and leakage control, or by the provision of additional water resources.
Environment Agency (EA)	UK government agency whose principal aim is to protect and enhance the environment in England and Wales.
Group Against Reservoir Development (GARD)	A community organisation set up to oppose the development of a new reservoir near Abingdon.
Habitats Regulation Assessment (HRA)	Regulations to protect Natura 2000 sites (Special Areas of Conservation and Special Protection Areas) and Ramsar sites (wetland sites of international importance).
Historic England	A government department whose aim is to protect the historical environment of England by preserving and listing historic buildings and ancient monuments.
Innovative groundwater options	Innovative groundwater options include artificial recharge and aquifer storage and recovery schemes. These involve pumping water resources underground for use in dry periods. The approach is not widely used in the UK.
Interactive River and Aquifer Simulation (IRAS)	IRAS is a water resource simulation tool, based on water balance accounting principles that can test alternative sets of conditions of both supply and demand.
Leakage	Loss of water from water mains (including trunk mains, distribution mains and communication pipes), and customer pipes.
Leakage reduction	Controlling the loss of treated water through leaks in the distribution pipework, either by active leakage control or by replacing whole sections of pipe (mains replacement).
MaRIUS	Managing the Risks, Impacts and Uncertainties of drought and water scarcity. A NERC funded research project, to examine how best to manage future droughts by introducing a risk based approach to drought and water scarcity.
Natural capital accounting	The process of calculating the total stocks and flows of natural resources in a given system, either in terms of monetary value or in physical terms.
Natural England	An organisation sponsored by the Department for Environment, Food and Rural Affairs to protect the natural environment in England, helping to protect England's nature and landscapes.
Net gain	The overall improvement which is observed in a form of measurement, after all positive and negative influences have been fully accounted for.
Non-governmental organisation (NGO)	An organisation that operates independently of any government, typically one whose purpose is to address a social or political issue.
Ofwat	The regulatory body responsible for economic regulation of the privatised water and wastewater industry in England and Wales.
Per Capita Consumption (PCC)	The amount of water used per person per day. It is usually presented as litres/head/day (l/h/d).
Price Review	The process by which Ofwat set the price, investment and service package that customers receive.
Reuse	The use of treated wastewater as a source of potable supply.
Statement of Response (SoR)	A document produced in response to the public consultation on the draft WRMP. The document outlines the comments received to the public consultation and revisions to the draft WRMP as a result of these representations.
Strategic Environmental	A systematic decision support process to ensure that environmental and other sustainability aspects are considered effectively in policy, plan and programme making.

Term	Description
Assessment (SEA)	
Water transfer	The movement of water from one place to another through a variety of methods. These may include water pipes and aqueducts.
Water Available for Use (WAFU)	Deployable output – less any sustainability reductions – plus any bulk supply imports – less any bulk supply exports – less any reductions made for outage allowance.
Water Framework Directive (WFD)	EU legislation that requires all member states (including the UK) to take certain steps to protect and improve the quality and quantity of water within water bodies such as lakes and rivers.
Water Industry National Environmental Programme (WINEP)	Environmental improvement schemes that ensure that water companies meet European and national targets related to water. Developed and enforced by the EA.
Water Resources Management Plan (WRMP)	A statutory plan which sets out how a water company intends to provide a secure and sustainable supply of water to customers over at least a 25 year period.
Water Resources South East (WRSE) Group	A group of water companies and regulators working together to determine potential programmes of water resource options and water sharing opportunities in the south east of England.

Statement of Response No. 2

Main Report

A. Executive summary

Introduction

1. Water is essential for everyday life, it's also essential for the wellbeing of the environment and economic growth. We provide safe drinking water to around 10 million household customers and 215,000 businesses in London and across the Thames Valley. It's our job to ensure we can continue to provide a secure supply of safe drinking water for our customers now and in the future.

2. Many people think there is plenty of water in the UK but the South East of England is one of its driest regions and is designated by the Environment Agency (EA) as seriously water stressed. The pressure on our water supplies will increase in the future, with a growing population combined with changes to the climate and the need to protect the environment.

3. These pressures are not unique to our supply area, they are faced across the wider South East of England. We work closely with other water companies in the South East region, through the Water Resources in the South East (WRSE) group, to ensure we plan to secure water supplies for the whole region.

4. The consequences of not planning our future water supply properly are significant - for society, the economy and the environment. For example, the introduction of severe water use restrictions could result in supplies being cut off for part of the day or supplied at very low pressures, which would fundamentally transform everyday life. It would potentially force the closure of schools, and offices, as well as causing damage to wildlife, and costing the economy up to £330m a day in London alone.

Planning future water supply

5. We have a statutory duty to provide a secure supply of water for customers[1]. Every five years we are required to produce a Water Resources Management Plan (WRMP)[2], a strategic plan which sets out how we intend to maintain the balance between supply and demand of water for our customers. Government, and regulators, publish reference documents[3],[4] which provide a framework for the development of the WRMP. These set out the need to develop plans over

[1] Water Industry Act 1991, Section 37
[2] Water Industry Act 1991, Sections 37A to 37D (as amended by the Water Act 2003)
[3] Environment Agency and Natural Resources Wales, Water Resources Planning Guideline: Interim Update April 2017
[4] Defra, Guiding principles for water resources planning for water companies operating wholly or mainly in England, May 2016

a 25 year period as a minimum, with a longer time horizon where the planning problem is significant and complex.

6. Our Water Resources Management Plan 2019 (WRMP19) looks forward over the next 80 years, from 2020 to 2100. We took a long-term view in recognition of the scale and complexity of the challenges that we face. We designed our plan to satisfy three main objectives:

   - to provide a secure supply of water for our customers addressing the supply demand deficits that we forecast in our region;
   - to improve resilience to a severe drought; and
   - to look beyond the needs and opportunities of our supply area alone and take into account the growing needs of the wider South East of England.

7. We developed our plan based on the insights from customers, who confirmed they want us to build a resilient plan making sure there is enough water for future generations.

8. We also engaged with regulators and stakeholders throughout the development of our draft plan, we listened to their views and took account of their feedback in developing our plan.

9. We also worked collaboratively with water companies from across the South East of England, through the Water Resources in the South East (WRSE) group, to understand the challenges facing the whole region and to identify opportunities for shared solutions and ensure we plan to secure water supplies for the whole region.

Public consultation on our draft plan

10. In February 2018 we undertook a public consultation on our draft plan. We received over 540 representations. In October 2018 we published a report, called the Statement of Response No 1, which responded in detail to the representations received to the consultation. This is available on our website www.thameswater.co.uk/wrmp.

11. We made revisions to our draft plan in response to feedback received via the public consultation and new information. The main revisions to our draft plan were:

    - changes to the long-term population forecasts (from 2045 to 2100) using the latest information from the Office for National Statistics (ONS);
    - confirmation of our target to reduce leakage by 15% by 2025 and to halve leakage by 2050;
    - removal of Teddington direct river abstraction scheme in response to concerns raised by the EA. To compensate for the loss of this scheme the revised draft plan includes additional activity to manage demand and alternative new water resource schemes including groundwater development, Oxford Canal raw water transfer and a reuse plant at Deephams; and
    - advancement of the SESRO to 2037/38 to respond to the regional need for water, and joint promotion of the scheme with Affinity Water.

Further public consultation on our revised draft plan

12. In recognition of the changes that we had made to our draft plan we held a period of further consultation between 3 October and 28 November 2018 to provide an opportunity for stakeholders to comment on the changes.

13. We publicised the further consultation through a number of channels and sought feedback in writing (email, letter or feedback form) or via an online survey. Overall we received 751 representations, around half of the responses were written responses and half were via the online survey. In addition we undertook research with our customers and engaged with our online customer panel to seek the views of our representative customer base.

14. We have published this report, Statement of Response No 2 Main Report and supporting appendices, to formally respond to the further consultation. This report sets out the approach we took to the further consultation and an overview of the responses received (Sections B and C), the common issues raised and our consideration (Section D) and a summary of the changes we have made to our revised draft plan in response to feedback (Section E).

15. A summary of the representations received, presented by categories of stakeholders, is provided below.

- Representations from regulators and appointed bodies - These representations did not fundamentally challenge our proposed plan but raised specific comments such as the need to improve the transparency of the decision making process, the need for on-going studies on resource options, the ambition and delivery of the leakage reduction programme, and the adequacy of assessment and mitigation for designated sites and heritage assets. There was also wide support for greater collaboration between water companies.
- Representations from stakeholder organisations and individuals – The comments were wide ranging - Group Against Reservoir Development (GARD) submitted a lengthy representation, in excess of 200 pages, reinforcing a number of points they had raised in the preceding consultation. Their specific points included inflated population forecasts, over-stated climate change impact on available water resources, opportunities for further leakage reduction, a greater reduction in consumption and a call for the re-introduction of Teddington Direct River Abstraction scheme. Cotswold Canals Trust also submitted a substantial representation which set out its challenge to the preference for a pipeline for conveyance over the restored Cotswold Canals as part of the Severn-Thames Transfer (STT) scheme. Environmental, river and angling groups supported the development of new resources, specifically the South East Strategic Reservoir Option (SESRO), to help to reduce abstraction and thereby protect vulnerable watercourses.
- Representations via the online survey - The majority of the responses received via the online survey broadly fell into two camps – supporters of the restoration and use of the Cotswold Canals to support the STT or opponents of the proposed reservoir.

Summary of the common issues raised

16. A summary of the common issues raised is provided below. More detailed information on each of these issues, and our consideration of the points raised, is presented in Section D "common issues" of this report.

17. **Leakage -** Overall the higher leakage reduction targets were welcomed, particularly the new target for 2050. Opponents to the reservoir suggested that doing more to reduce leakage, along with other changes to the plan, could negate the need for a reservoir. Conversely a number of stakeholders expressed concern about the deliverability of the leakage targets and asked for reassurance, including a more detailed description of how we plan to achieve these targets.

18. **Managing demand for water** - Overall measures to manage demand were supported by customers and the majority supported an increase to the programme of activity. Some stakeholders recognised the risk from over reliance on these measures and stated that these measures would not provide the level of resilience that consumers expect from their water companies.

19. **Teddington Direct River Abstraction -** Some stakeholders were encouraged that we had taken on board comments about the potential negative environmental impacts and had removed the scheme from the draft plan. On the other hand, there was concern raised that a central element of the plan had been removed at a late stage in planning, and replaced with options on which there was less information. Opponents of the reservoir challenged why we had not done more to look into mitigation measures instead of removing the scheme from the plan.

20. **Deephams Water Reuse** - Respondents opposed to the reservoir called for consideration of more reuse plants. Other stakeholders mentioned possible negative impacts on the navigation and river ecology that need to be investigated. The EA raised concerns about the reduction in river flow and the environmental impacts on downstream habitats, and the need to consider alternative options if Deephams Reuse is not taken forward.

21. **Severn-Thames Transfer (STT)** - Respondents opposed to the reservoir called for consideration of more transfers and argued that the STT should not have been deferred. Supporters of the Cotswold Canals (local residents and canal users, and bodies with an interest in canals) set out their strong support for a transfer via Cotswold Canals, rather than a pipeline. Other stakeholders recognised the need for further investigations and partnership working to address issues of concern before the scheme could be implemented. Water transfer schemes had a mixed response from customers with common concerns being the security of water supply, potential environmental impacts and lack of control.

22. **Oxford Canal Transfer** - The EA raised concerns about the Oxford Canal-Cropredy transfer in terms of the reliability and environmental impact of the scheme and advised that these needed to be addressed to be confident that the scheme could be delivered.

23. **South East Strategic Reservoir Option (SESRO)** - There was strong local opposition to the reservoir and calls for a public inquiry from some local residents, parish councils in the vicinity of the reservoir, campaigning organisations and some local authorities. The main concerns

raised were the visual impact of the scheme, potential exacerbation of local flooding, environmental impact, close proximity to local villages and safety aspects. Affinity Water's involvement added to concerns, with respondents citing that Affinity Water's requirements are not confirmed and that we are aiming to profit from the development by selling water. A number of organisations and individuals expressed support for the reservoir and argued that it should be brought forward, in order to protect vulnerable chalk streams sooner and increase resilience. Feedback from our wider customer base indicated that the majority were in favour of the reservoir, with it being the preferred strategic option, and one in ten respondents questioning why the reservoir isn't in the plan until the 2030s.

24. **Justification of the preferred programme** - The EA raised a number of points in relation to the programme appraisal process[5], and the transparency of the narrative to explain the choice of the preferred programme. Several stakeholders highlighted uncertainties in the plan, mainly around (i) Affinity Water's requirements for the reservoir and (ii) options introduced or brought forward to replace Teddington DRA. Ofwat flagged the need to consider the sensitivities to different planning scenarios and the EA suggested the need for more adaptive planning to provide greater confidence.

25. Stakeholders were positive about our active involvement in regional planning through the Water Resources in the South East (WRSE) group and other mechanisms. They recognised the difficulty of regional planning because of the different timetables for the different water company plans, interdependencies between plans and the absence of a regional WRMP. They emphasised the need to continue to engage in regional planning, particularly over the reservoir and water transfers to achieve the optimum solution for the South East region.

A recap of our proposed plan

26. We have proposed a twin track approach, aiming to make the most effective use of the water resources that we have available, with a focus on leakage reduction and supporting our customers to use water efficiently through smart metering and innovative engagement, in combination with the development of new resources to ensure a secure water supply and environmental resilience.

27. Our revised programme up to 2030 proposes an increase in demand reduction, a water reuse scheme (Deephams 45 Ml/d), innovative groundwater development (approximately 30 Ml/d), a commercial trade with RWE Npower and a water transfer from the Canal and River Trust via the Oxford Canal (15 Ml/d). This programme will ensure enhanced resilience to severe drought from 2030.

28. In the longer term we will continue to reduce leakage and promote the efficient use of water as well as the development of a strategic water resource option. We have proposed the SESRO in 2037/38. We have completed detailed work to examine a range of options which has concluded that a new reservoir is the most cost effective strategic resource, as well as providing resilience to drought and opportunities for benefits to the local community and the environment. The reservoir could, with additional network connections, provide the water needed to reduce abstractions from vulnerable chalk streams and watercourses – putting

[5] Updated revised draft WRMP19 Technical Report - Section 10

natural capital into practice. Furthermore it is the option that is most preferred by our customers. The reservoir would be jointly promoted with Affinity Water and provide a storage and transfer hub for the wider South East region.

29. There has been much focus on building a regional or national network and using this to transfer water. We have looked at transfers of water from Wales, the Midlands and North West which form an integral part of the plan towards the end of the planning period.

Adaptive planning and further work

30. We have made some important additions to our revised draft plan including the development of an adaptive planning approach. This is in response to a recommendation from the EA and provides flexibility to adapt to changes and new information as they emerge across the long term planning period. Taking an adaptive approach ensures we can be confident that we can continue to provide a secure and sustainable supply of water in spite of the challenges of an ever-changing world.

31. The adaptive plan sets out our preferred programme of investment, as described above, and alternative programmes of options if further work determines that we should change our approach. This is presented in detail in the updated Section 10 of our revised draft plan.

32. We have committed to undertake further work to examine all the new water supply options that are outlined in our adaptive plan. This work will be undertaken in collaboration with other water companies, as appropriate, and with engagement with regulators and interested stakeholder organisations. It will be concluded by 2022 and the findings applied to our adaptive plan to understand if this results in changes to our preferred plan. This is presented in summary in detail in the updated Section 11 of the revised draft plan and the new Appendix XX.

33. We will continue to work closely with regulators and stakeholders as we undertake this work. We have published an outline monitoring plan in the updated Section 11 of the updated revised draft plan. We will review our plan annually, and publish an Annual Report, and will undertake a full and thorough review of our plan in 2023/24.

B. Introduction

35. Water is essential for everything we do at home and at work. It is also essential for a healthy environment and a prosperous economy. Thames Water, hereafter referred to as we or TW, provides a reliable supply of safe drinking water to around 10 million household customers and 215,000 businesses in London and across the Thames Valley.

36. Many people think that there is plenty of water in the UK but the South East of England is one of its driest regions and is classified by the EA as "seriously water stressed". Pressure on our water resources is already significant and in the future this pressure will increase with a growing population and less water available due to a changing climate and the need to protect the environment. We need to plan ahead to ensure we have a secure and sustainable water supply in the future.

Water resources planning

37. Water companies are required[6] to produce a Water Resources Management Plan (WRMP) every 5 years which sets out how the company plans to maintain the balance between supply and demand for water for a minimum planning period of 25 years, although companies with particularly complex planning problems are encouraged to take a longer term view. Government and regulators publish reference documents namely, the Guiding Principles[7] and Water Resources Planning Guideline (WRPG)[8], which provide a framework to guide water companies in the preparation of WRMPs.

38. We have developed our draft plan over an 80 year planning period, from 2020 to 2100. This is known as WRMP19. We have taken a long term perspective recognising the scale and complexity of the water resources challenge ahead and to ensure we can provide our customers with the best value over the long term. We have designed our plan to satisfy three main objectives:

- to provide a secure supply of water for our customers addressing the supply demand deficits that we forecast in our region;
- to improve resilience to a severe 1 in 200 year drought; and
- to look beyond the needs and opportunities of our supply area alone and take into account the needs of the wider south east of England.

Engagement and consultation

39. We recognise there is wide interest in water resources and over the past 5 years we have worked extensively with regulators and stakeholders as we developed our plan. This approach has provided stakeholders with the opportunity to understand and challenge our approach and decisions, and to input to the preparation of the plan in a timely manner. We

[6] Water Industry Act 1991, Sections 37A to 37D (as amended by the Water Act 2003)
[7] Defra, Guiding principles for water resources planning for water companies operating wholly or mainly in England, May 2016
[8] July 2018, Water Resources Planning Guideline: Interim Update.

have published the minutes from meetings in addition to presentations, papers and technical reports on a range of matters related to the plan. Further information on the engagement and consultation undertaken is presented in Appendix S: Stakeholder Engagement of the revised draft plan.

40. We also engaged with our customers as we developed our plan to ensure we understood their views and to make sure we reflected what they want now, and in the future. This is presented in Appendix T: Our customer priorities and preferences of the revised draft plan.

41. We published our draft plan for statutory public consultation on 9 February 2018. We promoted the consultation through a variety of channels to encourage stakeholders and customers to provide their feedback. The consultation closed on 29 April 2018. We received over 540 responses to the consultation, as well as feedback from customers via our online panel, interactive tool and bespoke research sessions.

42. We considered the feedback from the public consultation alongside new and updated information and on 3 October 2019 we published a report responding in detail to the responses we received to the consultation, called the Statement of Response No 1. In the report we set out the comments we received and how we had taken these into account in revising our draft plan. We also published our revised draft plan. We sent a website link to these documents to everyone who participated in the public consultation, notified all stakeholders we originally invited to participate in the consultation, and published the documents on our website www.thameswater.co.uk/wrmp.

43. On 3 October 2018 we started a further phase of consultation, to provide an opportunity for stakeholders to comment on the changes that we had made to our draft plan. The further phase of consultation lasted for 8 weeks and closed on 28 November 2018.

Purpose of this report

44. The purpose of this report, Statement of Response No 2, is to set out the comments received in response to the further public consultation, explain the consideration given to the points made, and how these have been taken into account, alongside new information, in making further changes to our revised draft plan. This report has been sent to everyone who participated in this phase of further consultation and it has also published on our website www.thameswater.co.uk/wrmp. We held a stakeholder meeting in March 2019 to disseminate the main points arising in the further consultation and action we had taken to respond.

C. Overview of the further consultation

45. In recognition of the changes that were made to the draft plan we undertook a period of further public consultation for 8 weeks from 3 October to 28 November 2018. The purpose of the further consultation was to provide an opportunity for stakeholders and customers to comment on the revisions that we had made to our draft plan. This approach was applauded by a number of stakeholders including the Vale of White Horse District Council and Group Against Reservoir Development (GARD).

46. We worked closely with Community Research, an independent consultancy specialising in research and consultation, to design and undertake this stage of the consultation. We have published Community Research's independent report on the further consultation on our website[9].

47. We also engaged with our Customer Challenge Group, an independent body whose members include regulators, representatives from business, local government and organisations including the Consumer Council for Water, whose role is to ensure the views of our customers' are properly considered and reflected in our future plans.

Approach and documentation

48. We wrote to stakeholders and published details about the further public consultation and how to participate on our website www.thameswater.co.uk/wrmp.

49. We published a suite of documents on our website www.thameswater.co.uk/wrmp and made paper copies available to view throughout the consultation period, by appointment, at our offices in Reading. We also made copies of supporting technical documents that we could not publish on our website due to national security restrictions, available to view at our offices.

50. The documents were prepared in a tiered approach, with increasing technical content, to ensure that they were accessible to a wide audience, from the less technical reader to water resources specialists. The tiered documents produced included:

- An Overview document – This provided a summary of the feedback received in the first phase of the public consultation and the changes made to our draft plan in response to the feedback and new information. The front cover and an illustration from this document is shown in Figure 1.

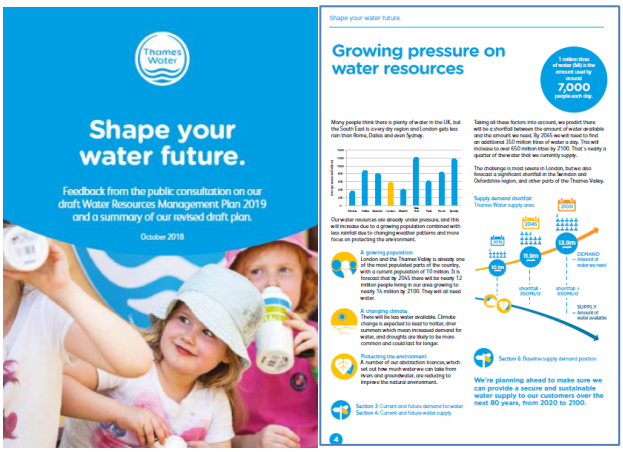


Figure 1: Front cover and illustration from the Overview document

- The Statement of Response (SoR) No 1 – This provided information on the consultation process, the responses received, the main issues raised in the consultation, our consideration of them and the changes made to the draft plan, both as a result of feedback, and new information. The SoR included a number of

[9] Community Research, Shape your water future: revised draft WRMP19 Report on the consultation response, January 2019 available on www.thameswater.co.uk/wrmp

appendices which provided the full representations received to the public consultation and our detailed consideration of the points raised.

- A technical executive summary of the revised draft plan – This provided a technical summary of each of the sections of the revised draft plan with signposts to relevant sections of the detailed technical documentation to enable the reader to navigate to the relevant section to read more about a particular topic.
- The revised draft technical report which comprised 11 sections and 26 appendices.
- Supporting technical reports, these included new and updated Methodology Reports and Option Feasibility Reports.

Promotion

51. The further consultation was promoted, and stakeholders and customers were encouraged to give their views on the revised draft plan, through a variety of channels including the following:

- Email communication - On 3 October we sent an email to over 1,000 stakeholders and interested parties, including all statutory consultees, third party organisations, retailers, developers and stakeholder organisations who had participated in our water resources stakeholder fora and stakeholders who had participated in the public consultation on the draft plan to advise them of the further consultation. We provided a web link, details of how to participate in the further public consultation and an electronic copy of the Overview document. Annex 1 is a list of all stakeholder organisations to whom the email was sent and Annex 2 provides the email.
- Water Resources Forum (WRF) - Ahead of the further consultation we held a WRF (August 2018). We invited Affinity Water to join the WRF who presented an overview of their draft plan and the next stages in the process to finalise their plan. During the consultation we offered to host a further WRF, however this received a low uptake and instead we held one-to-one meetings with organisations on request.
- Annual Stakeholder Review (ASR) - We held the ASR (November 2018) which was attended by a large number of stakeholders and included a break out session on water resources.
- Meetings with stakeholder organisations - We highlighted the further consultation as part of dialogue with stakeholders at regular meetings. We held a number of meetings with interested stakeholders to discuss topics of specific interest to them such as Wilts and Berks Canal Trust, East and West Hanney Parish Council and Historic England.
- Meetings with regulators and other water companies - We held meetings with regulators and other water companies both individually and through Water Resources in the South East (WRSE) group and participated in other regional planning meetings.
- Drop-in event in Steventon in Oxfordshire (October 2018) - We had previously held community meetings close to the vicinity of the proposed reservoir and as such we held a further drop-in event to provide an update to the local community and the opportunity for discussion. Over 100 people attended. Technical experts from Thames Water, including planning consultants, engineers and water resources

specialists attended the events to ensure we could address questions and concerns as fully as possible at the time.

- Information was published on the homepage of the main TW website www.thameswater.co.uk.

Feedback channels

52. Consultees were able to make representations through a range of channels:

- Online survey - Respondents could submit an online response via a Citizen Space hosted website, hyperlinked from the Thames Water website www.thameswater.co.uk/wrmp. This was an open access survey and we set out 4 consultation questions, respondents could choose which questions to answer.
- Email or post - Respondents could send feedback via email or post to Defra, and were asked to copy their responses to Thames Water, the EA and Ofwat. Some respondents submitted responses to Defra only, others to Thames Water only, others to the EA only and others to all the organisations listed. These responses were freeform responses in that they did not respond to specific consultation questions. Thames Water collated all the responses received and shared these with the EA.
- Paper feedback form - Respondents could fill in a hard copy feedback form (which had the same questions as the online survey). A pre-paid envelope was provided with the feedback form.

53. An independent research agency, Community Research, which specialises in public consultation assisted in designing the consultation questions, to ensure we adhered to good consultation practice. This involved making sure the questions were clear and unambiguous, ensuring customers had sufficient information in order to provide an informed response, that the questions were neutrally worded and balanced. All questions were optional, meaning that respondents could provide a response to a question on a particular topic without having to provide a view on any others. The consultation questions are provided in Annex 3. Community Research also worked with us to ensure the approach we adopted to the public consultation, the materials published, and the analysis undertaken were robust and fair; and they have published a separate report[10] on the consultation exercise.

Stakeholder feedback

54. In total we received over 750 representations to the further public consultation. The total number received online and via a feedback form, letter or email, is shown in Table 1.

55. A list of stakeholder organisations who responded to the consultation (through any channel) is provided in Appendix B. A list of individuals who responded has not been provided in line with data protection and privacy requirements.

[10] Community Research, Shape your water future: revised draft WRMP19 Report on the consultation response, January 2019 available on www.thameswater.co.uk/wrmp

Table 1: Number of representations received to the further public consultation

Channel	Number of responses
Email or post	367 (85 written and 282 email responses)
Online	384

56. Table 2 shows the breakdown of respondents who submitted a response either by letter or email to the consultation by sector. A large number of the responses received focused on one of 2 topics, local opposition to the proposed reservoir and support for the transfer of water from the River Severn to the River Thames via the restored Cotswold Canals.

Table 2: Representations by sector

Written or email response by stakeholder type	Number of responses
Individual	328
Charity/campaign organisation	12
Local authority	15
Industry/landowner	2
Regulator or appointed organisation	5
Water company	1
Other	4
Total	**367**

57. The online survey responses were dominated by respondents with an Oxfordshire postcode – nearly nine in ten were from Oxfordshire and almost three-quarters had a postcode starting OX12, OX13 or OX14, as shown in Table 3. These postcodes are mainly located in the Vale of White Horse and South Oxfordshire District Council areas and include the towns of Wantage and Abingdon and surrounding villages.

Table 3: Online survey – geographic location

Online community – geographic location	Number of responses
All Oxfordshire	317
• OX11	11
• OX12	91
• OX13	108
• OX14	72
• Other Oxfordshire postcodes	35
Other areas	45
Not stated	22
Total	**384**

Customer feedback

58. Feedback from customers relevant to the consultation was also received through research and engagement activities conducted during the consultation period. This included customer workshops and feedback from Thames Water's online customer community. Table 4 shows the number of responses from the online community and customer workshops.

Table 4: Responses via customer research

Channel	Number of responses/participants
Online customer community	195 responses
Workshops (4)	69 participants

Online customer community

59. Online community members are participants who had previously taken part in research and engagement activities conducted by Thames Water and had expressed a willingness to continue giving their views via an online forum. They were, therefore, more informed about water issues and Thames Water than typical customers. The majority of online community respondents were household customers and just over half were based in London. These participants completed a version of the online survey. Community Research analysed the feedback received from online community participants[11].

Customer workshops

60. Four workshops of household customers were conducted in areas which will potentially be affected by the plan – Abingdon, Lechlade and north London; with an additional 'control' session run in Guildford. Each session lasted three hours and the total number of attendees was 69 household customers. The customers were recruited to ensure a broadly representative spread of lifestages and demographics. Members of campaigning organisations were specifically excluded in order to explore the views of the 'silent majority', i.e. those who had not already submitted a response to the consultation and / or those who were not members of campaigning organisations (either in favour or opposing proposals in the draft WRMP). Community Research analysed the feedback received from customer workshops[12].

Analysis of responses

61. As outlined above, we have received feedback from a number of channels. It is not appropriate to analyse all the feedback in the same way, as such we have separated feedback to the consultation (proactive feedback) from feedback from customers.

[11] Community Research, Online community Report on the further consultation on the rdWRMP19, December 2018
[12] Community Research, Customer Workshop Report on the further consultation on the rdWRMP19, December 2018

62. Section D of this report provides an overview of the common issues raised in the consultation and our consideration of the points, and the appendices A-J provide detailed responses to the points raised by organisations and individuals.

Stakeholders

63. Feedback to the open access consultation, i.e. in writing or via the online survey, was self-selecting, any individual or organisation can submit their views and those who have an interest in (and who have the capacity to respond) are more likely to participate in a consultation than those who do not. As such public consultations by their very nature, are not necessarily representative of the general population. For this reason, the approach to consultation analysis tends to be qualitative rather than quantitative – we are interested in the range of views held and who said what, rather than focusing on the number of responses.

64. All email and written freeform responses to the consultation were systematically logged and coded using an agreed code frame, which corresponded to the sections in the revised draft plan technical report.

65. Responses to the online survey and via the feedback form were also coded, using a code frame developed for each question and based on the responses received. In terms of the survey responses, it should be noted that not all respondents answered every question and not all responses related to the question asked. Some responses related to other consultation questions and some to issues not explicitly raised in the consultation.

66. The coding was completed by Community Research and reviewed by Thames Water.

67. Respondents' views on specific issues were often linked to their other views – for example, those opposing the Abingdon Reservoir called for other options to be considered, particularly for more concerted action on leakage and for the water transfer to be advanced as it was considered that these would obviate the need for the reservoir.

Customers

68. In view of the selective nature of the public consultation, as explained above, the views of our wider customer base were actively sought through two research approaches - online community and research workshops, in order that the views of Thames Water's representative customer base could be captured. Feedback received via these routes has been analysed separately.

D. Common issues

69. In this section we have addressed the common issues that were raised in the public consultation. A common issue is defined as those points that have been raised by multiple respondents.

70. For each common issue we have included a summary of the views of stakeholders and individuals who submitted a freeform response and online responses as well reflecting the views of our customers, where the topic or issue was specifically discussed with them. We have then set out our consideration of the issue and explained the changes that have been made to the revised draft plan in response, where appropriate.

71. As well as raising common issues a number of respondents also raised specific points, these are not included here but in the relevant appendix to the Main Report.

72. The common issues raised were:

- Leakage reduction
- Managing demand for water - metering and water efficiency
- Teddington Direct River Abstraction
- Deephams Water Reuse
- Water Transfers - Severn-Thames Transfer (STT)
- Water Transfers - Oxford Canal
- Abstraction and protecting vulnerable watercourses
- South East Strategic Reservoir Option (SESRO)
- Deciding on the preferred plan

Leakage reduction

Consultee issues – headline points

73. There were a large number of comments made in relation to the revised targets to reduce leakage over the next 5 years to 2025, and in the longer term to 2050. The majority of comments focused on the scale and timing of the targets, and the approaches and technology that would be used to ensure the targets would be successfully achieved.

Stakeholder organisations

74. Stakeholder organisations who commented included regulators (EA and Ofwat), elected and local authorities (London Assembly, Oxfordshire County Council, South Oxfordshire District Council, Vale of the White Horse District Council, West Hendred Parish Council) and environmental organisations (Berks Bucks & Oxon Wildlife Trust (BBOWT) and South East Rivers Trust).

75. Several stakeholders expressed support for the revised leakage targets, with the longer term target to 2050 the most frequently mentioned, but some stakeholders also expressed support for the 2025 target. One respondent, Oxfordshire County Council, proposed that TW should outline further reduction in leakage beyond 2050, particularly as the revised draft WRMP19 extends to 2100.

76. There were a number of comments around confidence in achieving the targets, particularly considering the difficulties in meeting current leakage reduction targets, and the consequences of not meeting the targets in terms of the security of water supply and environmental impact. Stakeholders sought reassurance, including more detailed description of how TW plans to achieve the targets, and contingency plans should the targets not be achieved.

"Given the challenges the company has faced in achieving its 2015-2020 (AMP6) leakage targets, it does raise concerns over the achievability of these longer term commitments unless there is a significant step change in this area of activity and performance which is yet to materialize." (Consumer Council for Water)

"The 2050 target is very much an aspiration with very little detail behind it… Fleshing out such thinking should very much be a priority." (CCG)

77. In spite of some concerns about deliverability, no respondents suggested that TW should reduce the targets. However CCWater did raise concern about over-reliance on demand management activity and the London Assembly suggested the need for additional interim targets to help to ensure performance was on track.

78. There were a few comments calling for greater ambition in respect of leakage reduction, as summarised in Table 5.

Table 5: Leakage - Summary of the main reasons calling for greater ambition

Comment	Reason for wanting greater ambition
Short term target is too low	South East Rivers Trust welcomed the 2050 target but argued that the 2025 target is too low as more needs to be done sooner to protect chalk streams.

	Opponents of the reservoir suggested that doing more to reduce leakage, along with other changes to the plan, could negate the need for a reservoir. While GARD was critical of both short and long term targets, other opponents focused on the short term.
Both targets are too low	CCG pointed out that both the short term and long term targets are below customers' acceptable level of leakage i.e.14–15% of total water into supply lost through leakage.
Timescale not specified	GARD highlighted that TW's proposals on leakage reduction would still leave it lagging behind most of the other water companies (*"at the top end of water company leakage rates"*). London Assembly pointed out that the metering programme would help identify leaks more effectively and therefore believed that TW could and should set higher targets for leakage reduction. Wycombe District Council argued that a step change is needed in TW's approach to leakage, instead of the current targets.

Online survey

79. Around one quarter of those who responded were broadly positive about the focus on leakage.

80. Around half the respondents called for more ambition in terms of higher targets and achieving the targets more quickly. Around a quarter of those who commented specifically linked comments on leakage to their opposition of the reservoir and suggested that tackling leakage more aggressively would obviate the need for a new reservoir.

"It is absolutely unacceptable to have a target of 15% for leakage reduction by 2025. I understand that if you fixed 70-80% of the leakage there would be no requirement for an expensive and disruptive project to build a new reservoir that does not even benefit the communities that will be impacted by the project." (Household customer, OX13)

Customer feedback

81. Around two thirds of the online customer community indicated that they were happy with the revised proposals for leakage reduction. It was highlighted that fixing leaks sends the right message that TW is serious about its long term aspirations and sets a good example to customers about water efficiency. A small number of respondents referenced the economic level of leakage as a rationale for their positivity about the targets and a number also commented that targets need to be deliverable and realistic.

> *"I think this is a positive and ambitious statement, I am somewhat concerned about the disruption (especially to roads) that these works will cause but I am 100% behind the scheme as I believe it is imperative for the continuing success of London." (Online community, household customer, Outer London)*

82. Around one quarter of the online community felt that the targets should be more ambitious, and a number of respondents suggested that they should be achieved more quickly.

"While I welcome a commitment to reduce leakage, a target of 15% seems very low. I'm sure it's a complicated and complex issue but I would welcome much more ambitious targets. 25% of water lost in the network sounds like a lot so I would like to see much more ambitious targets set - 2050 is 32 years away, and the general landscape is going to look very different by then in terms of population, demand for water etc." (Online community, household customer, Inner London)

83. In the research workshops repairing pipes and thereby reducing leakage was of prime importance for most participants. The majority of participants felt that more could, and should, be done to reduce the current level of leakage, and furthermore that plans to reduce leakage should be done more quickly than proposed in the revised draft plan.

"15% is not ambitious enough. They don't seem to have the vision – they should be aiming for 50% in the next 5 years." (Guildford)

84. A small number of participants thought that the targets were realistic and they cited affordability, congestion and deliverability as the basis for their view.

"I agree it's a low percentage but I'd rather it be lower and not cost me as much than it be higher and me have to pay extra, like more on top of my bill. I think the amount we pay on the wastage is extremely high; it's practically the same amount as what they charge for the water. So I agree it's low, there probably is more that could be done about it but I don't want to pay for it basically." (Lechlade)

Our consideration

Introduction

85. We have over 31,000 km of underground water pipes which move water around London and the Thames Valley and a further 13,000 km of smaller pipes, called communication pipes, which are connected to our customers' properties. In addition, our customers have an estimated further 32,000 km of pipes which take water into their home or business. A lot of our water pipes are old, many being laid in the Victorian period.

86. A pipe network of this scale and age will always have cracks and fractures and therefore leak. Currently we lose around 25 per cent of the water that we put into supply. This includes water lost from our pipe network, from our customers' supply pipes and private supply networks connected to our network.

87. We are committed to reduce the amount of water we lose through leaks from our pipes. We have been working to reduce the amount of water lost from our pipes since early 2000s and have achieved approximately 30% reduction in leakage since this time. Most of this reduction was achieved through a large water mains replacement and pressure management programme.

88. In line with the preferences of our customers and stakeholders we have set ambitious targets to reduce leakage.

Our current leakage reduction plan

89. Our current leakage reduction plan, agreed with our economic regulator, Ofwat, as part of our Price Review in 2014, set out to reduce leakage to 606 Ml/d (annual average) by March 2020.

90. In 2016/17 we missed our leakage target for the first time in 11 years. We paid a £120m financial penalty for failing the target and we committed to a legal undertaking with Ofwat. We implemented a leakage recovery plan to get us back on track. This includes changes to commercial contracts to drive the right performance, an increase in our field staff to repair leaks, and technology improvements such as the installation of a larger number of acoustic loggers.

91. We provide regular performance updates to Ofwat and our Customer Challenge Group. We also publish a monthly report for customers to provide an update on the targets, performance, number of leaks fixed and leakage reduction activities (https://www.thameswater.co.uk/help-and-advice/leaks/our-leakage-performance).

92. It sounds simple to mend pipes and reduce the amount of water lost through leakage. Before we consider reducing leakage, we need to achieve at least 34Ml/d per year, or 1,600Ml/d per AMP (2020-2025) to just stand still. The size, age, corrosivity of the soil and congestion in London makes this quite a complex activity. Since we missed our leakage target in 2016/17 we have increased our focus and expenditure on leakage, however despite concerted effort, the amount of water that is lost through leakage is not reducing as we had planned. The extreme weather events in 2018 proved to be a significantly more challenging environment to operate in than expected, which caused an estimated 30Ml/d impact on our leakage position.

93. Based on the current level of leakage we are concerned that we will not achieve our regulatory target of 606 Ml/d by March 2020. We will continue our efforts to achieve this target but based on the current position we are presenting a revised forecast of 636 Ml/d in 2020, which takes account of the 2018 weather impact. In our updated revised draft WRMP19 we have made a minor change to our baseline data[13] to reflect this.

94. Whilst this is very disappointing it does not mean that we are moving away from the targets we set ourselves in 2025 and 2050. We will increase our efforts further to reduce leakage and achieve the 15% reduction target (from current 2020 regulatory target) by 2025 and the 50% reduction in leakage by 2050. These are ambitious targets and the scale of reduction is much greater than we have ever achieved in the past.

Defining short-term and long-term leakage reduction targets

95. Our leakage reduction targets, a 15% reduction from our 2020 forecast target achieved by 2025 and 50% reduction by 2050, are ambitious; we set these targets in response to customer feedback and policy aspirations from stakeholders[14].

96. In developing our draft plan we tested a wide range of demand management options, including leakage reduction options, and using advanced modelling tools we developed over 80 feasible programmes of leakage and demand reduction activity. The programmes were

[13] We have updated our leakage performance and forecasts to 2025 in the data tables (Appendix A) and performance update (Section 2) and baseline supply demand position (Section 6)
[14] Ofwat, Delivering water 2020: Consulting on our methodology for the 2019 Price Review, July 2017" and National Infrastructure Commission, Preparing for a drier future: England's water infrastructure needs, 2018

developed based on actual performance data from our leakage, metering and water efficiency programmes. This is presented in Section 8 of our revised draft plan and associated appendices. This work confirmed that whilst the proposed 2025 and 2050 leakage reduction targets were ambitious, going beyond the Sustainable Economic Level of Leakage, they are deliverable hence we took them forward in our plan.

97. We did consider if we could go further than these targets. However when we compared customer feedback for leakage reduction versus the cost of achieving further reduction, and the consequential impact on customers' bills, we concluded that our proposed target is at the limit of what customers are willing to pay for. We will nevertheless continue to review this matter as technology is enhanced and more cost effective technologies are developed, and as part of our next plan, WRMP24.

Confidence in delivery of targets

98. We recognise there is concern that we will not be able to achieve our targets based on our current performance. We understand these concerns, and whilst we are committed to achieve these reductions we concur that it is prudent to have contingency plans in place.

99. Firstly, we have included a buffer for under-delivery as part of a planning uncertainty allowance called headroom, the approach and methodology we have applied is in line with the government planning guideline.

100. Secondly, in the short-term our plan includes more demand management activity than strictly required to meet the supply demand deficit which provides some surplus, and in the medium-term the development of new water resources, namely reuse in 2030 and a new reservoir from 2037/38, will provide surplus capacity in the early years, post development of the resource, until the resource is fully allocated.

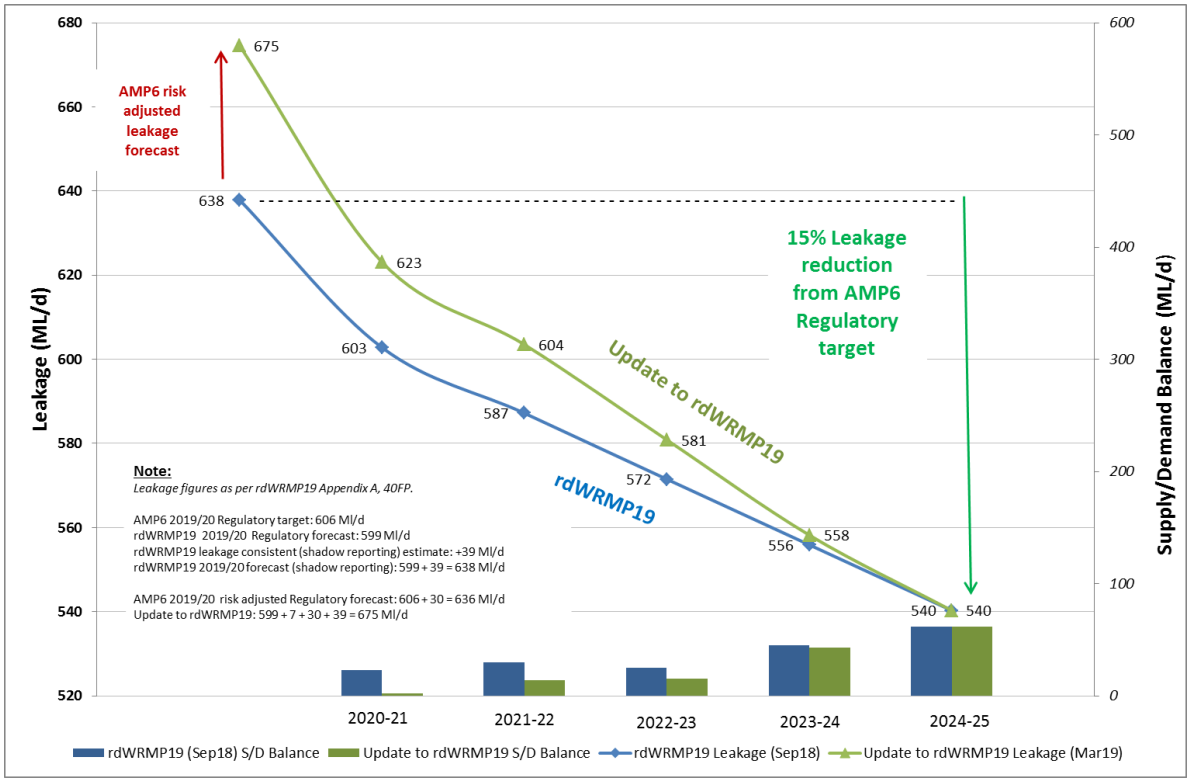
101. Thirdly, we do have additional small groundwater options and Didcot, which we can deliver in the event that we are not able to reduce leakage to the extent that we have planned, or demand reduction measures such as metering do not deliver the water resource benefit that we forecast.

102. The contingency provided through these routes gives us confidence that we have a sufficient buffer to mitigate any under-performance on leakage or demand reduction.

103. We also have a strong reputational and financial incentive to achieve our leakage reduction targets. In our PR19 business plan we have included a performance measure, with an associated financial penalty/reward, called an Operational Delivery Incentive (ODI) for leakage in AMP7. This is a significant incentive for the company to continue to focus and sustain its efforts to achieve the leakage reduction targets.

104. Figure 2 illustrates our revised leakage reduction forecast and the progress to develop additional resource capacity by 2030.

Figure 2: Leakage reduction forecast to 2025



105. We provide regular updates on leakage performance. We publish a monthly report on our website for customers to provide an update on the targets, performance, number of leaks fixed and leakage reduction activities (https://www.thameswater.co.uk/help-and-advice/leaks/our-leakage-performance). We also provide an annual progress report to the EA setting out our performance against our supply and demand commitments which we publish on our website www.thameswater.co.uk/wrmp.

How will we achieve the targets?

106. We have planned an integrated programme to achieve these targets as shown in Figure 2. There are two main strands to the programme:

- **Customer side leakage** - this currently accounts for around 28% of total leakage. We will continue to roll out the progressive metering programme, and the installation of bulk meters on blocks of flats, this will improve our ability to pinpoint and target leakage, and wastage, on customers' pipes and at their properties.
- **Network enhancement** - Our network is organised into sub-areas, called District Meter Areas (DMAs), we have around 1,700 DMAs in our area. Through the use of monitoring equipment, including acoustic loggers and smart meters at customers' homes, and smart data, we can improve our understanding of the amount of water provided, the movement of water and the amount of water used, therefore helping to target leakage and high usage. This is illustrated in Figure 3 and
- Figure 4 shows a breakdown of our planned programme of activity.

Figure 3: Using improved data analytics to target leakage

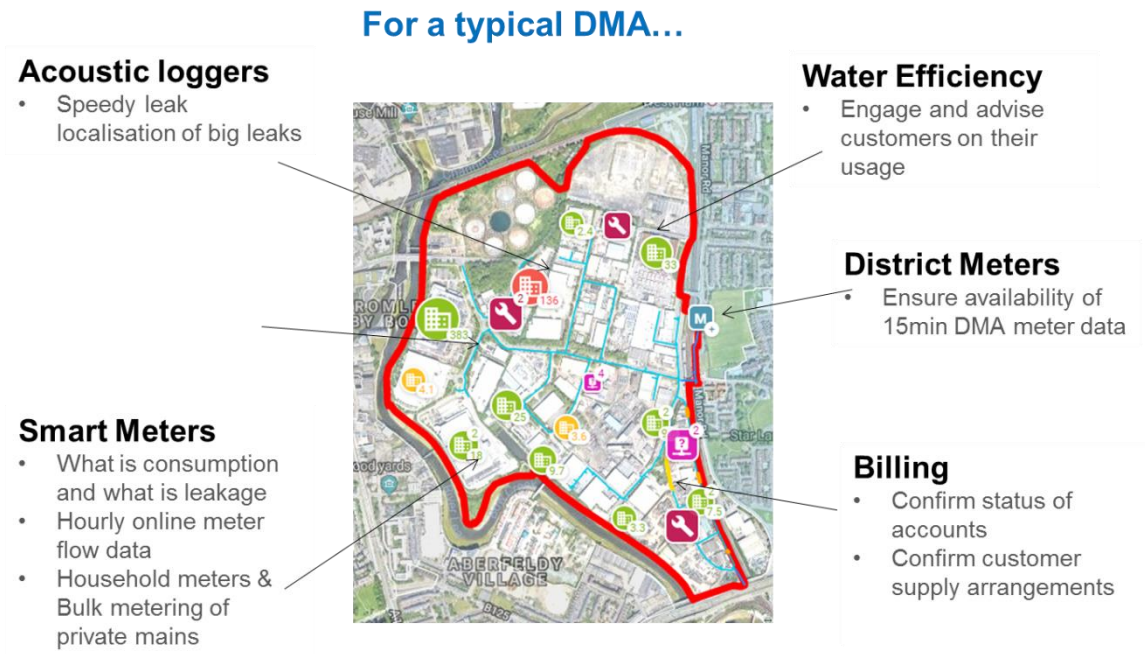
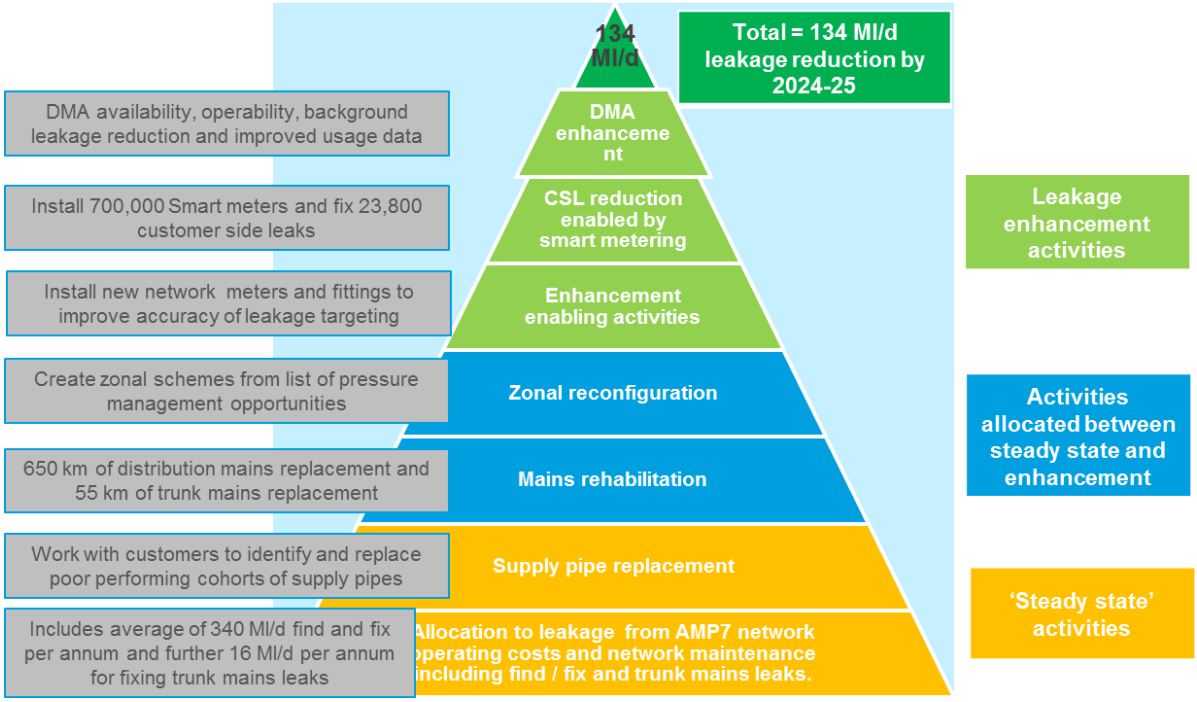


Figure 4: Achieving our leakage reduction plan 2020 – 2025

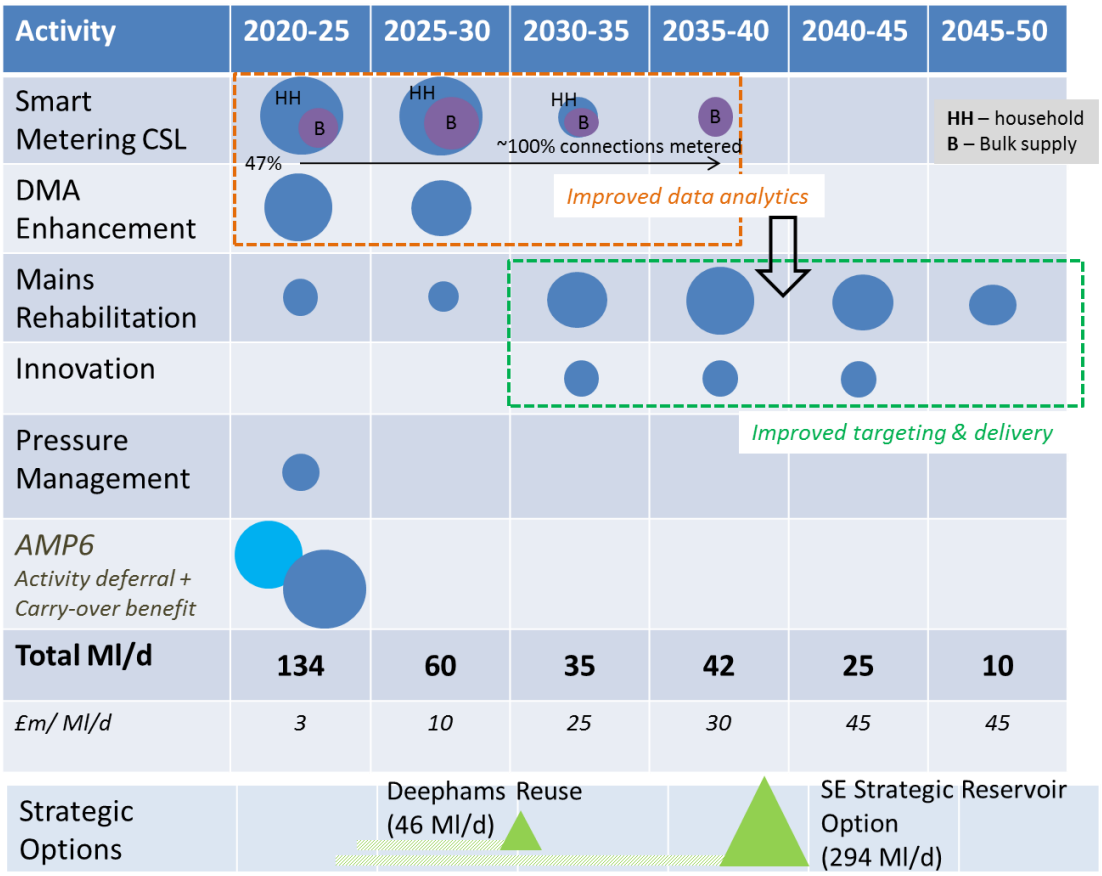


107. In the short term we will achieve the targets through the use of smart data from network meters, acoustic loggers and household meters which will enable us to accurately target wastage, leakage on customer's pipes, and improve the efficiency of our find and fix programme.

108. In the longer term, after we have completed the roll-out of smart metering of all the connections from our network, we will need to undertake more mains rehabilitation to reduce leakage further. Mains rehabilitation is a sustainable solution to reduce leakage, bursts, interruptions to supply and improve water quality, but it is significantly more costly than other interventions. Our long-term enhanced leakage plan is illustrated in Figure 5.

109. The longer term plan goes beyond the Sustainable Economic Level of Demand Management (SELDM) to halve leakage by 2050 which delivers a performance similar to other water companies. We will continue to develop more innovative interventions to reduce longer term costs, including for less disruptive mains rehabilitation techniques.

Figure 5: Long-term enhanced leakage plan



Targets beyond 2050

110. We have not developed leakage reduction targets beyond 2050 but expect to continue a programme of leakage management, both in terms of maintenance and reduction, as a foundation to making the most effective use of water resources.

111. We will continue to develop our approach integrating learning from our current programme of activity and the opportunities afforded by technological innovation.

112. Any leakage reduction beyond 2050 will not affect the key decision pathways on the strategic options in our preferred plan.

Changes to our revised draft plan

113. We have taken account of our current leakage performance and adjusted our leakage reduction profile in our revised draft plan to accommodate the higher leakage level forecast in 2020 of 636 Ml/d. However we have retained the 15% leakage reduction target by 2025 (from our 2020 regulatory target) so will still achieve the same planned leakage reduction overall. Relevant changes have been made in Section 2, Section 6 and Appendix A of the updated revised draft plan.[15]

Managing demand for water

Consultee issues – headline points

114. Overall there was broad support for measures to manage demand for water such as the installation of smart meters and the promotion of the efficient use of water. Some respondents raised concern about the consequences of over-reliance on demand management. A few stakeholders, mainly opposed to the reservoir, voiced their opinion that further action on demand management could obviate the need for the reservoir.

Stakeholder organisations and online survey

115. Stakeholders generally welcomed the focus on managing demand for water. A few stakeholders, including the EA and Ofwat, made positive comments about the more ambitious targets for demand management set out in the revised draft WRMP19.

> *"We welcome proposals to reduce demand for water and that these promote water efficiency messages and advice alongside metering" (BBOWT)*

116. There were two main challenges to the targets for water efficiency and metering, these echoed the challenges raised in respect of the leakage targets; firstly, around the confidence that the targets can be achieved particularly in respect of behaviour change and secondly, requesting further details about the means by which TW intends to achieve the targets to provide reassurance around deliverability. Stakeholders highlighted the consequences of not

[15] Specific changes to our revised draft WRMP19 have been set out in the Technical Update Note published on www.thameswater.co.uk/wrmp

achieving the targets in terms of the security of public water supply and the impact on the environment.

"The CCG would stress that success in meeting targets will require profound behavioural change by customers of all types, and as yet the CCG has little feel for what the underpinning plans would be to effect such change, beyond the metering and smart homes programmes, the former of which has disappointed to date in terms of the speed and reach of its roll out. Putting this degree of emphasis on activities which require such a marked and sustained shift in customer behaviour is perhaps an over-optimistic approach." (CCG)

"[The plan] assumes a reduction of per capita consumption from 144 to 121 litres per day by rolling out metering and customer persuasion. Reductions from metering are fairly well-defined, but not those from large scale customer persuasion." (Inland Waterways Association)

117. A few opponents of the reservoir asked for TW to further increase its demand management targets. They argued that reducing usage further would help to negate the need for a reservoir. When calling for TW to aim higher, some stakeholders pointed out that metering targets and per capita consumption (PCC) targets are lower than the industry average.

> *"A greater priority for TW than the reservoir is to reduce the leaks and usage. Their current performance is unacceptable. Regarding leakage - TW's leakage record is the worst in the country. Regarding metering… - TW have only just over 1/3 households on meters, compared with 90% of Southern Water households." (Ardington and Lockinge Parish Council)*

Customer feedback

118. Overall customers were in favour of household metering. Some sought more explanation on the benefits, how meters work, and information to dispel myths about the use of data for commercial gain/invasion of privacy. Those in favour of metering supported faster roll out of smart meters. Those who opposed meters cited future bill increases, additional pressure on low income households and bad experiences with energy smart meters.

119. Customers positively engaged on water efficiency and supported the provision of information to help them to understand, and reduce, their water use alongside the provision of water saving gadgets. There were mixed views on smarter home visits, some thought that the target was too low whereas others thought there were more efficient ways to reach a higher proportion of TW's customer base. A number of participants supported more social media activity, working with schools, other partnerships such as Housing Associations and group workshops. There was some enthusiasm for using water treated to an appropriate standard such as for toilet flushing.

Our consideration of the feedback

Overview of our programme development

120. The preferred Demand Management Programme (DMP) was developed using a three stage process; identification and assessment of feasible demand management options, optimisation of these options to develop a range DMPs and evaluation against supply solutions to identify the preferred DMP.

121. The first stage involved identification of a list of generic demand management options and screening based on technological, financial, environmental, risk and resilience constraints. The output was 47 feasible options. The majority of the feasible options are part of our current delivery plan to manage demand reductions. These include smart metering and water efficiency activities to encourage the efficient use of water and the introduction of financial tariffs in 2035 when household meter penetration is widespread. We have also included a number of new innovative demand management options including further water efficiency techniques, non-potable solutions and a customer incentive programme.

122. These options were optimised in our modelling tool, the integrated demand management model (IDM), to provide combinations of demand management activity, called programmes. We extended our demand management programmes to 2100 to provide longer duration demand reductions. Each demand management programme provides a volume (Ml/d) of water reduction and cost.

123. These programmes have been included for consideration in programme appraisal, where the demand and supply options are combined to provide a twin track assessment. The outcome of this assessment is the identification of a preferred demand management programme from the range of DMPs evaluated in programme appraisal.

Defining short-term and long-term Per Capita Consumption (PCC) targets

124. Our usage reduction activity from the preferred DMP translates to Per Capita Consumption (PCC) targets. Our PCC targets, a reduction of 141 l/p/d to 135 l/p/d from 2020 to 2025 and 120 l/p/d by 2050, are ambitious; the NIC is promoting 118 l/p/d aligning to Water UK's most ambitious pathway.

125. The reduction in AMP7 is primarily achieved from the installation of 420,000 smart household meters, and a large scale targeted water efficiency programme, achieving 35Ml/d reduction over baseline water efficiency activities. This is the largest water efficiency programme in the industry across domestic and commercial properties, winning multiple national awards for innovation and delivery in AMP6.

126. We did consider if we could go further than these targets. However, larger reductions in AMP7 run the risk of impacting quality of the delivery within our metering and water efficiency programmes. Larger reductions in the water efficiency programme in earlier AMPs also leads to increased work in future AMPs. This is due to the deterioration experienced in the savings achieved, with a 7 year deterioration gradient (e.g. a 5 ML/d saving in one year will reduce to zero over 7 years, and therefore need to be replaced with further work). This will also lead to an unsustainable programme trend of compounding water efficiency savings values.

127. Furthermore further reductions to PCC beyond our proposed short and long term levels can be achieved but, will require legislative and regulatory changes from central government, in the form of introducing mandatory water labelling on water using products, changes to fitting standards and building regulations and extensive community engagement at a national level. We are currently working with Defra, Waterwise and the wider sector to pursue these new options, and achieve further sustainable reductions. A number of workstreams across the industry, coordinated through Water UK and Waterwise, are investigating methods to achieve sustainable long-term PCC reductions.

128. We have commissioned Artesia to review potential further reductions and develop a PCC scenario roadmap for our region to help guide our future programme. Artesia are using a similar methodology for PCC forecasting as used in Ofwat's The long term potential for deep reductions in household water demand report (April 2018). The key outputs from this work will quantify the PCC reduction levels possible through our demand reduction efforts and the policy/regulatory changes controlled by government. Using a weighted analysis, with occupancy and tenure demographics, the research will also better align the PCC levels for London and Thames Valley areas against other regions with different demographics – showing that PCC in our region is the equivalent to lower PCC levels in other non-London areas.

129. Also, the reuse of water from non-potable sources will achieve sustainable reductions. We have a programme of work from AMP7 to progress on new developments. We are also commencing new innovative work to prove the Water Neutrality concept, and leading the development and delivery of PCC workshops to the Water Resources South East new Advisory Panel.

Confidence in delivery of targets

130. We recognise there is concern that we will not be able to achieve our targets based on their reliance on customer behaviour change. Since the targets in the preferred DMP are based on the data input to IDM, the level of confidence in our targets is based on our confidence in our input data.

131. The data input to IDM is based on actual performance data from our metering and water efficiency programmes in AMP6. This is presented in detail in Section 8 and Appendices N and O of our revised draft plan.

Metering – confidence in assessments

132. The usage reduction targets for metering are based on the behaviour change observed in our customers who have had a meter fitted for up to 29 years (i.e. since 1990). This means the reductions used in the plan were realised and sustained over a long period of time by our customers.

133. The dataset used was considered our most reliable to date to quantify the behaviour change achieved from household metering. It included properties across all property types (i.e. terrace, semi-detached) and demographics. The four predominant foundations for this confidence are:

134. ***Savings decay is included***: the data used includes a proportion of customers who had been paying on a metered tariff for up to 27 years. This was deemed to be representative of the long term impact of customers paying on a metered tariff including any decay in savings over time. Therefore, the 17% usage reduction realised from customer behaviour change in response to becoming metered is expected to be sustained over time.

135. ***Occupancy is known***: understanding the average number of people living in each property is critical to accurately predict household usage after being metered[16]. For example, if the metered property dataset contained a high proportion of single or two people occupancies, we are likely to severely overestimate the average savings achieved by metering because these customers, on average, use much less water. However, if average occupancy is known, we can factor this into our dataset to ensure it is representative of customer behaviour change across the Thames Water area.

136. The dataset used included properties where the occupancy was known. We know occupancy by using data from properties who had taken up a Smarter Home Visit where occupancy is recorded as part of the water assessment. The meter readings after a SHV were **not** included in the dataset. When a meter is installed, occupancy is not recorded because this information is voluntary and requires a customer appointment.

137. ***Savings are underestimated***: the data is based on customers with a dumb rather than a smart meter[17]. The savings realised from a dumb meter are expected to be lower than that achieved from a smart meter because dumb meter customers cannot track their water consumption outside of billing periods. This means the average usage reduction of 17% is an underestimate of the behaviour change expected. Customers on smart meters are expected to exceed this.

138. ***Impact of Optants is removed:*** properties that choose to have a meter, on average, are already more conservative in their water use than other customers. Therefore, they are shown to save even more when they are charged on a metered tariff. To ensure we do not artificially increase the savings expected by having a meter, the impact of Optants is removed from the dataset used to measure the 17% behaviour change.

Water Efficiency

139. Similar to the expected savings achieved by installing a meter, the savings expected from water efficiency activity are based on savings achieved by our Water Efficiency in AMP6.

140. There are five areas of the programme that impact our PCC target; Smarter Home Visits, Wastage ('Leaky Loo') Fixes, Housing Association Fixes, Incentives and Innovation. The usage reduction targets for water efficiency are based on the data collected in AMP6 to quantify the change in water use achieved by these activities.

141. SHVs are offered to both measured and unmeasured customers, with a focus that complements our rollout of smart water meters. A SHV can be applied to five different property types; newly metered, existing metered, unmeasured, replacement metered and bulk metered properties. The usage reduction achieved by implementing an SHV in each of these categories is based on measured data collected from over 100,000 SHVs conducted between 2015 and early 2018.

[16] Understanding the number of people living in a property is critical to obtaining an accurate understanding of change in usage. See, '*Using Household Consumption Models to Estimate the Impact of Metering*', February 2017.
[17] Data from smart meters where the property type and property occupancy is known is not yet available.

142. Following a collaborative UK water sector research project, and a parallel Thames Water initiative, it was found that 'Leaky loos' are one of the most common causes of high water use, and often go unnoticed or left leaking. Our smart meter data and research shows that leaky loos can lose a significant volume of water in comparison to other internal wastage issues so we have devised a specific wastage fix activity to tackle this usage. The reduction achieved by implementing 'Leaky Loo' fixes is based on smart meter data and fixes conducted in AMP6.

143. We are also working with Housing Associations to promote water efficiency advice to their residents. The benefit obtained by conducting a Housing Association Fix is based on data collected during Housing Association property visits in AMP6.

144. The Incentives Programme is a scheme whereby customers are incentivised through non-financial offers (vouchers, prize draws, community rewards) to be more efficient with their water consumption. The benefits of the incentives scheme have been based on the results of our trial involving 3,000 properties in Reading, launched in Autumn 2016.

145. The total water efficiency savings have been based on our water efficiency demand management options. However, we also recognise there is opportunity to be more ambitious with our customer usage reductions and so we have included further water efficiency activity in the form of innovation. This innovation is based on our work with other water companies through the Water Efficiency Network, our role within the UK Water Efficiency Strategy Steering and Leadership Groups, and our efforts during the 2018 'heatwave'. Potential areas of demand reduction innovation to be considered include; alternative water supply options for large irrigation users, innovative engagement through partner digital platforms, and working closely with Defra on water labelling.

146. Section 8 and Appendix O provide further detail for each water efficiency activity in our plan.

147. Although we have confidence in the delivery of our targets, we have also included a buffer for under-delivery. This buffer has been included as part of our planning uncertainty allowance called headroom, the approach and methodology we have applied is in line with the government planning guideline.

148. We also have a strong reputational and financial incentive to achieve our usage reduction targets. In our PR19 business plan we have included a performance measure, with an associated financial penalty/reward, called an Operational Delivery Incentive (ODI) for PCC in AMP7. This is a significant incentive for the company to continue to focus and sustain its efforts in rolling out the metering and water efficiency programmes to achieve the usage reduction targets.

How will we achieve the targets?

149. We have planned an integrated programme to achieve the PCC target for AMP7 as shown in Figure 7.

150. There are two main strands to the programme:

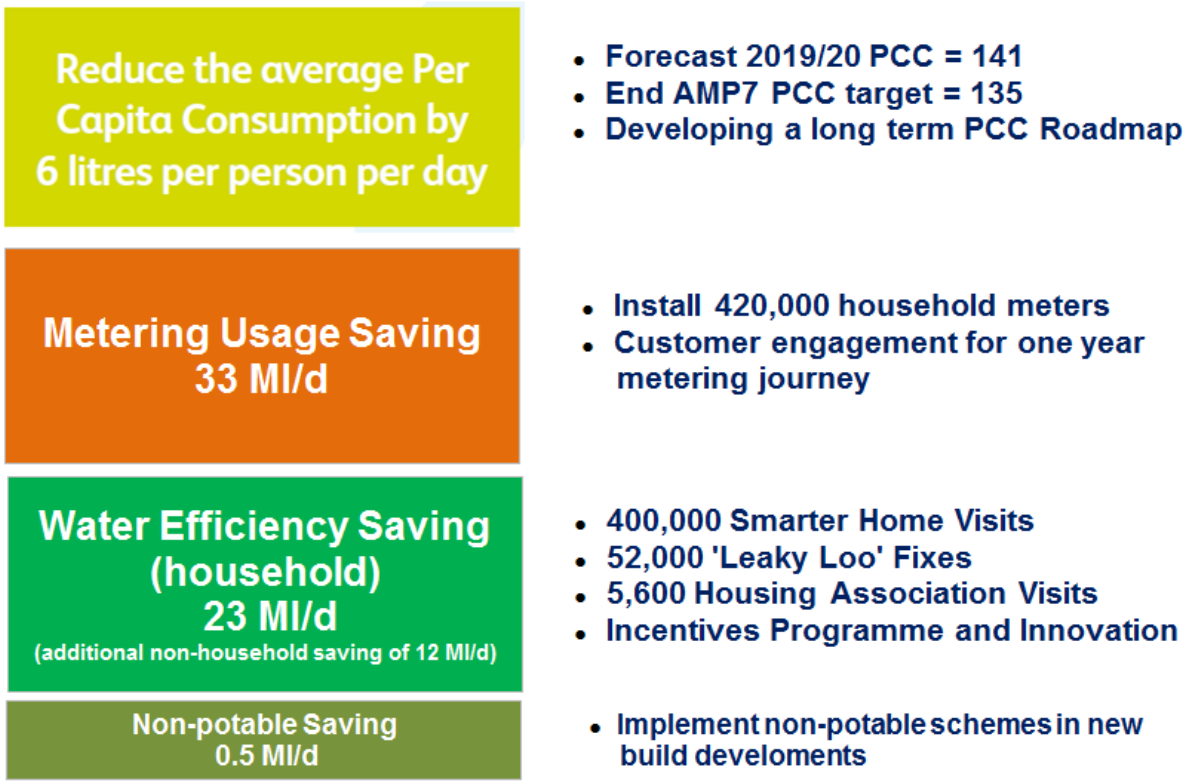
151. **Metering Usage Saving**: this currently accounts for approximately 58% of the total AMP7 usage saving that contributes to a PCC reduction. The metering usage saving will be

achieved through the roll out of over 420,000 household meters. In response to being billed on a metered tariff customers are expected to reduce their usage by 17% on average. The roll out of smart household meters will be accompanied by customer engagement for the one year metering journey.

152. **Water Efficiency Usage Saving**: this currently accounts for approximately 41% of the total AMP7 usage saving that contributes to a PCC reduction. The water efficiency saving will be achieved by undertaking 400,000 Smarter Home Visits, 52,000 'Leaky Loo' Fixes, 5,600 Housing Association visits and the implementation of our new incentives and innovation programme. There is also a non-household water efficiency saving of 12 Ml/d that will be achieved by undertaking 11,700 Smarter Business Visits.

153. The remaining 1% is made up of non-potable usage savings achieved from implementing non-potable schemes in new build developments.

Figure 6 – achieving our usage reduction plan 2020-2025



154. Our ability to achieve these targets is based on our ability to achieve our targets in AMP6.

155. In WRMP14, we planned to install 441,000 smart household meters by the end of AMP6. So far, we have installed 300,000. This underperformance is due to start-up challenges and the number of internal installations required. In WRMP14, we assumed all installations would be external, however, due to the property distribution in London, we found that up to 20% of properties require an internal installation. Internal installations are more costly and time consuming to achieve due to the enhanced customer engagement and fitting required.

156. To ensure we have provided an achievable programme for AMP7, we have used the internal and external data split from our AMP6 metering programme. This data allows for the higher proportion of internal installations that will be required to reach our target of 420,741 meter installs in AMP7.

157. In addition, we have begun to implement a multi channelled customer journey in AMP6 that we will continue into AMP7. This journey utilises text messages, emails and online appointment booking to secure appointments. This improved method of customer communication has resulted in us installing more meters per month. We are confident that the continuation of this method of customer communication can maintain and exceed this level of delivery in AMP7.

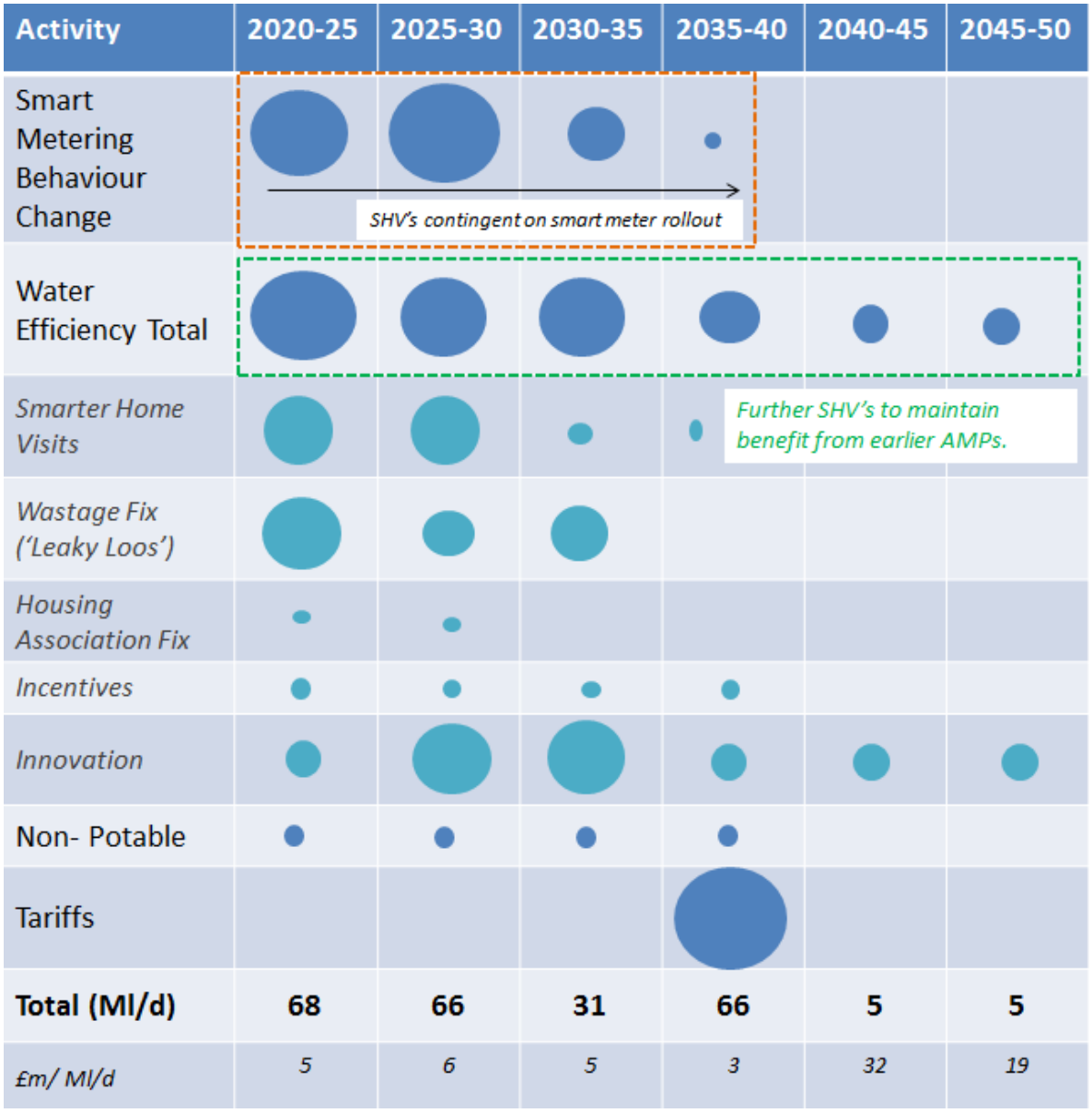
158. We are currently delivering the UK's largest ever water efficiency programme, and are on track to meet our regulatory commitment, saving approximately 40 Ml/d of water by 2020. We are promoting water efficiency to encourage our customers to save water, energy and money through a wide range of household and business focussed programmes. We have developed and tested innovative approaches, including a reward scheme for customers who use less water, which we will expand in AMP7. Our award winning Smarter Home Visit programme provides household customers with tailored advice and installation of free water efficiency savings to achieve a behavioural change and usage reduction in their homes.

159. In AMP6 to date, we have met our activity targets as set out in WRMP14, and, the measured water savings delivered from both the smart meter installation and Smarter Home Visit work, have exceed original targets.

160. In the longer term, we will achieve our PCC targets through the continuation of our smart meter and water efficiency programme. Our long term plan is illustrated in Figure 7.

161. To drive and sustain customer water savings even further, we will continue to improve our digital platforms and customer engagement communications that are derived from our smart data analytics.

Figure 7 – Long term usage reduction plan[18]



Targets beyond 2050

162. We have not developed usage reduction targets beyond 2050 but we are working with Water UK, Defra and other water companies to help shape the Government's future introduction of sustainable PCC targets. Such a target is likely to drive increased demand reduction programmes both in the water sector and government or regulatory areas such as labelling and Building Regulations. We are currently developing a 'PCC Scenario Roadmap' which will quantify the PCC reduction opportunities and scale up to mid-century - outlining the initiatives

[18] The relative size of the circles represents the Ml/d usage reduction in each AMP. The total (Ml/d) and £m/ Ml/d also includes the non-household component of Water Efficiency activity achieved through Smarter Business Visits. In AMP7, this accounts for 12Ml/d of the 68 Ml/d total, AMP8, 3.4 Ml/d and AMP9 0.8 Ml/d.

and changes needed from both TW and external bodies. We have also designed our AMP7 water efficiency initiatives and communications with customers, to align with the objectives outlined in the Water Efficiency Strategy for the UK (Waterwise).

Changes to our revised draft plan

163. We have taken account of our current performance and planned future activity and not made any changes to the revised draft plan.

Teddington direct river abstraction (DRA)

Consultee issues – headline points

164. There were differing views about the removal of Teddington DRA from the preferred programme in the revised draft WRMP19. Several stakeholders, and many of the online customer community, welcomed TW's responsiveness to concerns about potential negative environmental impacts of the scheme. Whilst other stakeholders raised concern that a central part of the draft WRMP19 had been removed at a late stage in planning and that serious environmental objections to Teddington DRA had not been taken on board earlier or mitigation opportunities fully examined. These concerns were expressed mainly, but not solely, by opponents of the reservoir or single issue groups looking to promote their own individual favoured scheme.

Stakeholders

165. The majority of stakeholders who commented on the Teddington DRA scheme welcomed TW's responsiveness to concerns raised about the potential negative impacts on the environment and the removal of the scheme from the revised draft WRMP19 until further work had been completed. The stakeholders included EA, GLA, London Assembly, London First, Angling Trust, BBOWT, Colne Valley Regional Park, Inland Waterways Association and Newbury Angling Association.

> *"The Angling Trust supports the removal of the Teddington Direct River Abstraction scheme due to the environmental risks associated with the scheme. This is evidenced by the Environment Agency's environmental impact assessment, which unearthed serious potential negative impacts on the aquatic environment." (Angling Trust)*

166. Those who opposed its removal cited 3 main challenges, namely:

- the decision to remove the scheme, a central plank of the draft plan, was made at a late stage in planning and that environmental concerns should have been taken on board earlier;
- mitigation measures should have been examined more thoroughly and the scheme amended to address them. This view was expressed mainly by opponents of the reservoir e.g. Campaign to Protect Rural England (CPRE), GARD, Oxfordshire County Council, Wantage and Grove Campaign Group, and West Hendred Parish Council; and
- concern about relying on alternative schemes in the revised draft WRMP19 instead of Teddington DRA which had not been thoroughly researched.

> *"The loss of the Teddington DRA scheme has created a shortfall of 270ML/d in the short – medium term supply for London... [This] has not been replaced by a Severn – Thames transfer of a similar size but by bits and bobs eventually amounting to about 100ML/d plus even further demand reductions and pipe leakage targets over and above the very ambitious ones already outlined in the dWRMP document. Furthermore, the rdWRMP is rather reliant on the*

Deephams Reuse (45Ml/d) the acceptability of which has to be in significant doubt." (Cotswold Canals Trust)

167. A handful of respondents also queried whether the composition of the revised draft WRMP19 would make up for the shortfall resulting from the removal of Teddington DRA scheme, the impact on costs and contingency planning.

Customer feedback

168. One in 10 online community respondents specifically mentioned the removal of Teddington DRA; of these most were positive about its removal largely citing environmental reasons.

169. The scheme was not specifically discussed in the research workshops.

Our consideration of the feedback

170. Whilst the external perception is that Teddington DRA was removed at a late stage in the planning process we had been working hard to understand and address issues and concerns with the EA for some time.

171. Since 2016 we engaged with the EA and Port of London Authority (PoLA) as part of the feasibility assessment of the Teddington DRA option, this identified the need to undertake further work to understand the impact of the Teddington DRA on the hydrology of the River Thames upstream and downstream of Teddington Weir.

172. The initial scope of the modelling was agreed with the EA and PoLA in late 2016 and the modelling results were presented to the EA and PoLA in summer 2017 at which point further investigations into impacts and mitigations were agreed. These further investigations were completed in early 2018 and the findings were discussed at meetings with the EA and PoLA in May 2018 and subsequently with the EA on in July 2018.

173. HR Wallingford was commissioned to model the impacts of the option on the freshwater River Thames and the Tideway including water levels, salinity, sediment, dissolved oxygen and temperature.

174. The modelling results were used to inform assessments of the likely impacts of the scheme on ecology (including fisheries and benthic invertebrates) and navigation. Mitigation options to address the impacts have subsequently been investigated.

175. This work identified that one of the likely impacts of the option would be an increase in water temperature in the freshwater River Thames locally above Teddington Weir and in the Upper Tideway as a consequence of discharging treated effluent at Teddington. The potential temperature effects were identified as a key concern to aquatic ecology in the draft WRMP, and the EA advised that a precautionary approach may be appropriate, including mitigation to achieve a zero temperature increase.

176. Both operational mitigation, to reduce / temporarily suspend the DRA operation, and engineering solutions, to cool the treated effluent prior to discharge to achieve a zero temperature increase, have been investigated. The work completed to date has not identified mitigation which can achieve zero temperature uplift. Appendix K of the SoR No 1 (to the consultation on the draft WRMP) includes a statement of common understanding agreed

between TW and the EA on the effects of the Teddington DRA option on the water environment.

177. At this time there is insufficient evidence to support a higher temperature difference. Typically, where warm water is discharged into a water body, increases in water temperature are greatest in the part of the river closest to the outfall, allowing space for ecology to adapt, such as fish swimming past in the cooler, less affected part of the river. In the Teddington DRA option, at times of low flow in the River Thames (target flow of 300 Ml/d over Teddington weir), the flow over Teddington weir would mainly comprise treated effluent and therefore the temperature increase would be seen across the full width of the river. This elevated temperature would continue downstream of the weir. The ecological and fisheries impacts of this increase in river temperature, and the associated discontinuity in temperature upstream of the outfall, are not fully understood at this time.

178. Without evidence that there would be no adverse impacts, the precautionary approach has been adopted and is supported by both TW and the EA. In discussion with the EA it was agreed that the work completed was not been sufficient to satisfactorily determine the required extent of mitigation for the impacts of the scheme on river temperature, or to identify a viable mitigation option to deliver this. In consequence, it was agreed that the Teddington DRA option cannot be considered a feasible option in a proposed WRMP programme at this time. TW committed to undertake a programme of research to enable better understanding and mitigation of the potential risks.

179. In the draft WRMP19 TW set out that there were ongoing investigations into the potential environmental impacts of the Teddington DRA option and mitigation measures.

"*A significant programme of further work is currently under way to understand the potential for Teddington DRA to affect ecological status or potential, and to identify the design, operation and mitigation measures that would be required in order to make the scheme compliant with the WRPG. We fully expect this work to be concluded by the submission of our revised draft plan, and that the potential ecological issues raised to date can be resolved*." (paragraph 11.48 Section 11 draft WRMP19)

Further research

TW committed to undertake further work to better understand the potential impacts of the Teddington DRA option and the effectiveness of the potential mitigation measures, as summarised in Table 6.

Table 6: Scope of further work for Teddington DRA option

Further Work		Description
1	Further investigation of the ecological effect of the option	Research on how this option may affect non-native species population (fauna and flora) and the resilience of native fauna and flora. Research on the sensitivity of the River Thames ecosystem to the discharges at all times of the year and potentially viable mitigation measures. Research on the climate change sensitivity and resilience of the ecosystems and any proposed mitigation measures.

2	Further investigation of the chemical effect of the option	A sampling programme will be undertaken to provide information on metals and olfactory inhibitors relevant to adult upstream salmonid migration. The effect of reducing effluent discharge at Isleworth Ait will be assessed to understand if further treatment is required to ensure WFD status is not compromised.
3	Further investigation of the physical effect of the option	Research will be undertaken to assess how sedimentation within the middle estuary is affected. Work will be undertaken to assess the impact on navigation and the management of Richmond lock and weirs.

180. Subject to satisfactory resolution of the environmental concerns, further work would then be required to examine navigation impacts.

181. This programme of work will support the adaptive alternative options approach described in the updated Section 10 of the revised draft WRMP in order to achieve a decision in 2022/23 to confirm the options to be included in the preferred investment programme and the timing of the options. Information on the further work is presented in Appendix XX of the updated revised draft WRMP19.

Optioneering and substitution of Teddington DRA

182. In the development of the draft WRMP TW adopted a phased approach to the appraisal and screening of options:

- Phase 1: developed the approach to fine screening, including developing and consulting stakeholders on the assessment dimensions and sub-dimensions. New water resource options were identified and stakeholders were consulted on these and on whether there were other options that had not been considered. A course screening of generic option types was undertaken.
- Phase 2: feasibility assessments were undertaken for the option types that passed the generic screening exercise. Specific options for each option type (direct river abstraction, desalination, water reuse, raw water transfers, reservoirs, groundwater and inter-zonal transfers) were assessed and compared to each other. Cross option studies were also undertaken to identify the system reinforcements required (raw water systems, water treatment works and network reinforcement). Options were carried forward from the feasibility assessment into the Feasible List for further fine screening. The resulting output of the fine screening is the Constrained List of options
- Phase 3: conceptual designs were prepared for options on the Constrained List, costs were updated, bottom-up risk assessments were prepared (for options larger than 50Ml/d) and Strategic Environmental Assessments were carried out. Options on the Constrained List were considered in programme appraisal.

183. There was extensive engagement throughout this work and supporting technical reports, namely - feasibility reports, cross option study reports and fine screening report are published on our website[19].

184. The options that have been included in the Preferred Plan to substitute for the Teddington DRA option have been taken through this appraisal and screening process and as such, we are confident that in combination they will address the forecast deficit.

185. Between the draft and revised draft plan we restated the baseline supply demand balances, this resulted in a reduced forecasted deficit in 2030 and in the longer term. As such it is not necessary to replace the full yield that would have been provided by the Teddington DRA. With the Teddington DRA option removed from the Feasible List, the programme appraisal process primarily selects further demand management (increase in leakage reduction and associated metering and water efficiency activity), Deephams water reuse, Oxford Canal transfer and a set of small innovative groundwater options.

Revisions to the draft plan

186. There are no changes required to the revised draft plan.

[19] www.thameswater.co.uk/wrmp - Document Library

Deephams water reuse

Consultee issues – headline points

187. There were both concerns raised and support expressed for Deephams water reuse. Several stakeholders raised concerns about the potential negative impacts that Deephams water reuse scheme might have on navigation and river ecology of the Hackney Marshes, Thames Tideway and stressed the need for TW to fully investigate the impacts and possible mitigation measures. In contrast, a few stakeholders including the Group Against Reservoir Development (GARD) and individuals opposing the reservoir suggested that the environmental concerns around reuse schemes had been over-emphasised, and suggested re-introducing a larger version of the Beckton reuse scheme in addition to the Deephams reuse scheme. Water reuse was the most polarising new supply option discussed by customers both via the online customer community and in the workshops.

Stakeholders

188. Several stakeholder organisations raised concerns about the potential negative impacts that Deephams water reuse scheme might have on navigation and river ecology of the Tideway and Hackney Marshes. These comments were raised by the EA, Canal and River Trust, Cotswold Canals Trust, Port of London Authority, GLA and NE. The EA went further than other stakeholders in its critique of the scheme, asking for further information on the selection of this scheme in preference to other schemes, challenging the deployable output assessment presented, and recommending that alternative schemes should be identified should Deephams water reuse be removed from the preferred programme following further study.

> *"A Deephams reuse option could affect the River Lea, the tidal stretch of which falls under the jurisdiction of the PLA. The PLA will need to see that these plans ensure safety of navigation on the River Lea and that the length of time that the Lea is not navigable at low water is taken into consideration." (Port of London Authority)*

189. Only a few stakeholders stated that they supported reuse schemes in general and Deephams scheme in particular. For instance, a few reservoir opponents encouraged TW to further investigate options such as reuse before making a decision about the reservoir (Ardington and Lockinge Parish Council, Wantage and Grove Campaign Group). GARD suggested that the environmental concerns around reuse schemes had been over-emphasised, and suggested re-introducing a larger version of the Beckton scheme (275 Ml/day instead of 95 Ml/day), in addition to the Deephams scheme.

Customers

190. Of the online community participants one in six respondents mentioned the plans in relation to reuse at Deephams and all were positive, some called for more water reuse in the future.

191. Customers who participated in the research workshops gave polarised views on the reuse scheme. The majority of participants who were positive saw it as a quick, self-sufficient solution that could help reduce the amount of water drawn from rivers. Those that were negative found it difficult to believe that the water would be of a standard acceptable for

drinking water and particularly disliked the need for more chemicals and higher energy use. Some participants wanted further reassurance on the quality of water, treatment processes to deal with pollutants and local concerns before supporting it.

> *"The Deephams water reuse scheme sounds promising, perhaps could be powered using renewable energy too. The new and sustainable resources also sound positive and an indication that TW are thinking about the future correctly. Overall all three methods sound promising and it is good that the environment is being considered and that you were able to think about not just the financial effects of a project." (Online community, household customer, Berkshire)*

> *"I guess we have to get our water from somewhere but when I really think about the fact that it comes from waste it is really off-putting. But, it has to be done and is already being done so in my humble opinion as a novice on these things the plans seem ok as long as it does not affect our rivers too harshly." (Online community, household customer, Outer London)*

Our consideration of the feedback

192. Reuse is the process of reusing highly treated wastewater effluent to provide additional water resources. There are 2 types of water reuse that we are proposing in our revised draft WRMP19; indirect potable reuse (IPR) at Deephams and non-potable reuse in new commercial developments in London.

Indirect Potable Reuse (IPR)

193. In the United Kingdom, as in many countries, treated wastewater effluent is an integral part of the public water supply. Wastewater is treated, discharged into a river or watercourse, the treated wastewater effluent combines with the natural river flow and further downstream water is then abstracted from the river and treated for drinking water supply. This is called indirect potable reuse (IPR). "Indirect" indicates that the treated wastewater effluent is put back into the environment, such as a watercourse, and is then re-abstracted and used for drinking water supply following treatment.

194. In the development of new resource options for the WRMP, the water reuse options follow the same principle outlined above, the difference is that the wastewater treatment works considered are those located in the Thames Tideway and so the treated wastewater discharged from these works would normally be lost to sea, and instead it is diverted upstream to enable us to make use of it as a resource.

195. So, for these options there would need to be advanced treatment of wastewater, this highly treated wastewater effluent would then be transferred to a watercourse upstream of an existing abstraction point, mixed with the river water, and abstracted at either the east or west London reservoirs. The water abstracted will therefore be a mix of river water and treated wastewater. Water from the reservoirs would then be treated to drinking water standards at a water treatment works using conventional treatment processes. Both environmental protection and drinking water safety are considered in assessing the appropriate level of advanced treatment for the reuse option.

196. The Water Reuse Feasibility Report[20] identified eight London Sewage Treatment Works (STW) catchments where reuse would not impact existing downstream abstractors and where discharges would otherwise be lost in the tidal reach of the River Thames. Within these catchments options were identified across a range of sizes. Following assessment of the options against a range of feasibility criteria the feasible options identified were:

- Beckton STW reuse (up to 380 Ml/d)
- Crossness STW reuse (up to 190 Ml/d)
- Deephams STW reuse (46 Ml/d)
- Mogden STW reuse (up to 200 Ml/d)
- Mogden South Sewer (50 Ml/d)

197. Assessments were completed to understand the extent of treatment that would be required to ensure there is no negative impact on the environment and confidence in the quality of the source water for drinking water supply. A range of potential treatment technologies were evaluated including granular activated carbon (GAC) adsorption, ultrafiltration, nanofiltration, reverse osmosis (RO), membrane bioreactors (MBR), UV disinfection, chlorine disinfection and advanced oxidation processes (AOP).

198. The assessments showed that as the total volume of wastewater discharge to a watercourse increased, higher treatment standards would be required to avoid environmental deterioration. So while a lesser degree of treatment might initially be considered to be acceptable in some situations and for smaller application of reuse, as future schemes are introduced the initial scheme would need to be replaced with a scheme based on more advanced technology. For example, wastewater treatment without RO at Beckton would address water quality parameters of high concern (not those of medium or low concern) for discharge flows up to 150 Ml/d; however if the discharge flow was subsequently increased above 150 Ml/d then RO would need to be provided for the total discharge (not just flows above 150 Ml/d). The more advanced technologies have therefore been adopted for all sizes of water reuse.

199. RO and AOP have been selected as our preferred treatment technology to manage possible future risks and ensure confidence in drinking water quality. This is based on extensive research, consultation with water quality specialists and with reference to worldwide best practice. The quality of drinking water is of paramount concern to customers and therefore we consider that this treatment technology will also be most acceptable to our customers. Furthermore adoption of advanced technology for the first reuse option provides flexibility for phased development in the future and as well as providing operational experience of such a system both for TW and for the wider UK water industry.

200. This approach is discussed in more detail in Appendix L of the revised draft WRMP19.

Non-Potable Reuse (NPR)

201. Supplying non-potable water to customers for use such as for toilet flushing and landscape irrigation reduces potable water demand. We completed a desk based study which concluded that non-potable reuse (NPR) could reduce potable water demand by up to 33 Ml/d for new commercial and residential developments in the 38 opportunity areas (OAs) in London, by

[20] Water Reuse Feasibility Report, www.thameswater.co.uk/wrmp - Document Library

taking rainwater and stormwater, and/or recycling greywater. An important issue in relation to the implementation on NPR systems is the risk from misuse or misconnection. All options will require effective management controls to ensure that risks linked to the misuse of non-potable water or linked to cross-connections between the non-potable and potable water supply are mitigated. An introduction to NPR and description of NPR options by different developments is categorised and summarised in Appendix L to the revised draft WRMP19.

202. A work programme to progress NPR will be developed for implementation over the next 5 years. This is also referred to in the section of the report on water efficiency.

Deephams water reuse

203. Following feedback to the public consultation, and new information, we revised our draft plan. Two of the main changes were an extension of the proposed leakage reduction programme and the removal of the Teddington DRA scheme. In view of the extended leakage reduction activity, as well as further demand management activity, it was not necessary to replace the full water resource benefit that would have been provided by Teddington DRA option and as such a combination of Deephams reuse, Oxford Canal water transfer and some groundwater options were considered to provide the best overall value combination of schemes in the preferred programme. This is explained in detail in the updated Section 10 of the revised draft WRMP19.

204. The resource deficit forecast in 2030, following the application of the preferred demand management programme, is the primary driver for the site for reuse. The deficit is not sufficiently large to require a single larger reuse option (i.e. Beckton reuse 95 Ml/d), furthermore the proposed combination of smaller options allows greater flexibility, hence Deephams reuse has been selected in combination with other options. This combination is sufficient to address the requirement for enhanced drought resilience by 2030.

205. In response to concerns raised in respect of environmental and navigation impacts of Deephams reuse we have undertaken further work in consultation with the EA and have agreed a forward programme of environmental investigations. These will be completed by 2022/23 and will also involve other interested stakeholders. Information is provided in Appendix XX of the updated revised draft plan.

206. We have also committed to undertake studies of reuse at other sites, namely Beckton and West London, such that if Deephams reuse cannot be taken forward then alternative reuse options can be introduced. This approach is part of the adaptive alternative options planning outlined in updated Section 10 of our revised draft plan. The decision on our forward plan will be made in 2022/23. This is in alignment with other water companies and regional-level WRMPs which are likely to be in place before then.

Transfers of water - Severn - Thames transfer (STT)

Consultee issues – headline points

207. There were a number of comments in relation to transfers of raw water between regions. The comments noted in this section relate specifically to raw water transfers from the River Severn to the River Thames, referred to as the Severn Thames Transfer (STT). The responses can be broadly categorised in three groups:

- those who welcomed the deferral of the STT due to concerns about potential negative environmental impacts;
- those who did not comment on the timing of the STT but recognised the need for further investigations and partnership working; and
- those who argued that the STT should not have been deferred but instead advanced.

208. In addition, as in the previous consultation, there was strong support from supporters of the Cotswold Canals Trust for a regional raw water transfer via the restored Cotswold Canals, rather than conveyance of water using a new pipeline. A large number of responses restated the opportunities and potential multiple benefits of using the restored Cotswold Canals for conveyance as part of the water transfer.

209. Customers considered that the positive attributes of a transfer included taking water from an area where there was surplus and collaboration between water companies. However they considered that the positives were outweighed by the negatives which included the reliance on other regions for water, the risk of non-native wildlife species impacting on local species and the size and location of the pipeline required.

Stakeholders

210. Environmental and angling-related organisations raised concerns about the possible negative environmental impacts of the STT (Angling Trust, BBOWT, Newbury Angling Association, Wild Trout Trust) specifically referring to potential impacts on water quality and quantity, the risks associated with introducing non-native species to a river system where they are not currently present, and the carbon impacts of transferring water over long distances. The EA also highlighted the lead time for the scheme which it considered would be significantly longer than 10 years and specifically the need for a data improvement programme which could take up to 4 years to ensure all aspects of the scheme are considered on a robust basis.

211. Several stakeholders highlighted their support for further investigations and partnership working before the STT scheme is taken forward. Natural Resources Wales wanted reassurance that all necessary adverse environmental impacts are fully explored and mitigated and to demonstrate that the Wellbeing of Future Generations Act and the Environment (Wales) Act have been considered. Bristol Water welcomed plans to assess potential impacts of the STT on other abstractors from the River Severn, specifically the need to understand what impact a Drought Order might have on availability and reliability of water from the River Severn. Bristol Water also welcomed the proposal that the reservoir would be developed prior to a STT, so that water from the River Severn could be transferred and stored

during periods of higher flows, thus boosting resilience. Natural England raised concerns about negative environmental impacts of the pipeline on the Cotswold AONB and recommended that TW ensures appropriate landscape mitigation is selected and opportunities for landscape enhancements are identified.

212. Many stakeholders expressed their support for a STT and argued that the STT should not have been deferred; these comments were mainly from local opponents of the reservoir (GARD, CPRE, Ardington and Lockinge Parish Council, East Hendred Parish Council, Oxfordshire County Councillor, Steventon Parish Council, Sutton Courtenay Parish Council, West Hendred Parish Council and numerous individuals) who consider that the STT is a viable alternative to the reservoir stating that it would be faster to implement, less expensive, with fewer adverse environmental impacts, less visual impact, and less impact on heritage assets. GARD cited many criticisms of TW's investigations proposing that the focus had been on reasons not to use STT, rather than reasons to use it; proposals for a reservoir before the investigations of STT were complete; and lack of transparency about STT option costs.

"Ignoring inter-regional transfers for 60 years is effectively a rejection of the option." (GARD)

"We call for… the STT water transfer scheme to be investigated more thoroughly before being… deferred to the end of the 21st century." (CPRE)

Conveyance via the restored Cotswold Canals

213. As in the consultation on the draft WRMP19, there was strong support from the Cotswold Canals Trust for a STT via the restored Cotswold Canals, rather than a pipeline. Additional support came from numerous individuals, including local residents and canal users, and bodies with an interest in canals (Canal and River Trust, GMB, Stroud Valleys Canal Company, Stroudwater Navigation Canal Company, Inland Waterways Association). Their main arguments echoed the arguments about this option in the previous consultation namely that it would be beneficial for wildlife, operationally energy efficient, would help to safeguard the canal, provide leisure opportunities, and have economic benefits through tourism, regeneration etc. Many of the potential benefits were simply perceived benefits stated by interest groups and not supported with evidence.

"A restored Cotswold Canal, designed to satisfy raw water conveyance requirement, would have significant social, environmental and economic benefits to communities, businesses, and customers that we feel need to be included in TW's decision-making process." (Canal and River Trust)

Customers

214. In the customer research workshops a number of positive issues related to a STT were identified including taking water from an area where there is surplus and positive collaboration between water companies. However the positives were outweighed by the concerns raised, most notably, the reliance on other regions for water, the risk of non-native wildlife species impacting on local species and the construction impacts of the pipeline. The concept of self-sufficiency came up several times across the workshops which was consistent with feedback from other customer research studies.

Our consideration of the feedback

Overview of STT options

215. The STT would transfer water from other regions of England and/or Wales via the River Severn to the River Thames. The transferred water would be available for abstraction for use in Swindon and Oxfordshire (SWOX), Slough, Wycombe and Aylesbury (SWA) and London water resource zones as well as potentially providing a resource for other companies in the South East of England albeit no other water company in the South East supports delivery of the transfer in isolation, Affinity Water has stated that it does not have the raw water storage that is required to efficiently generate reliable yield from the scheme[21]. A range of conveyance options were considered for the transfer from the River Severn to the River Thames and a range of support options were considered that would either augment flow in the River Severn upstream of the abstraction or directly augment the transfer of water to increase the reliable volume of water available from the STT scheme. The options that passed feasibility and fine screening assessment were included in the Constrained List and were available for selection during programme appraisal. The conveyance and support options that were considered are summarised in Table 7 and Table 8 respectively.

Table 7: Severn-Thames Transfer Conveyance Options

Conveyance	Size	Status	
		On Constrained List	In Preferred Programme
Pipeline	100	✗	✗
	300	✓	✓
	400	✓	✗
	500	✓	✗
	600	✗	✗
Canal	Do Min 100	✗	✗
	Do Max 100	✗	✗
	Do Min 300	✗	✗
	Do Max 300	✗	✗
	Coates Portal	✗	✗

Table 8: Severn-Thames Transfer Support Options

STT Support Options	On Constrained List	In Preferred programme
Great Spring	✗	✗
River Wye to Deerhurst	✓	✗
Minworth STW effluent to River Avon	✓	✗
Mythe WTW unused part of licence	✓	✓
Netheridge STW effluent	✓	✓
Lake Vyrnwy 60 (Ml/d)	✓	✓
Lake Vyrnwy 148 (Ml/d)	✓	✗
Lake Vyrnwy 180 (Ml/d)	✓	✗

[21] March 2019 Alignment of Water Resources Management Plans. Pauline Walsh (CEO, Affinity Water) joint letter to Rachel Fletcher with Steve Robertson (CEO, Thames Water)

River Severn (unsupported)	✓	✓
Redeployment of ST Abstractions at Shrewsbury (12 Ml/d)	✓	✗
Redeployment of ST Abstractions at Shrewsbury (30 Ml/d)	✓	✓

STT Conveyance

216. Two conveyance options were assessed at a range of capacities: Deerhurst Pipeline and the restored Cotswold Canals. The options are mutually exclusive and were compared in the Raw Water Transfer (RWT) Feasibility assessment[22]. As set out in the RWT Feasibility Report, the Statement of Response No1 and the revised draft WRMP19, the Deerhurst Pipeline option is the preferred conveyance option and was taken forward to Fine Screening and the Constrained List for the following reasons:

- **Normalised Cost** – the Cotswold Canals conveyance option has a higher cost than the pipeline alternative when considered on a whole life cost basis and as an average incremental cost (cost per m^3 of water used). We note that no changes have been made to the cost estimates for the STT options since SOR No1 and our assessment of cost still show that the restored Cotswold Canals is more costly than the pipeline.
- **Operational Complexity** – both options would require agreements with third parties to utilise the STT support options; however, the canal option would also require cooperation with CRT (for the Gloucester & Sharpness Canal) and potentially a third-party operator of the restored Cotswold Canals. The pipeline has fewer assets in series and consists of a closed pipeline whereas the canal is readily accessible to the public increasing vulnerability to pollution and vandalism. The canal will have a much higher incidence of algal blooms than a pipeline conveyance mechanism. Algal blooms are likely to increase given the forecast impacts of climate change and they pose a risk to water quality/availability by overwhelming treatment during hot, dry periods and could restrict the supply of water from this route, at a time when the water is likely to be most needed.
- **Construction Complexity** – the Cotswold Canals would require construction around existing historical assets and the need for construction in urban areas; this is not the case for the pipeline option.
- **Non-Native Invasive Species (INNS)** - based upon expert advice from Dr David Aldridge (University of Cambridge), the Cotswold Canals option has a higher risk of spread of non-native invasive species than the pipeline.

217. CCT state in its representation that the risks associated with the transfer of invasive non-native species (INNS) have been over-stated. Significant concerns about INNS risks have been raised consistently by the EA and NE in respect of the STT for both the canal and pipeline conveyance options. An expert assessment of the INNS risks was carried out for TW by Dr David Aldridge (University of Cambridge) in response to challenges on the risks of INNS which confirmed the views of the EA and NE that treatment measures would be necessary to minimise the risk of INNS transfer for both the canal and pipeline conveyance options. INNS

[22] Raw Water Transfer Feasibility Report www.thameswater.co.uk/wrmp

treatment measures for the pipeline option were assessed as being more robust than those that could be put in place for the canal option, as set out in the Severn Thames Transfer Water Quality and Ecology Assessment Phase 2 Report (October 2016)[23]. These conclusions were endorsed by the EA and NE who have the statutory duty to manage the risk of the spread of INNS in England.

218. A number of responses to the consultation specifically refer to the benefits of the Cotswold Canal conveyance option. This point was addressed in SOR1 Appendix H, Section B, which acknowledged that there would be some benefits associated with the canal option, particularly if it included end to end restoration of the Cotswold Canals. However, the overall assessment of the option concluded that it performed less well than the Deerhurst pipeline option and therefore it was not taken forward to the Constrained List.

219. For further information about the STT conveyance option assessments reference should be made to the RWT Feasibility Report and SOR No 1[24].

Stakeholder Engagement

220. We have engaged extensively with stakeholders throughout the development of the draft plan, including the third parties that offered STT support options, the Canal & River Trust (CRT) and the Cotswold Canals Trust (CCT).

221. We engaged directly with CCT during development of a bespoke engineering feasibility study for the Cotswold Canal conveyance option and responded to feedback from CCT that proposed alternative arrangements for the option. Following investigations of the proposals some were adopted prior to SOR1 (such as rationalising the number of pumping stations included in the option) and the feasibility assessment was updated to reflect the changes. Other options were not taken forward to a full feasibility assessment (such as the Coates Portal alternative arrangement) as an initial review indicated that they would not improve the feasibility assessment of the Cotswold Canals option. The investigations on the Cotswold Canals option are reported in the Cotswold Canals Feasibility Study Report (which forms Appendix G to the RWT Feasibility Report), the RWT Feasibility Report itself and SOR1. CCT requested further engagement with TW following its representation (January 2019). Following detailed review of CCT's representation TW advised (March 2019) that the points raised did not introduce new information but were willing to discuss these if CCT felt that it would be helpful. CCT have agreed to contact TW to continue discussions in May 2019.

Preferred Programme

222. Programme appraisal is the process by which we seek to address and resolve the supply and demand problems identified, by appraising combinations of water management options. The preferred programme is based on long term best value and not "least cost planning". A suite of metrics that incorporate a wide selection of factors are optimised to produce the "preferred programme", this is presented in the updated Section 10 of the revised draft WRMP19. The preferred programme in the updated Section 11 of the revised draft WRMP includes a STT option that becomes operational in 2080 and consists of a 300 Ml/d pipeline conveyance with

[23] Severn Thames Transfer Water Quality and Ecology Assessment Phase 2 Report (October 2016) www.thameswater.co.uk/wrmp - Document Library
[24] www.thameswater.co.uk/wrmp

the following support options: Mythe (15 Ml/d), Netheridge (35 Ml/d), Vyrnwy (60 Ml/d) and redeployment of Severn Trent abstractions at Shrewsbury (30 Ml/d).

223. Inclusion of the STT in the preferred programme is in line with the National Infrastructure Commission's (NIC) report: Preparing for a drier future, which emphasises the importance of regional transfers for both national resilience and water companies' need. The timing of the STT option within the programme is determined by the programme appraisal process, which is discussed in Sections 10 and 11 of the updated revised draft WRMP19.

Regional Needs and Resilience

224. The STT is one of the strategic options that we have considered to provide a strategic water resource to the south east of England, providing water not only to our customers but also Affinity Water and other regional companies in the Water Resources South East (WRSE) group.

225. Affinity Water has identified a need for 100 Ml/d of new resource in 2037/38 and the programme appraisal process selects a preferred programme with construction of SESRO to meet this need; this is followed later in the planning period by the STT; this sequencing of options is supported by Affinity Water and WRSE. Affinity Water has stated that it does not have the raw water storage that is required to efficiently generate reliable yield from the STT scheme.

226. We rely on existing reservoir storage in the West London and Lee Valley reservoirs which help to buffer peak demands in London. Affinity Water has very little reservoir storage available and therefore their water resource needs are considered on a peak basis. This is relevant for the unsupported River Severn element of the STT, which is predicted to provide a Deployable Output (DO) of 80 Ml/d on an annual average basis but may not be available on a peak weekly basis, and therefore it would not provide a resilient resource for Affinity Water. Furthermore the volume available is lower than Affinity Water's requirement. On this basis, meeting the needs of Affinity from the STT, would require a higher level of support than is currently included in the preferred plan; it is expected that the support from Vyrnwy would be increased from 60 Ml/d to 148 Ml/d. This would be more costly than the option (SESRO) which is currently in the preferred plan, as well as having greater environmental impacts.

227. With SESRO constructed before the STT, as indicated in the preferred programme, this enables Affinity Water's peak week demands to be met using the SESRO, without the need to increase support to the STT from Lake Vyrnwy.

Further work and adaptive alternative options approach

228. To meet future water demand in our area, and across the South East region, taking account of climate change and environmental requirements we will need to develop a combination of resource options. Our preferred plan as presented in the updated revised draft WRMP19 sets out the best value plan to the end of the century based on current information. There are areas of uncertainty and further work is needed to address these; we have accommodated this through the adaptive alternative options planning framework. Over the next few years we will work collaboratively with the EA, other water companies, working groups such as the River Severn Working Group, WRSE and other stakeholders to undertake these further studies to ensure the right long term decisions are taken in a timely manner. The adaptive

planning approach is described in the updated revised draft WRMP19 Section 10 and Section 11.

229. SOR No. 1 Appendix J identified a number of areas for further investigation to provide greater certainty in the STT option. This information is updated and reissued in Appendix XX of the WRMP. We are continuing to work with regulators and potential providers of resource to develop the future investigation programme, which includes:

- Further work to confirm the availability of water in the River Severn, taking forward the water resource modelling and studies of coincident drought that have been undertaken to date. More work will need to be undertaken to confirm the DO for specific combinations of support options and not just the DO of independent support options. This is particularly significant given the EA's recent increase in the Lower Severn hands off flow, reported in its Severn Corridor Abstraction Licensing Strategy, March 2019. The increase is likely to have a significant impact on the existing DOs which have been currently calculated for the STT.
- Continue to work with the EA, NRW and regional working groups to understand the changes that would be required to the regulation of the River Severn to facilitate the STT. This will also ensure that the Severn Estuary European Marine Site and Bristol Water are not detrimentally impacted by the increased upstream abstraction.
- Further work to establish appropriate assumptions for losses in the River Severn to inform changes to regulation and agreements with STT support option providers.
- Continue working with water companies that have offered STT support options including Severn Trent Water, United Utilities and Dwr Cyrmu (Welsh Water).
- Further environmental investigations and surveys for the STT support options that would augment flow in the River Severn, including releases from Lake Vyrnwy reservoir. This would also include identification of mitigation measures where appropriate.
- Investigation of water quality issues associated with River Severn algae behaviour when transferred into the River Thames.
- Further consideration of the time needed to implement the option. A lead time of 10 years has been assumed for the STT option in programme appraisal to allow sufficient time to enter into agreements with third party providers of support options, obtain planning permission through the Development Consent Order (DCO) process and construct the necessary infrastructure for the option to operate, potentially using the Direct Procurement for Customers (DPC) route. This lead time is assumed to apply following completion of the programme of investigations proposed above which the EA considers is likely to take up to four years to complete. The lead time for the Severn Thames transfer is therefore likely to be as much as 14 years. However, the investigations may also impact upon this lead time, for example if the investigations conclude that the timescales for completing the required changes to River Severn regulation cannot be accommodated within the timescales for development of the scheme – it is important that there is certainty on the regulatory changes before DPC contracts are awarded.
- Further work will also be undertaken in relation to mitigation for spread of INNS. The STT design currently includes water treatment for this purpose as described above.

Thames Water will continue to consider the risk of spread of INNS associated with the STT as the option is developed and further information about INNS risk assessment requirements become available from the EA.

230. Appendix XX provides scopes for the following three areas of investigation:

- Further investigation of the magnitude of water losses in the River Severn. This scope was developed by HR Wallingford[25].
- Scoping of environmental investigations and survey requirements for the STT support options.
- Scope for algal studies for the Severn-Thames transfer developed by the Centre of Ecology and Hydrology (CEH).

231. For further information about these studies please refer to revised draft WRMP19 Appendix XX.

232. Further information is given below about the scope of work required for the remaining areas of investigation listed.

Water Availability and Deployable Output

233. A considerable amount of work has been undertaken to establish the likely DO of partially and fully supported STT options. This work was undertaken by Atkins and is appended to the Raw Water Transfers Feasibility Report which can be found in the WRMP document library on the website www.thameswater.co.uk/wrmp. The stochastic modelling work completed considered the likely DO of individual support options and the results were processed outside the model to provide an estimate of DO for various combinations of support. The next stage of this work is to model specific combinations of support, taking account of the assumptions on losses that are confirmed through the further investigations proposed.

234. This work will also need to take account of potential changes to the "Hands-off Flow (HOF)" that would apply to the abstraction at Deerhurst that have been identified by the EA in their response to the consultation. These changes to the HOF have the potential to substantially reduce the deployable output benefit of the unsupported flow element, which would adversely impact the cost effectiveness of the STT.

Working with EA, NRW and River Severn Working Group

235. We continue to work collaboratively with other parties to examine technical issues such as standardisation of the River Severn data sets and models, and refinement of the conveyance losses that should be assumed during transfer - we have assumed 20% losses at this stage.

Working with third party support option providers

236. Severn Trent, United Utilities and Thames Water have established a consortium to collaborate on the development of the STT. The consortium is open to other third parties to join who wish to contribute to the development of the scheme, either as beneficiaries, or as potential providers of resource. The group will develop a programme of work and associated "gates" to

[25] Whilst the study work for losses described in Appendix J has yet to be undertaken, we have investigated the sensitivity of programme appraisal to an increased loss assumption. The losses associated with water released from Vyrnwy, redeployment of Shrewsbury abstractions and Minworth were increased to 30% in a special run of EBSD.

respond to the proposals set out in Ofwat's Initial Assessment of Plans (IAP) in relation to development of strategic water resources for the South East. This is expected to include both development of the transfer pipeline and the development of resources required by donor companies to make water available to export.

237. We have included further details of the studies that we are undertaking on the STT, as well as other strategic water resource schemes, over the next few years in Appendix XX of the updated revised draft plan.

Transfers of water - Oxford Canal

Consultee issues – headline points

238. There were relatively few comments on the proposed transfer of water via the Oxford Canal and the comments that were received were brief, with the exception of the comments received from the EA. The EA raised a number of concerns about the availability of water, the environmental impact and the reliability of the scheme and stated that these require further work to be confident in the deliverability of the scheme.

Stakeholders

239. The EA raised a number of concerns about the feasibility, resilience and environmental impact of the water transfer via the Oxford Canal that need to be addressed. The EA also requested that TW identify alternative replacement schemes in case this scheme cannot be progressed as part of the preferred programme.

> *"We have significant concerns about… the Oxford Canal transfer option… due in 2030… The Oxford Canal option appears to make use of the same water that is shown as a resource in Severn Trent Water's preferred plan. We are also concerned about the reliability of the option in drought events and the impacts on the environment." (EA)*

240. In addition a few other organisations raised concerns - BBOWT asked for detailed appraisal of the impacts of the scheme on Sites of Special Scientific Interest and Local Wildlife Sites, and to take mitigating measures to achieve a net gain in biodiversity. Historic England (HE) requested mitigation measures to protect heritage assets.

241. Supportive responses were received from the Canal and River Trust (CRT) who welcomed the advancement of the scheme and Group Against Reservoir Development (GARD) who suggested that the scheme should be moved even further forwards, so that it could then meet Affinity Water's needs, in combination with other early schemes.

Customers

242. Customers broadly supported the transfer of water from the Midlands using the Oxford Canal, with some participants assuming that this kind of water transfer already took place.

Our consideration of the feedback

Overview of the resource option

243. The Oxford Canal raw water transfer option included in the revised draft WRMP19 preferred programme involves the transfer 15 Ml/d of water from the canal network in the Midlands via various canals including the Oxford Canal to the River Cherwell, which flows into the River Thames at Oxford. The transferred water would be abstracted into the existing reservoirs located to the west of London to supply water to customers in London.

244. The water would be sourced from the Birmingham Canal Navigations (BCN) hydrological unit of the canal network. This unit has 14 reservoirs (including Chasewater Reservoir) and two groundwater sources (Perry Well and Bradley Borehole). The water would be transferred to the River Cherwell through the canal network (including the Coventry and Ashby Canal and

the Oxford Canal). Alterations would be needed in the canal system to make the transfer possible, including new pumping facilities and lock bypasses; however, water levels in the canal system would remain within existing operating ranges and bank raising would not be required.

245. The CRT proposed this option to TW as a commercial arrangement in 2017. CRT has undertaken modelling[26] of the canal network to confirm the availability of the 15 Ml/d of water for transfer and we assessed the option in the Raw Water Transfers Feasibility Report[27]. Further discussions have been held with CRT to understand the location and scale of alteration works required within the canal network.

246. The information provided by CRT informed more detailed assessment of the option and the option passed feasibility and fine screening and was included on the Constrained List. A Conceptual Design Report[28] was produced, and the SEA and WFD assessments for the option were completed, in common with all options included on the Constrained List.

Work completed since Autumn 2018

247. In the further public consultation on the revised draft WRMP19 the EA raised a number of concerns about this option. In response TW and CRT have undertaken further work, and discussed this with the EA, including:

- Further investigation of the availability of the water
- Development of scope for further environmental investigations

Water Availability

248. CRT has confirmed that the 15 Ml/d offered to TW is not currently under consideration by other water companies.

249. Further work was undertaken using the existing CRT water resources model to validate the yield of the option. This work included investigation of the relative reliance on surface water and groundwater sources, the likely level of resilience and potential impact of climate change. A number of model runs were undertaken to test the sensitivity of the model in various scenarios; the approach followed was considered to be proportionate to the size of the option.

250. The results of the modelling indicated that the option would be resilient to a 1 in 200 year drought event providing CRT can abstract the full licensed volume at their groundwater sources. It is also likely that the option would not be significantly impacted by climate change partly due to the reliance on groundwater abstraction from sources that appear to be relatively resilient to climate change impacts.

251. The modelling has highlighted the importance of the CRT groundwater sources for the yield of this option and these have been further reviewed by TW. CRT has abstraction licences in place for both sources and therefore the likely yield is dependent on licence restrictions, physical constraints on abstraction (such as pump capacity) and potential environmental

[26] Putting the Water into the Waterways, Water Resources Strategy 2015-2020 available from the CRT website for more information about the model
[27] www.thameswater.co.uk/wrmp - see Document Library
[28] www.thameswater.co.uk/wrmp - see Document Library

impact of abstracting water above recent actual abstractions (determined through WFD assessment of relevant water bodies).

252. The work carried out to date has not provided definitive confirmation that a 15 Ml/d transfer will be available in all scenarios; however, it does provide confidence that the option should be investigated further with additional water resource modelling, review of groundwater sources and environmental assessment. This work will form the basis of an adaptive alternative option assessment alongside consideration of alternative options that could be brought forward if the option becomes unviable or a lower yield / Deployable Output is determined.

253. More detailed information of the work completed to date and responses to the specific concerns raised by the EA can be found in Appendix A - Response to the EA representation. The scope of further adaptive planning work is discussed below.

Adaptive Alternative Option Approach

254. Table 9 outlines the proposed scope of additional studies for the Oxford Canal transfer option which has been shared with the EA for comment. The work summarised in Table 9 and will be translated into a formal work programme once agreed. The adaptive alternative option approach is described in the updated Section 10 and Section 11 of the revised draft WRMP19, this sets out the approach to decision making to be made in 2022/23 which will determine whether to progress this option taking into account other water companies and regional-level plans which are likely to be in place before then.

Table 9: Draft scope of further work for the Oxford Canal transfer option

Further Work		Description
1	Additional water resources modelling	CRT is developing a new water resources model using current industry standard software. It has been agreed that the new model will be used to validate the predicted 15Ml/d yield. The new model is unlikely to be available in 2019, but this work will be completed as soon as the model is available.
2	Further investigation of borehole yields and likely licence restrictions	Review of potential licence restrictions based on additional WFD work. Consideration of need for additional borehole testing and development of scope, if needed.
3	WFD assessment related to canal water sources	Carry out WFD assessment of the WFD water bodies associated with the CRT groundwater sources, at a comparable level of detail to other WFD assessments of WRMP19 options.
4	Collection of additional water quality and other data to confirm impact on River Cherwell	TW, CRT and the EA to agree scope of additional data required to assess the likely impact of the option in more detail and to monitor the scheme when in use.

5	Optimisation of the transfer arrangement	Discharging the transfer into the River Cherwell at Cropredy could have both positive and negative impacts on water quality and ecology in the river at this point (depending on conditions in the river at the time of transfer). Further work on the way the transfer is discharged would reduce concerns and potentially provide some benefit to the river. This may lead to an option that discharges some transfer flow at Cropredy and the remaining flow downstream at Aynho / Nell Bridge where the Oxford Canal and River Cherwell currently interact. Any change to the discharge arrangement would have a cost impact that would also require assessment.
6	Development of provisional plan for transfer operation	The way the transfer is switched on and off will impact the canal system and the River Cherwell. Further work would provide provisional recommendations for operation to reduce impacts on water quality and ecology. This work would also inform permitting requirements and discussions to develop a commercial agreement between CRT and TW.
7	Commercial agreement between CRT and TW	Further discussions will be required to agree heads of terms for a commercial agreement between CRT and TW.

255. In response to the representation from BBOWT, as the scheme is progressed further, TW will assess the potential effects on relevant Sites of Special Scientific Interest and Local Wildlife Sites, and where necessary develop appropriate mitigation measures. As with all new supply schemes, TW is committed to seeking opportunities for net gain in biodiversity in line with the National Planning Policy Framework.

256. We note the comments made by HE that mitigation measures are likely to be required to protect heritage assets, we confirm that this will form part of the next stage of development of the scheme design. It is anticipated that the scope of works will include a new pumping station at the Grade II Atherstone Lock and the rebuilding of existing pumping stations at the Grade II listed Hillmorton and Napton Locks. The indicative project plan allows for a period of 12 months for archaeological studies pre submission of any planning application, including development of any necessary mitigation measures. TW and/or CRT will liaise closely with HE and other relevant stakeholders on the specific details of the proposed mitigation measures.

Abstraction and protection of vulnerable chalk streams and watercourses

Consultee issues – headline points

257. A number of stakeholder organisations expressed support for TW's ambition to reduce abstraction from vulnerable chalk streams and watercourses. There was also support to advance the reservoir to achieve this ambition earlier and to do more to address environmental damage caused by current licensed abstractions. However opponents of the reservoir proposed that there were alternative solutions to the reservoir that could help to protect vulnerable chalk streams and potentially achieve the same outcome, but sooner. Customers supported protection of vulnerable watercourses in principle, subject to the impact on their bills.

Stakeholders

258. A number of stakeholder organisations, mainly from environmental and river-related bodies (Action for River Kennet, Angling Trust, BBOWT, Colne Valley Regional Park, Newbury Angling Association, River Chess Association, South East Rivers Trust) welcomed TW's aspiration to protect vulnerable watercourses and chalk streams through reduction in abstraction where there is environmental degradation, with the Angling Trust raising specific concerns regarding the environmental quality of some of the Oxfordshire streams, and the development of the reservoir. A number of commentators urged TW to do more including bringing the reservoir forward even earlier in order to protect chalk streams sooner.

> *"We believe that the Abingdon reservoir makes a huge amount of sense as a regional resource. It will enable Thames Water to capture high winter flows in the River Thames, which transport millions of gallons of water that cannot currently be stored and are lost into the North Sea, to utilize during periods of water scarcity. It will also give an alternative resource for Thames Water to abstractions from chalk aquifers… thus reducing pressure on chalk streams. The reservoir would also provide increased resilience for both the environment and the economy from the potential effects of a severe drought. The reservoir will improve water resource resilience for several south east water companies." (Angling Trust)*

> *"TW's admirable commitment to cease abstraction which impacts chalk streams." (Action for River Kennet)*

259. Some respondents also highlighted that the reservoir could help to protect chalk streams in Affinity Water's area.

> *"It is good to see that the Abingdon Reservoir is also supported by Affinity Water who hope to benefit from the project by up to 100Ml/d, which would enable them to reduce abstraction from the chalk aquifers of Hertfordshire and*

Buckinghamshire relieving pressure on chalk streams such as the Ver, Chess, Lea, Miram, and Beame." (River Chess Association)

260. However GARD and opponents of the reservoir suggested that the reservoir is not the only solution that can help to protect the chalk streams, and alternative solutions could potentially protect the chalk streams sooner. Furthermore they argued that there is no urgency to build the reservoir as water supplies from the reservoir are not needed to protect chalk streams until the late 2050s.

"The Parish Council support the need to reduce abstraction from chalk streams. However, the reservoir will take 15 years to design and build and 3 years to fill; more resilient schemes such as the Severn transfer could be available in less than 10 years, with minimal environmental footprint and at less cost." (Steventon Parish Council)

"Affinity's needs can be met quickly and cheaply through other means. Pressure on chalk streams would be removed within 5 years, 15 years less than planned [with the reservoir]." (GARD)

Customers

261. A small number of research participants commented on the issue of chalk streams specifically, and environmental issues generally were top of mind for a significant minority of research participants.

"The last reservoir built in the South East was Farmoor in 1976 – since then the stresses on abstraction and water demand have increased substantially. The Abingdon reservoir is needed now. Why wait until 2037? That might already be too late to save already over-stressed chalk streams." (Household customer, OX16)

Our consideration of the feedback

Background

262. We recognise that some of our abstractions can cause environmental damage and we work closely with the EA and other stakeholders to investigate these abstractions and implement solutions, where it is agreed to be the right course of action.

263. Over the past 30 years we have made significant reductions in abstraction, around 100 Ml/d, under the EA led programmes - Alleviation of Low Flows (ALF) programme and the Restoring Sustainable Abstraction Programme (RSAP), now superceeded by the Water Industry National Environment Programme (WINEP).

264. These programmes have prioritised sites which have been designated for environmental protection, including Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Sites of Special Scientific Interest, but we recognise that other watercourses are sensitive to environmental damage.

265. The assessments to determine if reductions in abstraction are implemented are guided by the EA Catchment Abstraction Management Strategies and more recently the Water Framework Directive, and supported by targeted investigations of the hydrogeology, hydrology and

ecology. An important element of the assessment is determination of whether the solutions are cost beneficial. There are cases where it is not cost beneficial to make changes to abstraction, because the cost of replacement resources (needed to ensure that water supply can be maintained) together with the cost of the network enhancements (needed to ensure that water can be transferred from alternative sources to replace the one where reduction is being made) outweigh the assessed benefits. In these cases the solutions are not implemented.

266. Our revised draft WRMP19[29] includes sustainability reductions which have been agreed with the EA and included in WINEP, these are at Hawridge (on the River Chess) and Bexley (on the River Cray) as shown in Table 10. These will be subject to investigation and option appraisal. The WINEP also includes a list of sites that require further investigation and assessment which will be completed over the next 5 years by 2025. Further information on sustainability reductions and investigations is provided in Section 4 of the revised draft plan.

Table 10: Sustainability reductions impact on DO (Ml/d) (WINEP 3)

WRZ	Source	DYAA	DYCP	Year
London	Bexley	9.0	--	2024/25
SWA	Hawridge	6.8	6.9	2024/25

267. There is increasing recognition of the need to reduce abstraction from some vulnerable chalk streams and watercourses to ensure that all abstraction is environmentally sustainable, and in 2017 we made a long-term commitment to cease abstractions which were identified to be affecting vulnerable chalk and other sensitive watercourses, such as the Cotswolds streams.

268. The focus of the commitment is on those chalk streams and watercourses that are vulnerable and where abstraction has been shown to impact the river and the ecology. We have a large number of abstractions from the Chalk which are from the confined or semi-confined chalk aquifer that are therefore sustainable with no significant adverse impact on chalk streams.

269. This commitment is necessarily set over the long-term because of the potential volume of abstraction reductions that could be required and the need to develop replacement resources and/or make changes to the distribution infrastructure to facilitate them.

270. The detail of how to achieve these further reductions in abstraction needs development; however as a first stage we have identified sources where further reductions could be implemented to provide environmental protection if additional resources were available to facilitate it. The majority of the sites are groundwater abstractions in the upper reaches of potentially vulnerable streams but there are other sensitive sites which could potentially be improved.

271. We developed two scenarios which are described below and presented in Table 11.

272. Scenario 1 enables a reduction in abstraction of 34 Ml/d and includes changing abstraction licences at North Orpington (R. Cray); Waddon (R.Wandle) and Pann Mill (R.Wye). Investigations have previously taken place at these sources, there is evidence of adverse environmental impact, but solutions were assessed to not be cost beneficial at the time.

[29] Revised draft WRMP19 Section 4 www.thameswater.co.uk/wrmp

273. Scenario 2 enables a reduction of 77 Ml/d and includes all the reductions set out in Scenario 1 plus additional sources where investigations are ongoing as well as sources where investigations have taken place previously leading to abstraction reductions but where sources could be reduced further. These include Eynsford, Horton Kirby and Lullingstone on the River Darent, Marlborough and Clatford on the River Kennet and the Epsom sources on the River Hogsmill.

Table 11: Scenarios for reduced abstraction from vulnerable Chalk streams (DO Ml/d)

WRZ	Scenario 1		Scenario 2	
	DYAA (Ml/d)	ADPW (Ml/d)	DYAA (Ml/d)	ADPW (Ml/d)
London	15.97	23.87	28.46	38.3
SWOX	0	0	3.72	4.73
SWA	9.8	9.8	0	0
Total	25.77	33.67	67.75	76.7

274. The proposed development of SESRO in 2037/38 will provide temporary, but significant, surplus of water which would facilitate the reduction of existing abstractions. We have completed modelling which has shown that the preferred programme set out in our revised draft plan will facilitate the delivery of the reductions listed in Scenario 1.

275. Whilst we understand the call from stakeholders to advance the timing of the development of strategic resources to facilitate the earlier protection of vulnerable chalk streams, the opportunity to bring the reservoir completion date forward is constrained by the lead-in time, which for the reservoir is 15 years. Furthermore we have committed to complete further studies on all strategic options to provide confidence to our regulators and stakeholder community in our long-term approach. This decision will be taken in 2022/23.

276. It is correct that the reservoir is not the only possible solution to facilitate this commitment. There are some alternative solutions which could protect some of the chalk streams but these would be at higher cost. Furthermore the STT would also provide sufficient surplus, but our current assessment concludes that the STT provides better value as support in the longer-term, following the implementation of the reservoir.[30] This is a view supported by Affinity Water and WRSE.

277. Specifically in respect of the Oxford Watercourses, SESRO is the only strategic option which could benefit these sites. They have been identified as suffering from abstraction at Farmoor, the reservoir with a new intake downstream of where these distributaries re-join the River Thames would provide an opportunity to enable the abstraction to Farmoor reservoir to be moved downstream which would mean greater flow available for the valuable habitats on the Oxford distributaries.

278. Some stakeholders suggested that we should also consider protection of additional watercourses, specifically in Affinity Water's area. It would be possible to include

[30] Updated section 10 of our revised draft WRMP19

consideration of other chalk stream sources for reduction in the longer term but there is a limit to the amount of reductions that can be made without diminishing the volume of surplus resource available from any new option. Any potential reductions required by Affinity Water would need to be included in the potential longer term plans for chalk stream abstraction reduction.

279. This is a challenging commitment as it will need to be delivered at the same time as major growth in demand arising from significant population growth projected in south east of England and will need to be accommodated over the next 50+ years during a period in which the impact of climate change is expected to become increasingly acute. We will need to collaborate with the EA and other stakeholders to achieve it.

280. The CCG challenged whether our customers supported this long-term commitment. In response to the feedback from the CCG we completed research with customers on this topic. The objective of the research was to gauge their level of interest and appetite for investment to protect vulnerable watercourses and chalk streams. The findings[31] of this research indicated broad support from customers and provides in principle support, with further research needed with customers for our next plan to provide a robust business case for investment.

[31] Customer views on protecting vulnerable chalk streams and watercourses, Britain Thinks, February 2019 – written up in summary in Appendix T of the revised draft plan.

South East strategic reservoir option (SESRO)

Consultee issues – headline points

282. There were a large number of comments on the proposed reservoir, indeed most of the organisations who responded to the consultation had comments on the reservoir. In several cases it was their main reason for responding, particularly among opponents. The comments have been categorised into the following four topics:

- Support for the reservoir – these comments focused on the role of the reservoir in increasing resilience to drought and in protecting rivers, including chalk streams.
- Opposition to the reservoir - these comments were mainly from the local community including Parish Councils, and individuals located in the vicinity of the reservoir and campaign groups, GARD and CPRE
- Regional planning and the partnership with Affinity Water
- Financial gain to TW in developing the reservoir

Overall customers in the research workshops and the online customer community were positive about the proposed reservoir.

Support for the reservoir

283. There were a number of comments in support of the reservoir from river and angling-related organisations (Angling Trust, Colne Valley Regional Park, River Chess Association, South East Rivers Trust, Upper Thames Fisheries Consultative, Wild Trout Trust, Newbury Angling Association), some local authorities (GLA, London Assembly, South Oxfordshire District Council) and other organisations (CCWater, Bristol Water, London First). The two benefits that were fairly widely mentioned were the role that the reservoir would play in increasing resilience to drought and in protecting rivers, including chalk streams. Other benefits mentioned included opportunities to improve local leisure; opportunities to improve local transport; and increased flood resilience.

> *"We believe that the Abingdon reservoir makes a huge amount of sense as a regional resource. It will enable Thames Water to capture high winter flows in the River Thames, which transport millions of gallons of water that cannot currently be stored and are lost into the North Sea, to utilize during periods of water scarcity. It will also give an alternative resource for Thames Water to abstractions from chalk aquifers… thus reducing pressure on chalk streams. The reservoir would also provide increased resilience for both the environment and the economy from the potential effects of a severe drought. The reservoir will improve water resource resilience for several south east water companies." (Angling Trust)*

> *"We note that the approach set out in the TW preferred plan builds resilience into the use of water from the River Severn by introducing the South East Strategic Reservoir Option in advance, enabling water from the River Severn to be transferred and stored during periods of higher flows. We consider that this approach, of having reservoir storage in place prior to development of a bulk transfer, will help mitigate the risk of derogation or reduction in the*

reliability of the River Severn supply for existing abstractors, as well as protecting the Severn Estuary SPA." (Bristol Water)

"If TW or its neighbouring companies overly rely on demand management and do not secure the level of demand reduction they current plan and hope for over the next few years, the case for a strategically located new reservoir will only strengthen and become more urgent." (CCWater)

Opposition to the reservoir

284. As in the consultation on the draft WRMP there was strong, mainly, local opposition to the Oxfordshire reservoir and calls for a public inquiry. The main concerns included environmental impacts, visual impact, exacerbation of local flooding, and safety concerns. Whilst most opponents were opposed to a reservoir of any size in the proposed location, many cited the size and scale of the reservoir as exacerbating their concerns.

285. There were a large number of responses in opposition to the reservoir. The responses were mainly from individuals and organisations with a local interest and included Parish Councils located in the local area (Ardington and Lockinge Parish Council, Drayton Parish Council, East Hanney Parish Council, East Hendred Parish Council, Steventon Parish Council, West Hendred Parish Council), local and national campaign groups (GARD, Wantage and Grove Campaign Group, and CPRE) and over 200 individuals with nearly nine in ten of the online survey respondents providing an Oxfordshire postcode.

286. However it was acknowledged that the responses did not reflect consensus within organisations or among local residents. For example the following responses highlighted the lack of consensus.

"The Parish Council does not claim to speak on behalf of all villagers, and not all councillors hold the same views. However, there is a strong consensus that a project of such massive scale should, at the very least, be subjected to the proper scrutiny of a public enquiry." (Drayton Parish Council)

"Just want to say that I have no objection to the proposed reservoir. I think GARD is a group of extreme NIMBYs. They may be the most vocal, but do not represent the views of all residents." (Local resident)

287. In addition, several organisations raised concerns in relation to the reservoir but did not oppose it (Natural England, Historic England, BBOWT, Oxfordshire County Council, Vale of White Horse District Council).

288. A summary of the concerns raised about the reservoir is presented in Table 12.

Table 12: Summary of the main concerns raised in relation to the reservoir

Concerns	Reasons for concerns
Location	Why the site near Abingdon has been selected and given the impacts on

	local community and environment it was suggested that TW should demonstrate that alternative sites have been properly explored.
Environmental impacts	During construction – contamination of water during construction. After construction – large-scale and permanent loss of countryside, important for wildlife habitats and agricultural land; change to local micro-climate
Social and economic impacts	During construction – disruption from construction, e.g. noise and dust; local road infrastructure; negative impact on health of local people. After construction – negative impact on landscape and character of the area; safety risk from collapse of the reservoir; loss of farmland, homes, businesses; loss of archaeological remains; blight on house prices.
Cost	High cost compared to some other supply-side options.
Deliverability	Slow to deliver compared to some other supply-side options. Risk as a reservoir on this scale has not been built before.
Resilience	Increased flooding due to building over the flood plain. Damage to geology and aquifers underneath the reservoir. Drought resilience of the reservoir to long droughts and climate change and evaporation Sufficiency of water to fill the reservoir

289. A number of the concerns, for example those relating to the visual impact, safety risks, and impact on flooding, were exacerbated by size of the reservoir. Several stakeholders questioned the need for such a large reservoir, and some opponents felt that a smaller reservoir would be acceptable.

> *" I would not object to a small reservoir (like another Farmoor) here in the Vale where the water was all for local use." (Individual)*

290. In addition many opponents challenged the need for the reservoir citing over-estimations in demand forecasts and better alternative options.

291. Many opponents of the reservoir called for a public inquiry to examine the need for a reservoir and to consider their concerns about it.

> *"CPRE considers that a convincing case has yet to be made on the need, viability and consequences of this proposed development… If the reservoir proposals go ahead, the issues involved are sufficiently complex that a robust, independent review is required, to avoid concern about corporate, self-interested decision-making and to arrive at the most sustainable and cost-effective outcomes which have the confidence of local communities. CPRE therefore believes that a Public Inquiry is now essential." (CPRE)*

Regional planning and the partnership with Affinity Water

292. There were a number of comments concerning regional planning and specifically the partnership with Affinity Water.

293. There was positive feedback on regional planning and cooperation across the south east of England to improve resilience to the growing pressures on water from climate change and population growth and to protect the environment, natural habitats and wildlife (CCWater, Ofwat, EA). It was proposed that there is scope to increase collaboration and provide further optimised solutions to ensure the best overarching strategy for the region, and that TW needs to ensure its plans include the most up-to-date information from WRSE and demonstrate alignment.

> *"More strategic, regional planning should ensure that the water companies' plans are aligned and the development of any larger scale water resources can be agreed, planned for and delivered in a timely and appropriate manner and the potential benefits maximised. It should also ensure the costs associated with this investment can be shared and phased appropriately and thereby avoid bill shocks for consumers." (CCWater)*

294. However some stakeholders asked for reassurance that the reservoir is the optimal regional solution for the South East. The CCG drew attention to the need to seek customers' views about the implications of sharing the reservoir, e.g. about resources being shared fairly.

295. There were also comments about the uncertainty about other water companies' needs, specifically Affinity Water's needs particular as their needs form a key part of TW's case for the reservoir. Commentators suggested that it is premature to confirm the need to bring forward the reservoir, or even the need to include it in the plan at all and the importance of ensuring alignment with Affinity Water's plan. It was suggested that Affinity Water's needs do not justify bringing the reservoir forward in the preferred programme or making it as large as it is.

> *"Their needs have been overstated by Thames Water as being 100Ml/d, required in full by 2039. Based on Affinity's own figures for their more ambitious 'Alternative Plan' in their first draft WRMP, the deficit would still not arise until 2057 and be only 60Ml/d at their 2080 planning horizon." (GARD)*

Financial gain to TW in developing the reservoir

296. There were a number of other comments from respondents opposed to the reservoir which expressed concern that TW's main reason for building the reservoir was financial gain, to make a profit by selling water at the expense of local people who would experience the negative impacts of the reservoir.

> *"The proposed Oxfordshire reservoir is clearly not designed to meet the needs of the county but more that of Affinity Water... The idea that the proposed reservoir would have the capacity to serve other water companies in the South East should be examined carefully as it appears to be more profit motivated than meeting the actual need." (West Hendred Parish Council)*

"By bringing the reservoir forward creates a huge (240 million litres) surplus per day – water which can be sold on. Apart from Affinity, all the other water companies now have no requirement for additional future transfers from Thames Water and have made other arrangements from sustainable sources. Affinity's minor requirement can be easily met from other schemes. This suggests an act of pure commercial speculation." (Individual)

Customer

297. Overall customers in the online customer community and in the research workshops were positive about the proposed reservoir, citing the benefits of the reservoir whilst also recognising that it would have an impact on the local community.

298. Two thirds of online customer community indicated that they were positive about the plans for the reservoir, with one third specifically mentioning that they were favourable about the partnership with Affinity Water. They tended to mention the opportunity to share costs and also build on the skills and expertise in both companies. Some of those who were positive wanted reassurance that there would be a fair allocation of costs and benefits.

299. Whilst research participants were not asked for their preferred option or to rank the options in any way, the majority of the participants in the research workshops were in favour of the reservoir and identified it as the most popular of the new supply options. The reasons that the reservoir was preferred was due to its large yield, that it was a 'TW' source of water that didn't involve piping it in from other regions and that it offered benefits to the local society, the local economy and landscape, in terms of recreation, jobs and, once built and matured, a positive addition to the local landscape. There was some strong feeling at the Abingdon workshop with a significant minority of participants against the reservoir and one participant in Lechlade also opposed the reservoir. The concept of the reservoir being built in partnership with another water company was seen as a positive by most participants, although some wanted reassurance that the deal would be good for TW customers.

Our consideration of the feedback

Developing the reservoir option

300. The Abingdon site for the proposed SESRO was identified as the preferred site following an exhaustive, extensive exercise including an assessment of potential alternative sites that had regard to a range of property, legal, environmental, socio-economic, planning and engineering criteria. A site assessment feasibility report, which had regard to earlier studies undertaken, considered 55 potential locations for a reservoir within the catchment of the River Thames. The assessment involved a phased approach.

301. Stage 1 of the assessment screened out potentially unsuitable sites having regard to factors such as the thickness of the clay underlying the proposed site area as well as whether the proposed site areas included any internationally important designations such as Special Areas of Conservation and Special Protection Areas/Ramsar sites.

302. Stage 2 assessed the performance of each remaining potential site against a suite of land purchase, legal, environmental, socio-economic, planning and engineering criteria on a traffic light system, with the criteria rated Red, Amber or Green (RAG). These included

consideration of criteria such as: land acquisition costs; impacts on landscape designations; impacts on areas of biodiversity or nature conservation interest; impacts on heritage assets; impacts on water resources including potential Water Framework Directive impacts; change in topography across the site; flood zone encroachment and impact on recreation.

303. A range of sizes in terms of land area of potential reservoirs were considered as part of this assessment with the best performing sites categorised within three different land area bandings then taken forward for further assessment.

304. Stage 3 involved preparation of preliminary designs for those remaining site areas. These considered what alternative reservoir capacities could be accommodated. The range of reservoir sizes considered were 30, 50, 75, 100, 125 and 150Mm^3 (million cubic metres), although some of the sites could not contain some of the larger sizes. For the Abingdon site, two dual-phase options were also considered. For these, an initial development of a reservoir on part of the site was considered, with development of the rest of the site at a later date.

305. Stage 3 used the same RAG system as used in Stage 2 but considered the performance of the short list of sites in more detail and had regard to whether any identified issues or constraints could be mitigated or overcome.

306. Within Stage 3, a number of the performance measures considered in Stage 2 were examined in more detail using the preliminary designs. Additionally, a number of extra performance criteria were considered at this assessment stage including cost; complexity of construction; and opportunities for biodiversity improvements.

307. The output from Stage 3 was a summary for each site describing its performance against each criteria and overall conclusions. These assessments and conclusions were used to select the best performing sites within each of the reservoir capacity bands. From these assessments three feasible sites at a range of different capacity sizes were identified. These locations were Abingdon, Chinnor and Marsh Gibbon[32].

308. These reservoir options along with other large-scale potential water resource options were then considered within a Fine Screening Report, which compared these feasible options against other option types using six dimensions that recognise the inter-connectedness of the water cycle from source to tap covering a number of systems both man-made and environmental.

309. The six dimensions that were applied at the fine screening stage for all water resource options were:

- Environmental and social impacts and opportunities
- Cost
- Promotability
- Flexibility
- Deliverability; and

[32] Reservoir Feasibility Report, published on TW's website www.thameswater.co.uk/wrmp, for more information.

- Resilience.

310. The resulting output of the fine screening was a constrained list of option elements. The assessment undertaken at fine screening stage identified that the Abingdon site performed best out of the reservoir sites considered. The site has several distinct advantages which were not held in an equivalent combination by the other considered reservoir sites. These include proximity to the River Thames, limiting the construction and operation costs of the river-reservoir conduit and the emergency discharge channel, and suitable geology and topography.

311. As part of the resource option development process, consideration was given at fine screening to implementation of a series of smaller reservoirs at different sites (Chinnor, Marsh Gibbon and Abingdon) but this was found to be substantially less cost effective than either unphased reservoir development at the Abingdon site, or phased reservoir development at the Abingdon site. Furthermore development at multiple sites increases the construction impacts by impacting a greater number of people.

312. The conclusion of the fine screening process was that Abingdon is the preferred site in the River Thames catchment for each of the reservoir capacity bands.

Engagement and consultation

313. The initial reservoir site selection work was completed to support the preparation for a planning permission in 2007 and involved extensive engagement with stakeholders and the local community.

314. We continued the engagement with stakeholders throughout the development of the draft WRMP19. We engaged with stakeholders throughout the option appraisal process, sharing information on the methodological approach and output of the assessments for feedback and comment as the work progressed. An overview of stakeholder engagement undertaken throughout the development of our draft plan is presented in Appendix S of the updated revised draft WRMP19.

Extensive customer and local community engagement was undertaken as part of the development of the draft Business Plan and draft WRMP19 to ensure we understood issues and concerns, and addressed the points raised in our future plans including a Local Engagement Forums held across our supply area including in Abingdon in May 2017 and February 2018 and drop-in events held in Oxford and Steventon in April 2017 and October 2018. We also attended meetings with Parish Councils, District Councils and County Councils to brief them and to ensure we understood the views within the local communities which would be the most directly affected by development.

The size of the reservoir and selection in the preferred programme

315. The approach to determine the preferred programme, called programme appraisal, is presented in Section 10 of the revised draft plan and updated following the Autumn 2018 further consultation. The programme appraisal process selects a reservoir in the majority of the optimisation runs to meet the preferred planning scenario. It is also selected in the majority of the outputs of our performance testing (Adaptability, What-if analysis and enhanced resilience assessment using the IRAS-MCS system simulation model). The options selected by the modelling range in size from 100Mm^3 to 150Mm^3.

316. The smallest reservoir sizes were not selected for a variety of reasons, including being less cost efficient, for example, many aspects of the design would be required irrespective of the reservoir size, such as the river intake, tunnel, pumping station, railway sidings and emergency drawdown canal therefore, the relative proportion of the total cost taken up by these structures becomes greater for the smaller reservoir sizes.

317. Developing a single, smaller reservoir option would be inefficient use of the site, customer money and would effectively sterilise the site to future enlargement.

318. Phased development of a reservoir was assessed and this was concluded to be more costly and would prolong disruption during the extended construction phases. It was also considered an inefficient use of the site, due to the large proportion of potential stored water volume which would be lost because of the embankment that would be required between the first and second development phases.

319. In selecting our preferred best value programme, taking account of the future water requirements of Thames Water customers, the needs of the wider south east region, and the need to be resilient to drought, we have concluded that it would be prudent to develop the largest option for the SESRO site, in order to maximise benefit and resilience to future risks.

320. A benefit of providing additional water is that it would provide additional headroom to reduce abstraction from vulnerable chalk streams and watercourses, which is widely supported by environmental and angling stakeholders and our customers[33]. It also provides additional security of supply against future risks, such as further sustainability reductions, greater regional need from our neighbours, or higher demand due to potential future growth in the Cambridge-Milton Keynes-Oxford (CaMKOx) corridor development as currently proposed by government.

Regional Approach and Adaptive Planning

321. TW has worked collaboratively with the Water Resources in the South East Group (WRSE), an alliance of the six south east water companies, the EA, Ofwat, DWI, Consumer Council for Water, Natural England and Defra, with the aim to develop long term plans for securing water supplies in the South East. In March 2018 WRSE published a report “From Source to Tap: The south east strategy for water” which summarised the work completed to develop a sustainable and resilient regional strategy for water. As part of this work over 1,000 potential new options across the region were considered – from reducing leakage, increasing water efficiency and metering, to making better use of existing sources, or building new storage reservoirs and new water transfer pipelines – these options were proposed by the water companies based on their understanding and assessment of their supply areas. Following detailed modelling work, led by Jacobs, around 400 options were commonly identified as best value options, and within this shortlist there were 16 reservoirs and surface water abstractions including a large regional supply reservoir at Abingdon (South West Oxfordshire) and smaller, local ones at Havant Thicket (South East Hampshire), Broad Oak (Kent) and Arlington (East Sussex).

[33] Customer research on chalk streams, Britain Thinks, March 2019

322. Affinity Water has identified a need for 100 Ml/d of new resource in 2037/38. The programme appraisal process selects a preferred programme with construction of SESRO to meet this need; this is supported by both Affinity Water and WRSE.

323. Many of the WRSE companies (TW, Affinity Water and South East Water) have existing abstractions on the River Thames and/or infrastructure networks for distributing the water from these abstractions (Sutton and East Surrey). The location of SESRO, close to the River Thames and upstream of these abstractions, provides potential for other water companies in the South East to be supplied from this reservoir in the future.

324. SESRO is included in our preferred plan. We intend to complete studies and pre-planning for SESRO and Severn Thames Transfer in the next 5 years to address key uncertainties with the options that remain. The alternative options adaptive pathway approach described in the updated Section 10 of the revised draft plan allows the definitive decision to be made in 2022/23 in alignment with other water companies and regional-level WRMPs which are likely to be in place before then.

Timeline for the reservoir

325. The timing of water availability from the SESRO has moved forward from 2043 in the draft WRMP to 2037/38 in the revised draft WRMP. We have revised the timing based on new information on population projections, climate change, increased resilience and predicted water deficits in our region and across the South East, as well as addressing an earlier requirement for raw water from Affinity Water. Affinity Water requires a supply from the reservoir in summer 2038, so the completion date in order to deliver the supply is 2037/38.

326. Bringing the SESRO forward to 2037/38 also facilitates the reductions in existing groundwater and surface water abstractions which have a detrimental environmental impact on vulnerable chalk streams and watercourses. Detailed information is presented in updated Sections 10 and 11 of the revised draft WRMP.

327. Some respondents were in favour of delivering the reservoir earlier than 2037/38, however the programme developed as part of the conceptual design indicates that it is likely to take around 15 years from the decision being made to building the reservoir to the water being available. A definitive decision in 2022/23 would allow the reservoir to be delivered in 2037/38 but it is unlikely to be feasible to deliver the scheme any earlier.

328. Following a decision in 2022/23 it is expected that 2-3 years of investigations, site specific assessments and public consultations would take place prior to submission of a Development Consent Order (DCO) application to the Secretary of State. The DCO application would then be examined over a period of around 18 months before a decision would be made by the Secretary of State. Site activities would be expected to commence in 2028/29 with enabling activities such as environmental mitigation works, road diversions and access arrangements. Construction of the reservoir's embankments would be expected to start around 2 years later. Reservoir filling would commence in 2035/36 leading to water available for use in 2037/38.

Delivery of the reservoir and profiteering

329. The reservoir has been promoted in our revised draft WRMP19 as it is the most cost effective strategic resource, as well as providing resilience to drought and opportunities for wider benefits to the local community and the environment, and is the option that is most preferred

by our customers. The reservoir would provide a strategic storage and transfer hub for London and the wider South East, meeting the needs of Thames Water customers in London and the Thames Valley, as well as customers of the other water companies in the south east. It would be jointly promoted as a shared resource, and the required investment is likely to be raised under Ofwat's Direct Procurement for Customers approach and as such it would not be directly financed by the water companies involved, and Thames Water would not sell water to the other water providers in the South East. The assertion by some Stakeholders that Thames Water would sell water to other water companies and thereby profit from the scheme is therefore erroneous.

Disruption to local communities

330. We have engaged with local communities directly, through Parish Councils, District Councils and the County Council as well as receiving a large number of responses from local residents in opposition to the reservoir as part of the public consultation and further consultation. We have listened to the issues of concern of the local communities.

331. It is inevitable that there will be disruption during the construction of the reservoir and we understand the concerns raised; we will work with the local community to manage this if this scheme is promoted. We will carry out further site specific assessments along with statutory and non-statutory consultation in order to further the design and development of the proposed scheme. This will include considering the needs of existing land owners, local residents and local interests.

332. The conceptual design includes measures to mitigate potential disruption, such as development of new railway sidings for importing of sands, gravels and rip rap (rock for embankment wave protection) thereby avoiding road traffic impacts as much as possible. As part of the development of the scheme and planning application there would be more detailed work on the construction and design of the scheme, in consultation with the local community to ensure we understand and address local issues and concerns as far as we are able to.

333. For the SESRO proposal, the consenting route will be via the submission of a Development Consent Order (DCO) application to the Planning Inspectorate as the proposal would be a Nationally Significant Infrastructure Project (NSIP) as defined by the Planning Act 2008.

Recreational opportunities

334. New opportunities will be created for access, recreation and amenity provision within and around the reservoir. Such measures will be developed in close dialogue with regulatory bodies, planning authorities, interested stakeholders and local communities. Further engagement with stakeholders will be undertaken as part of any development of this option.

335. It is expected that the SESRO development will include a comprehensive range of facilities to enable conservation, access and recreation within and around the reservoir. Based on engagement previously undertaken, it is envisaged that such facilities could include:

- Visitor Centre with facilities to accommodate schools study centre;
- Water based activities including boating;
- Footpaths;
- Rehabilitation of part of the Wiltshire to Berks canal;

- Habitat creation including wetland areas;
- Landscaping and tree planting;
- Fishing and angling;
- Equestrian Centre and associated bridleways; and
- Woodland & scrub/grassland areas.

336. It is noted that some respondents raised concerns about the potential for floating solar panels on the reservoir which would inhibit its recreational use. At present it is not envisaged that the reservoir surface will be covered by such panels. Such panels have been installed over a small portion of the surface area of some of Thames Water's existing reservoirs, as their deployment is limited by a range of operational issues at reservoirs. Although the option to install them at the SESRO remains open and will be considered, the extent of any such installation will be subject to dialogue with stakeholders including potential recreational users, as well as landscape and environmental considerations.

Visual impact

337. Whilst we recognise that some local landscape features would be lost during construction, sensitive design and landscape treatments around the new reservoir will be adopted. Such treatments have the potential to integrate the reservoir into the wider landscape through ground re-profiling, extensive planting, forming new hedgerow and woodland links and grassland. The reservoir will not look like a 'wall' but a grassed and planted gently-sloped embankment, extensively landscaped in order to appear as natural as possible.

338. The extent of landscaping at the reservoir will be more extensive than at any other Thames Water reservoirs for example the existing Wraysbury Reservoir visible from the M25, or Farmoor Reservoir. The outside slope of the embankment will be intentionally varied through the application of landscape (non-structural) fill. Further separate bunds will also be constructed to offer screening of nearby receptors from visual and noise impacts of construction and operational infrastructure.

339. There will engagement on the design of the reservoir including the visual impact and landscape opportunities.

Environmental and biodiversity benefits

340. We acknowledge the concerns regarding the loss of the arable farmland habitat as a result of the reservoir development, and the species this supports, particularly the bird assemblage.

341. The avoidance of sensitive habitats was a key component of the optioneering work completed when designing the reservoir layout, with landscape and ecology being one of the criterion assessed[34]. The proposed location of the reservoir preserves as much as possible of the Drayton to Venn Mill Green Lane and the River Ock landscape, while avoiding disturbance to Hutchins's Copse County Wildlife Site (CWS) to the south.

342. Work completed between 2005 and 2008 concluded that the habitats within the reservoir footprint ranged from neighbourhood value to district value, with only two areas being of higher importance; Hutchins' Copse CWS and The Cuttings CWS. Since then approximately

[34] Reported in the Stage 2 Preferred Scheme and Design Options Report 2007.

15% of the reservoir footprint has been converted to solar panel farming. Baseline ornithology surveys concluded that the main reservoir site was not unique within the local area in terms of its farmland bird assemblage. The survey work showed that 83% of the bird species were either common or very common in Oxfordshire according to the Oxford Ornithological Society county list, with the remaining 17% being uncommon-very rare (e.g. corncrake). Medium sized populations of great crested newt were recorded within the reservoir footprint, and other herpetofauna were widespread (e.g. grass snake). Other species in high abundance were badger, water shrew, harvest mouse and brown hare, however only small populations of water vole and low levels of bat activity were recorded. Aquatic species surveyed included macrophytes, macroinvertebrates and fish populations, of which the assemblages were considered to be characteristic of the watercourses surveyed. Small isolated populations of native crayfish were recorded.

343. A full review of local biodiversity record centre data will be required, and a suite of baseline surveys completed to establish the current habitat and species assemblages across the reservoir development site, and ancillary works areas, and the value of the populations recorded. This work will be needed to inform any DCO application and the scope of the surveys, methodologies and extent will be agreed with the necessary stakeholders and consultees, including Natural England and the EA. There will be opportunities for engagement and consultation throughout this work.

344. As part of previous engagement on the reservoir, biodiversity mitigation and compensation measures were considered[35]. This work will need to be reviewed to reflect any change in abundance and/or value of the habitats and species, or any new habitats and species recorded during the update baseline surveys (as discussed above). However, the package will likely include the creation of new areas of priority habitat, including dry and wet grassland, woodland, species rich hedgerows and reedbed. Some land within the reservoir site will also be allocated for arable farming and hedgerow planting would be undertaken across the site. Measures will also be taken to improve the habitat offered by the inner slopes of the reservoir. Introducing vegetation directly to the slopes is limited due to the fluctuating water levels that will be experienced during operation. Instead, small-scale undulations in the slope face, promontories and beaches at the summer reservoir level, and lagoons adjacent to the reservoir at the high water level mark, will be created.

345. To support the DCO, a full Ecological Impact Assessment will be completed in accordance with the latest assessment guidance from the Chartered Institute of Ecology and Environmental Management[36] and use updated baseline survey data. As part of the assessment, the importance of the ecological receptors that could be impacted by the reservoir development will be defined. This will involve consideration of designations, biodiversity lists and protected species status, as well as the habitat/species rarity, diversity and irreplaceability, and the geographic context of their importance. The results of the assessment including any significant adverse effects, and application of the mitigation

[35] Conservation, Access and Recreation workshop (2006) and Stage 2 Preferred Scheme and Design Options Report 2007
[36] CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine

hierarchy (avoid, mitigate, compensate and enhance) would be presented and discussed with relevant stakeholders and consultees, before the DCO submission.

Heritage assets and archaeology

346. Several stakeholders, and notably Historic England, raised concerns about the effects of the reservoir scheme on archaeological remains and heritage assets. As presented in the Strategic Environmental Assessment (SEA) of the revised draft WRMP, it is acknowledged that the reservoir scheme does present some risks to these features and we have been consulting with Historic England about these risks. In its representation on the revised draft plan (see details at Appendix D), Historic England welcomed the confirmation by Thames Water that the proposed programme of works for the reservoir includes a period of some 12 months for archaeological works prior to the submission of any application and that the mitigation measures will include a review of previous desk-based and field studies, further targeted field evaluations and targeted excavations alongside watching briefs during overburden stripping where archaeology has been identified, as a staged approach. Historic England also welcomed the proposal for further meetings between Thames Water, Historic England and Oxfordshire County Council to confirm mitigation measures as part of the detailed design process, and the use of historic landscape character assessment.

347. In light of the representations received, additional information has been added to Section 11 of the WRMP to summarise the archaeological effects of the reservoir in line with the findings of the SEA.

348. More detailed work will be carried out as part of the detailed design of the reservoir scheme as part of the planning application and EIA to assess the effects on both designated and non-designated archaeological features and to inform the development of specific mitigation measures in close consultation with Historic England, Oxfordshire County Council and other relevant parties, as set out in Appendix D.

Other effects of a large waterbody on the local environment

349. A number of local residents raised concern that the microclimate in the local vicinity could be altered by the development of the reservoir. Effects could arise both as a result of disruption of the local topography by the construction of the embanked reservoir on predominantly flat land, and the replacement of the existing ground surface by a large area of open water. Previous studies (2005-2008) included assessments of how the embankments might alter wind speed, humidity, temperature and shading in the local vicinity, and the potential to increase fog and frost related incidents. Modelling and engineering studies involving an analysis of wind characteristics, predictions of wave generation and an assessment of their possible effects were carried out and the outputs used to inform the embankment design. Preliminary findings suggest the impact of the reservoir will be minimal, however mitigation may be required to improve road safety in areas where fog/frost related incidences increase once the reservoir is constructed.

350. In respect of nuisance of midges - aquatic bodies such as reservoirs and rivers provide a habitat for wildlife. Invertebrates such as midges and flies are an essential part of the ecology. The larvae are a food source for fish and amphibians and once emerged they provide a food source for birds, such as swallows and martins. A water body, such as the proposed

reservoir, is likely to increase the invertebrate population but not just of midges or mosquitos, it could also promote lace wings, sedge flies and Mayfly, and thereby promote biodiversity and increase the wildlife in the area.

351. A concern raised is that the midges will become a nuisance for local communities. Firstly, the reservoir layout has been designed to maximise the distance from communities based in Steventon and East Hanney, and therefore minimise potential nuisance. Secondly, due to the size of the footprint of the reservoir it is unlikely that they will occur outside the reservoir boundary, furthermore these flies don not hatch in more than a light breeze and do not have the same flying ability as blue bottles or house flies, or even fruit flies. Experience at Farmoor reservoir in Oxfordshire is that most of the fly life that occurs outside the reservoir boundary is from the River Thames, rather than the reservoir. However, Thames Water has experience of controlling nuisance midge populations at other reservoirs and will apply this knowledge and experience to the SESRO.

Fluvial and Surface Water Flooding

352. The SESRO will be built on some of the existing floodplain associated with tributaries of the River Ock and therefore flood compensation measures will be included in the design to avoid increasing the flooding risk. The SESRO footprint was developed to avoid encroachment within the floodplain of the main River Ock channel, however its footprint inevitably covers some existing watercourses to the south of the river and their associated floodplain.

353. As a requirement of the EA, floodplain compensation needs to be provided for the loss of flood storage which falls within the proposed SESRO area. The UK government guidelines also recommend allowing for an increase in flows of 25% to allow for climate change up to 2115 under the Central allowance category. Hydrology and hydraulic modelling of the River Ock, its tributaries, and its floodplain has been undertaken. An overview of the investigations and proposed solutions can be found in the Flood Technical Note[37].

354. Work completed to date indicates that the effects of building on the floodplain can be mitigated within the site boundary, and a further comprehensive Flood Risk Assessment will be undertaken to support an application made for a DCO for the SESRO scheme. This will build on the flood management analysis completed to date and will be carried out in consultation with the EA. Other options for the compensation for floodplain loss either instead of, or in addition to, those included in the current scheme could also be considered.

355. TW engaged with the EA when the preliminary design of the reservoir was being developed, and more recently to consider any overlap with the adjacent site under consideration for an EA Flood Storage Reservoir on the River Ock. Both of these schemes can be developed with some minor modifications to the preliminary designs to take account of the other scheme. The EA has confirmed to GARD that the SESRO would not be permitted to proceed if the detailed design of the scheme were to increase flood risk in the area. The assertion that the reservoir will increase flooding is therefore erroneous.

356. In conclusion, taking account of climate change, flood compensation will be developed as part of the scheme to more than compensate for the loss of flood plain caused by construction of

[37] Thames Water, SoR No 2, Appendix K – Technical note on resource options addressing stakeholder comments

the SESRO, with the objective of reducing the flood risk below what it would be if the scheme were not developed.

Groundwater Flooding

357. Although the site is underlain by highly impermeable clay strata, above this there is currently a varying depth of variable superficial deposits just below the topsoil. Where this is permeable it can contain groundwater which typically flows from south to north across the site (broadly following surface and fluvial water flow direction). Over the reservoir footprint (including embankments), this superficial strata will be removed, and the reservoir embankment will block groundwater flows through the superficial deposits. Without mitigation, this could cause groundwater levels to rise within the superficial deposits' aquifer in the area to the south of the proposed SESRO. Mitigation has therefore been included in the conceptual reservoir design.

358. We note that concerns have been raised about the impact on local groundwater due to seepage from the reservoir, or due to the weight of the reservoir compressing the underlying clays.

359. The net increase in weight applied to the existing bedrock clays which is caused by the new embankments and impounded water will compress the clay immediately below them. This will lead to the release of some pore-water within the bedrock clay over a prolonged period, but the resultant flow rate will be small compared to other local water flow sources and will not cause flooding.

360. Seepage rates from the reservoir during operation will be very low as nearly the entire reservoir bowl (both retained natural ground and the impounding embankment) consists of highly impermeable clay. The superficial materials will be removed over the entire reservoir before the embankments are built and used for landscape fill. The seepage flow rate has been assessed and will be small when compared to natural local groundwater flows, and will not increase the risk of flooding. Mitigation measures to address impacts on groundwater flows in the superficial deposits will also intercept any lateral seepage from the reservoir.

Mitigation of floodplain loss and groundwater impacts

361. TW recognises the concerns in respect of flooding to local communities and can confirm that the SESRO has been developed considering its impact on water flows, particularly flooding. The design includes:

- Diversion channels to east and west, picking up and diverting existing watercourses to either side of the reservoir. These will be natural channels, specifically designed to maximise ecological benefits whilst retaining adequate hydraulic capacity
- Floodplain compensation to replace that lost to the reservoir, including allowance for climate change
- A groundwater drain to counter the 'blocking' impact of the reservoir on flows through the superficial deposits

362. This combination of measures will be developed further in consultation with stakeholders and local communities but is expected to mitigate the changes to local hydrology and hydrogeology caused by the reservoir.

Substation flooding risk

363. There is a substation towards the south east side of the proposed reservoir, which currently sits outside the floodplain. TW can confirm that its susceptibility to flooding will not be increased by the works. It will be by-passed by the proposed eastern bypass watercourse and this will be designed specifically to ensure the substation is protected from flooding, through the inclusion of a bankside flood protection bund.

New housing developments in the locality of the SESRO

364. In response to the further consultation on the revised draft WRMP a number of comments have been made associated with insufficient consideration of new and proposed housing developments in the locality of the SESRO. TW can confirm that a review has been conducted to identify new and proposed developments and to review the implications. The findings are summarised below:

- Within the Strategic Environmental Assessment (SEA) accompanying the revised draft plan[38] regard is given to population / housing and future changes under Objectives 2.1, 2.3 and 6.1. It is considered that the potential new housing developments allocated in the VoWH Local Plan 2031 do not affect the assessments previously presented in the revised draft WRMP19 under these SEA Objectives.
- The residual effects on flood risk (SEA Objective 4.5) has been assessed as having minor adverse effects in the SEA after application of mitigation measures (in particular, after provision of flood plain storage compensation). None of the new housing areas or areas safeguarded for future housing in the Local Plan or Neighbourhood Plans are on the floodplain or overlap with the proposed flood storage compensation forming part of the SESRO scheme. No further flood risk assessment work associated with the SESRO is considered to be needed at this time due to the location of new and proposed housing. However, during future design development, further work will be needed to confirm floodplain compensation requirements and this should acknowledge any actual new housing developments and any potential remaining housing allocations contained in the Local Plan.
- A new housing development has been identified north of Drayton that, whilst located outside of the proposed SESRO land acquisition area, is located over the indicative route of a tunnel running from the proposed SESRO to the River Thames at Culham. During future design development consideration will be given to the feasibility of realigning the tunnel to the north of the recent housing development.

Reservoir safety

365. The construction, maintenance, operation and discontinuation (demolition) of large reservoirs in England and Wales are subject to the Reservoirs Act 1975. This provides a comprehensive statutory framework to ensure the proper management of such reservoirs for public safety, particularly ensuring that appropriate engineering competence is applied throughout each reservoir's life cycle. This statutory framework has proved effective, with no loss of life due to reservoir failure in the UK since the Reservoirs Act 1930 (a predecessor to the 1975 Act) came into force.

[38] Appendix B revised draft WRMP19 www.thameswater.co.uk/wrmp

366. The Reservoirs Act requires that an individual Construction Engineer is appointed, to supervise all aspects of the design, construction and commissioning of the reservoir in relation to public safety. Three years after its construction is completed, that engineer may sign certificates confirming the reservoir's adequate performance, which initiates a framework of supervision and inspection by other appropriately qualified engineers throughout the operational life of the reservoir. The Construction Engineer and those who subsequently supervise and inspect the reservoir must all be appointed to appropriate reservoir engineer panels, by the Secretary of State of DEFRA.

367. The design for the SESRO which has been developed to date has involved reservoir engineers and geotechnical experts who have experience in the design, construction and inspection of embankment reservoirs of comparable scale around the world.

368. Although the SESRO would be the biggest reservoir operated by Thames Water, the framework for managing its maintenance and operation will be in line with Thames Water's existing reservoir portfolio. Thames Water has a dedicated team of reservoir engineers who manage these assets and also contribute to developing guidance and standards for reservoirs throughout the UK. It is therefore well-placed to manage the safety of the SESRO, with experienced personnel and established procedures already in place. GARD's assertion to local residents that the reservoir would be unsafe is therefore erroneous, ill formed and highly misleading.

Terrorism

369. All water infrastructure, including reservoirs pose terrorist targets and their security management takes account of this. A security management plan for the SESRO will be developed as part of its detailed design. Some of the infrastructure, including pipework, tunnels and pumping station, are susceptible to malicious damage and it is expected that these will not be accessible to the public. However, such security concerns need not rule out public access to most of the reservoir embankments and crest, as is the case at other major reservoirs around the UK. Large, well-engineered earthworks embankments are inherently robust due to their scale.

Reservoir size, type and precedents

370. The SESRO will be a 'non-impounding reservoir', which means that it will not impound a watercourse – instead it is filled via a tunnel connected to the River Thames. This type of reservoir is very common in the UK, particularly in the south and east due to the low lying topography in the region. For example, a large concentration of reservoirs of this type can be found around west London and in the Lee Valley, owned and operated by Thames Water.

371. Once constructed, the SESRO will be the largest such non-impounding reservoir in the UK as measured by volume. However, the hydrostatic pressure on the impounding embankments is only determined by the depth of water against it (rather than the volume of water stored). The depth of water to be impounded against the SESRO perimeter embankment is entirely typical for a large water supply reservoir. There are over one hundred other reservoirs in the UK with maximum earth embankment heights the same or higher than those proposed for the SESRO.

372. The reservoir will constitute additional load on the bedrock formations at the site. However, the scale of this additional loading is not unusual, being replicated by many large reservoirs

throughout the country. By comparison, much higher concentrated loads are often applied to such bedrock materials through construction of large buildings.

373. The reservoir is almost completely constructed by a cut and fill process, with clay excavated from its centre used to form the perimeter embankment (with unsuitable material, particularly upper 'superficial' deposits, used for landscaping the outside of the bank to give it a varying and more naturalised profile). This means that around 30% of its storage is underground.

374. The cut and fill process means that the maximum additional weight is applied to the bedrock under the perimeter embankment, as the clay removed from the centre of the reservoir has a density of about twice that of the subsequently stored water.

375. The preliminary design of the perimeter embankment incorporates shallow slopes, which helps distribute its weight to the bedrock clay below. Substantial stability modelling of the embankment has already been completed to confirm the foundation adequacy, and further works will be completed as the design is developed.

Drought resilience and reservoir recharge

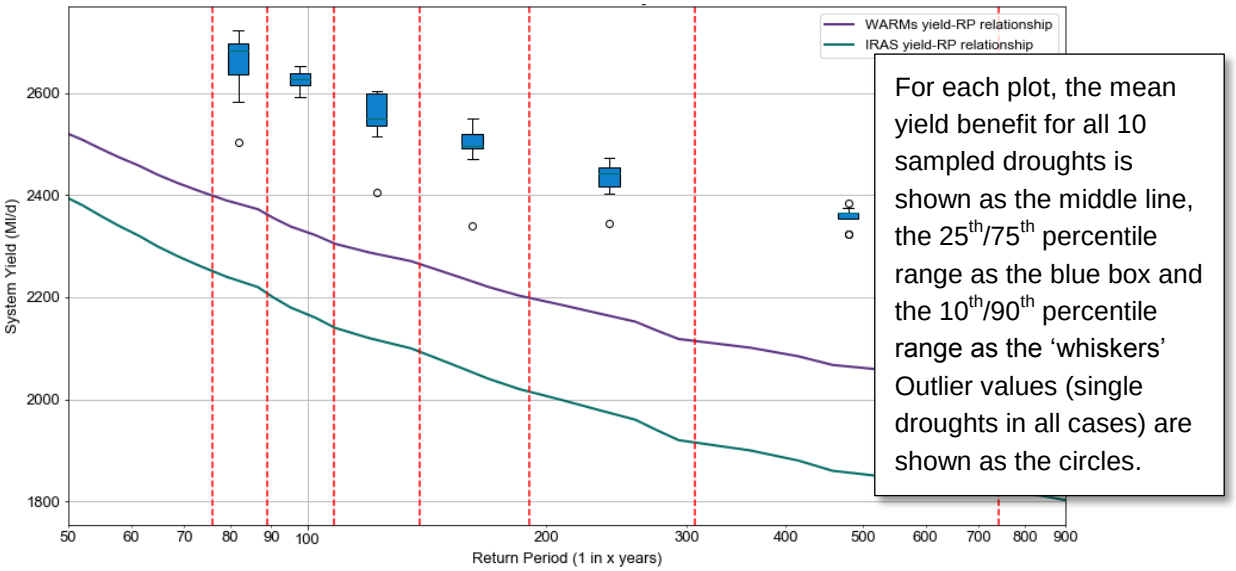
376. GARD has been critical of Thames Water's assessment of the resilience of Abingdon reservoir to long duration droughts. In response Thames Water held a stakeholder meeting, involving a number of organisations, to review the work completed to date and agree a revised methodological approach addressing GARD's concerns, as far as they were relevant. Using the revised methodology Atkins redid the work on behalf of Thames Water. GARD has stated that they did not agree the revised methodology and continue to argue that Abingdon reservoir "*would provide little true resilience to droughts in the sense of the ability to adjust to or recover from droughts more severe than the 1:200 year design standard. The true resilience of Abingdon reservoir to severe droughts is much less than any of the other option types available to Thames Water*."

377. The revised methodology that was adopted for this assessment was agreed by the stakeholders at the technical meeting (January 2018) that was held specifically to discuss the approach, including statisticians from the regulators. GARD did not have a credible argument against the proposed method, and the analysis that has been provided shows that there is no trend in yield risk with return period. In summary the methodology that was adopted:

- Transparently and randomly selected a proportion of the available drought data set and analysed them in a way that was practical for the main Thames Water modelling tool (WARMS2) to evaluate. The selection process was in no way biased towards 'proving' resilience - the process was randomised even to the point where droughts were numbered in a repeating process and the technical steering group decided in advance on the selection.
- The droughts that were presented represent a quarter of all drought events. Taking a sample of 60 droughts that represents a quarter of the population is definitely statistically robust.
- The method analyses the yield of all the droughts, which are representative of the full range of severity within the stochastic data set, and analyses the average yield within each severity band. Some of the long-term droughts generate low yield – this was expected (a rule of thumb of 10% of events had been expected prior to the analysis, so 3 out of 60 was lower than expected). The summary graph reproduced below

(Figure 4-5 in the DG10 Abingdon Reservoir Resilience Assessment Method report) shows that there is no discernible trend with severity, although each individual drought yield is variable.

- Crucially, as agreed at the technical steering group, if the yield does not demonstrate any trend with severity, then it is reasonable to use the average yield as being representative for that severity range. The reason for this, as explained in the DG10 report, is that return periods of events then effectively swap themselves around depending on the yield of the overall system (i.e. the new, combined London-SESRO system). In other words, the severity of each drought needs to be viewed conjunctively ('in the round') and the yield of the system is the output it can achieve at a given level of severity after the reservoir is built, compared with the yield the system could achieve at that level of severity before the reservoir is built. By doing that the overall yield assessment of the option then produces exactly the same type of assessment as the analysis used on, for example, the Severn Thames Transfer. The assessed 283Ml/d is therefore no more or less valid than any other option.



For each plot, the mean yield benefit for all 10 sampled droughts is shown as the middle line, the 25th/75th percentile range as the blue box and the 10th/90th percentile range as the 'whiskers' Outlier values (single droughts in all cases) are shown as the circles.

The above analysis represents the individual results for each of the 6 libraries as a 'box-whisker' plot drawn at the mid-point of the drought severity range represented by the library. The yield is plotted as a net increase above the WARMS2 estimate of the average baseline DO covered by each of the drought libraries.

Emergency Storage

378. A number of respondents questioned the extent of the emergency storage allowed for in the SESRO. The Abingdon Reservoir emergency storage allowance has been taken off the total capacity of the reservoir, which equates to 30 days demand and includes a normal allowance for 'dead storage', water that it would be unadvisable to discharge back to the river due to water quality concerns. The Abingdon Reservoir usable capacity (141,000 Ml) provides support to London reservoir storage and Lower Thames Flow at Teddington weir combined with other strategic schemes and restrictions on customer demand in line with Levels of Service and the LTCD. This applies for 550 days or 18 months of drought conditions, before

the Abingdon Reservoir emergency storage (9000 Ml) is reached, after which the Abingdon Reservoir augmentation release ceases and its support for London reservoir storage and Lower Thames Flow at Teddington ceases. For extended, more severe droughts, emergency storage (9000 Ml) within the Abingdon Reservoir is preserved and support for London reservoir storage and Lower Thames Flow is provided from a combination of alternative strategic schemes and restrictions of customer demand in line with Levels of Service and the LTCD; the drawdown of the Abingdon Reservoir and the combined London reservoirs does not occur in parallel. The emergency storage at the Abingdon Reservoir therefore adds to that of the London reservoirs which have storage equivalent to 30 days demand.

New water

379. A number of respondents expressed concern that the SESRO does not bring “new water” into the catchment in the same way that other options such as the STT do. What the respondents meant by “new water” is unclear, but it is important to emphasise that the proposed reservoir helps us to manage droughts through storing water from wet winters (that would otherwise flow into the sea) for use during droughts - in this way the reservoir does capture "new water" that is not currently used for water supply.

Evaporation

380. Open reservoirs do lose some water due to evaporation. However, this will be a smaller impact on the Abingdon Reservoir when compared to say Rutland Water or Grafham Water, both of which have a surface area to volume ratio of around twice that of the proposed Abingdon Reservoir. Evaporation from all surface water sources is inevitable but does not form a fatal flaw in reservoir development. Both evaporation and direct rainfall into the reservoir have been taken into account in the water resource modelling.

Local transport infrastructure

381. The conceptual design of the reservoir includes access during construction by both new rail infrastructure and local road infrastructure.

382. The development of a new rail siding to the north of the Great Western railway line has been included within the conceptual design, largely to enable the import of sands, gravels and rip rap (rock for embankment wave protection) thereby avoiding road traffic as much as possible. The transfer of aggregates around the country by rail is not unusual for major infrastructure projects, and several large quarries which could provide the required volumes of aggregates have railheads to specifically enable this.

383. Recent assessment has confirmed that, despite the busyness of this rail line and the rail network in general, it is feasible to utilise the railway throughout the construction period to enable rail deliveries (based on the current timetable).

384. Electrification structures associated with the railway can be relocated as required to ensure clearance is maintained to the proposed siding. Such works and the connection of the siding to the main line would need to be undertaken under possessions of the railway line. It is envisaged that such works could be timed alongside others on the network to minimise disruption.

385. We recognise local plans for the potential construction of a new train station at Grove. The proposed sidings should not impact on the ability to install/ introduce a new station at Grove.

386. The design includes for the provision of a permanent access road as a spur from the A415 Marcham – Abingdon road to the site, located in the vicinity of the existing Gozzard's Ford Lane. It is recognised that traffic flows in the vicinity have changed since this arrangement was first identified and will continue to change between now and the construction of the reservoir, as local developments are built. The final arrangement of access roads will be developed in consultation with local authorities to mitigate the impacts of construction and operational traffic.

387. We have considered all the comments submitted in the further consultation and provided full and detailed responses to the points raised, we have not made any significant changes to the revised draft plan but have made some changes and additions to reflect key points, for example we have committed to undertake further work in response to points raised by the EA as presented in the new Appendix XX of the updated revised draft plan. For a full list of specific changes that have been made to the revised draft plan please refer to the Revised draft WRMP19 Update Note.

Deciding on the preferred programme

Consultee issues – headline points

389. Several stakeholder organisations identified aspects of the revised draft WRMP19 that they considered to be unclear or inconsistent. The EA suggested that, whilst they understood the approach adopted by TW, and did not have specific concerns about the technical methods and decision support tools used by TW in the development of the revised draft WRMP19, the programme appraisal and the decision making approach needed to be more transparent and accessible for stakeholders.

Overall customers were positive about the revised draft WRMP19.

Stakeholders

390. Several stakeholder organisations identified aspects of the revised draft WRMP19 that they considered to be unclear or inconsistent. Opponents of the reservoir and supporters of the Cotswold Canals Trust voiced distrust due to a perceived lack of transparency about cost information.

391. The EA recommended that TW should provide further clarity on the decision making process and that the programme appraisal should be rewritten to ensure the approach was clear and accessible for all stakeholders. They specifically asked TW to focus on a number of aspects including the development of the optimised demand management programme, the performance metrics and the use of these in informing the selection of the preferred programme, the selection of alternative programmes and the scenario testing completed.

> *"The explanation for the preferred programme is complex and not coherent. As a result we do not have confidence in the company's preferred programme. The lack of a clear narrative means the justification is not transparent to customers and stakeholders. Given the significance of the company's plan, with large investment required, we recommend the company rewrites the programme appraisal section of the plan to clearly demonstrate how and why it has selected its preferred programme." (EA)*

392. The EA also suggested that given the uncertainties in the revised draft WRMP19, mainly around Affinity Water's need for the reservoir, the environmental impacts and water availability for Deephams reuse and Oxford Canal transfer, that TW should develop an adaptive plan.

> *"We are aware that the company will need to undertake further assessments to understand the risks and feasibility of the options available to it. Given the potential risks around the preferred options and the lack of clarity in the decision-making, the company may need to revisit its preferred plan... We therefore recommend that the company produces an adaptive plan which shows clearly the alternative options, decision points, and how it is working on the alternative options alongside its preferred options, so it can adapt to the results of the studies as it completes them." (EA)*

Customers

393. Customers did not comment specifically on the decision making process but over half of respondents via the online customer community were generally positive about the plans as described. Furthermore, one in ten respondents indicated that they were happy with TW's engagement in relation to the plans, particularly about the willingness to review plans in the light of feedback and the perceived innovative approach. A small number of respondents were negative about the plans overall with concerns focused on whether the new plans would make up for the shortfall caused by the removal of Teddington DRA scheme, impacts on costs and contingency planning and a focus on the needs of London.

Our consideration of the feedback

394. Programme appraisal is the process by which we seek to address the planning challenges in our supply area, and taking account of the challenges across the wider South East region, and determine the preferred programme.

395. For many years, 'least-cost' was the primary factor advocated by regulators in devising the preferred programme. The preferred programme was the cheapest practicable solution to the planning problem. There is now wide support from regulators, stakeholders[39] and our customers[40], to develop best value[41] plans which take account of a wider range of factors over the long term including the environmental impacts of programmes, resilience to drought, and customer water management preferences, in addition to cost.

396. Accordingly, we worked with other water companies and industry regulators to develop a more advanced, risk based decision making framework and have applied this in developing our revised draft WRMP19.

397. It is a complex process and challenging to explain succinctly and clearly to stakeholders and customers, however we note the comments received specifically around the need to improve the clarity and transparency of the decision making process. We have responded to these comments and have reviewed and updated Sections 10 and 11 of the revised draft plan, and accompanying appendices W and X and support the suggestions received to put the programme appraisal and our preferred programme within an adaptive planning context.

398. We have continued to engage with regulators and interested parties as we have updated these sections. We have explained our approach and taken into account, where appropriate, their comments and feedback.

399. We have also sought peer review by sharing our analysis and decision making with a panel of recognised industry experts to provide a robust and challenging sounding board to our work in this area. Our Expert Panel considered the changes made were helpful in clearly articulating the approach and decision making process that was applied. Their commentary is presented in updated Appendix Y, this has been updated to take account of, and provide transparency about the most recent engagement.

[39] Technical Stakeholder Meetings, March 2016 and November 2016
[40] Customer research, Britain Thinks, September 2016
[41] WRPG (July 2018) Section 6

400. We also held a Water Resources Forum in March 2019 to present the additional work completed on adaptive planning and to provide the opportunity for stakeholders to understand how we have responded to the comments received during the consultation and to allow them to raise comments.

Overview of the changes we have made

401. We have updated Sections 10 and 11 of the revised draft plan, and accompanying appendices W and X to improve the transparency of the process followed and the decisions made.

402. We have included an Overview to Section 10 for those readers requiring only a summary of the key messages; this is also helpful in providing a framework for readers who do read the full detail of the Section.

403. We have added an additional section on the methodological approach to clearly explain the methods, tools and metrics we've used in programme appraisal and how they fit together as part of the overall assessment approach.

404. Our preferred programme, as presented in the revised draft plan, is unchanged. However, we have added further explanation including:

- Use of analytical methods and tools
- Generation and interpretation of the metrics including their role in decision making
- Formulation of the demand management programmes
- Identification of the alternative programmes
- Assessment of the uncertainty associated with options
- Role of system simulation modelling (IRAS-MCS)
- Performance testing - Adaptability assessment
- Performance testing – What if analysis
- Impact of performance testing on the preferred plan
- Selection of the preferred programme
- Sensitivity of the preferred programme to different futures

405. We have also clarified our selection of a preferred programme by putting our assessment in a wider adaptive planning context. We have taken the key decision points identified over the planning period and included a decision tree approach to help explain the choice of options available at those times and why we have made particular choices.

406. We have also set out the further studies that will be undertaken prior to 2022, the gated decision process, a monitoring plan and the wider planning framework – at a national, regional and local level that will be relevant for forward planning.

407. In summary, for further information on programme appraisal and the selection of our preferred programme, monitoring activity and further work please refer to our updated and new sections of our revised draft WRMP19:

- Section 10 – Programme appraisal and scenario testing
- Section 11 – Preferred Programme

- Appendix W – Programme appraisal methods
- Appendix X – Programme Appraisal Outputs
- Appendix Y – Report of the Expert Panel
- Appendix XX - Further work (New)

Our preferred plan – the highlights

408. Our first priority is to reduce waste. Demand management is the main focus in the short-medium term, comprising an integrated package including significant reductions in leakage (15% by 2025 and 50% by 2050), the metering of all water supply connections and an enhanced water efficiency programme. Demand management programmes will be undertaken across our area to 2050 with savings maintained to the end of the planning horizon.

409. Demand management on its own will not be enough and a twin track approach with resource development is required in order to be consistent with our general duty to develop and maintain an efficient and economical system of water supply.

410. We have supplemented the proposed demand management programme with strategic water resource development at key points in the planning period to 2030 (driven by the need to increase drought resilience to severe 1 in 200 year events), 2037/38 (driven by regional need for water resources) and the 2080s (to maintain security of supply in the long-term).

411. The leading strategic resource options are:

- Water reuse (at Deephams, Beckton or West London)
- Reservoir development (SESRO)
- Severn-Thames Yransfer (STT)

412. Desalination was considered, but has not been proposed as it is considered to be inferior on cost and environmental grounds, compared to the available re-use options.

413. Re-use is the leading option type able to be constructed in time to meet the need to improve drought resilience by 2030, The decision is whether to build a single larger plant at Beckton, or a smaller plant at Deephams, supported by smaller innovative groundwater schemes, smaller regional trades and transfers.

414. At 2037/38 the SESRO is the leading option to meet regional need across the South East and secure supplies in the medium term. It also will enable us to make changes to our abstractions to improve vulnerable chalk stream ecosystems and other watercourses in our supply area, including on the River Wandle, Wye and river Cray as well as the Lee (Amwell Magna Reach) and Thames (Oxford Watercourses).

415. Once SESRO has been fully utilised further options are required to secure supplies to the end of the planning period. Re-use, desalination and the Severn-Thames Transfer are all available to meet this demand. We favour the Severn-Thames Transfer (STT). A preferred programme featuring the construction of SESRO first, before a STT is a position supported by Affinity Water. The STT in isolation does not provide a resilient solution for them and is more expensive. This position is supported by WRSE.

E. Updates to our revised draft plan

416. We have not made any material changes to our revised draft WRMP19 in response to consultation representations and the availability of new information. We consider that the approach presented in our revised draft plan is robust and provides a secure, economical and efficient water supply to our customers over the planning period.

417. We have made minor changes to the text in our revised draft plan to provide additional information or clarity, or to correct minor changes to data and text and ensure alignment with our business plan. The specific changes that we have made to our revised draft WRMP19 (Technical report and appendices) are set out in the Technical Update Note published on our website www.thameswater.co.uk/wrmp, in addition we have updated some sections of our revised draft plan namely Sections 10 and 11 and Technical Appendices – A, W, X, Y and XX. Once our revised draft plan is approved by the Secretary of State all the changes included in the Update Note will be included in our updated revised draft plan and we will publish the final version of the plan.

F. Next steps

418. We will submit our Statement of Response No 2 and the updated sections of our revised draft plan to the Secretary of State for Environment, Food and Rural Affairs for consideration.

419. We recognise there remain a number of uncertainties with our plan, which is not unexpected in view of the long planning horizon and the major investment decisions that we, and the wider South East, need to take to ensure the ongoing security of water supply. As such we have committed to undertake further studies on a number of resource options to ensure we are fully confident in our strategy. The adaptive alternative options approach that we have presented in our revised draft plan allows for results of the programme of studies to inform the selection of strategic options that will be promoted as part of the best value investment programme.

420. The further studies will be completed by 2022/23 and undertaken in consultation with regulators, other water companies and third party organisations. They will include, but not be limited to:

- Deephams reuse scheme
- Beckton reuse scheme
- Oxford canal transfer
- Severn Thames transfer, and
- SESRO

421. We have committed to actively monitor and report our progress to give regulators and stakeholders visibility of the ongoing delivery of the programme of studies. This will be managed through our established Water Resources Forum and the associated technical stakeholder meetings and we will also produce an annual report on progress as part of the EA's Annual Review of the water resources programme. Full details of the outputs and monitoring plan are provided in the updated Section 11 of the revised draft plan.

422. To enable the schemes to be delivered within their respective lead times, without risk to the overall robustness of the plan, a decision will need to be made in 2022/23 which finalises the strategic water supply schemes for promotion and delivery. The timeline of this decision point in 2022/23 aligns with the programme defined by WRSE and by Affinity Water to confirm the strategic options that it will promote as part of its own WRMP. The 2022/23 date also aligns with the regulatory timetable for the next WRMP, i.e. WRMP24, and as such it will facilitate stakeholder and customer engagement and input to the decision making process through the statutory consultation process associated with the next set of WRMPs.

Annex 1: List of consultees

424. An email was sent to around 300 stakeholder organisations, 450 developers and over 250 individuals. The mailing list comprised statutory consultees; retailers; developers; stakeholder organisations and individuals who had expressed an interest in the public consultation on WRMP19 and had provided their email address; and respondents to the draft WRMP19 public consultation.

425. The following list comprises the stakeholder organisations and retailers who were contacted by email. Individuals have not been included in the list.

- Abingdon on Thames Town Council
- Action for the River Kennet (ARK)
- Advanced Demand Side Management Ltd
- Affinity for Business
- Affinity Water
- Albion Water
- Amwell Magna Loop
- Anglian Water
- Anglian Water Business (National)
- Anglian Water Services Ltd
- Angling Trust
- Ardington Parish Council
- Ash Catchment Partnership
- Aylesbury District Council
- Basingstoke and Deane Borough Council
- Basingstoke Canal Authority
- Berks, Bucks, and Oxon Wildlife Trust
- Beane and Mimram Partnership and all other rivers partnerships in the catchment
- Borough of Broxbourne
- Bracknell Forest Borough Council
- Brent Catchment Partnership
- Bristol Water
- Business Stream
- BU-UK
- BWTUC
- Cambrian Utilities
- Canal & River Trust
- Castle Water
- Catchment Partnership in London
- Customer Challenge Group
- Centre for Ecology and Hydrology
- Cherwell Catchment Group
- Cherwell District Council
- Chiltern District Council

- Chilterns Chalk Stream Project
- City of London Corporation
- City of Westminster
- Clear Business Water
- Colne Valley Fisheries Consultative
- Consumer Council for Water
- Cotswold Canals Trust
- Cotswold District Council
- Cotswold Rivers Trust
- Cotswolds AONB
- CPRE
- CPRE Oxfordshire
- Crane Valley Partnership
- Cray & Darent Catchment Improvement Group
- Creekside Discovery Centre
- Dacorum Borough Council
- Dartford Borough Council
- Department for Environment, Food and Rural Affairs
- Drayton Parish Council
- DWI
- Dŵr Cymru Welsh Water
- East Hanney Parish Council
- East Hendred Parish Council
- East Hertfordshire District Council
- Elmbridge Borough Council
- Environment Agency
- Epping Forest District Council
- Epsom and Ewell Borough Council
- Essex and Suffolk Water
- Evenlode Catchment Partnership
- Everflow Limited
- Fresh Water Habitats Trust
- Frilford Parish Council
- Fyfield and Tubney Parish Council
- Garford Parish Council
- Gloucestershire Wildlife Trust
- Greater London Authority(GLA)
- Greene King Brewing
- Greenwich Tertiaries Operational Catchment
- Group Against Reservoir Development (GARD)
- Grove Parish Council
- Guildford Borough Council
- Hermes
- Herts and Middlesex Wildlife Trust
- Historic England

- Hogsmill Catchment Partnership
- Horsham District Council
- ICE
- Iceland Ventures Limited
- Icosa Water
- Independent Water Networks Ltd (IWNL)
- Kennet Catchment Partnership
- Kew Foundation
- Kingston Bagpuize Parish Council
- Lakehouse
- LedNET
- Lee Valley Regional Park
- Lockinge Parish Council
- London Borough of Barnet
- London Borough of Bexley
- London Borough of Brent
- London Borough of Bromley
- London Borough of Camden
- London Borough of Croydon
- London Borough of Ealing
- London Borough of Enfield
- London Borough of Greenwich
- London Borough of Hackney
- London Borough of Hammersmith & Fulham
- London Borough of Haringey
- London Borough of Harrow
- London Borough of Havering
- London Borough of Hillingdon
- London Borough of Hounslow
- London Borough of Islington
- London Borough of Lambeth
- London Borough of Lewisham
- London Borough of Merton
- London Borough of Newham
- London Borough of Redbridge
- London Borough of Richmond upon Thames
- London Borough of Southwark
- London Borough of Sutton
- London Borough of Tower Hamlets
- London Borough of Waltham Forest
- London Borough of Wandsworth
- London Chamber of Commerce
- London Councils
- London Fire Brigade
- London First

- London Wildlife Trust
- Lower Lea Catchment Partnership
- Luton Lea Partnership
- Lyford Parish Council
- Marcham Parish Council
- Milton Parish Council
- Mole Valley Catchment Group
- Mole Valley District Council
- Montgomeryshire Wildlife Trust
- National Farmers Union (NFU)
- National Federation of Anglers
- National Flood Forum
- National Trust (London & SE)
- National Trust (Wilts, Gloucs)
- Natural England
- Natural Environment Officer
- Natural Resources Wales
- New River Group
- National Infrastructure Commission (NIC)
- North Wessex Downs AoNB
- NWGB
- Ock catchment partnership
- OFWAT
- Oxford City Council
- Oxfordshire County Council
- Oxfordshire Farm Advice Project
- Oxon Ray
- Pang Valley Flood Forum
- Peabody Trust
- Pennon Water Services
- Policy Connect
- Port of London Authority (PLA)
- Portsmouth Water
- Ravensbourne Catchment Improvement Group
- Ray Catchment Groups
- Reading Borough Council
- Regent Water
- Ridgeway Working Group
- River Chess Association
- River Colne Catchment Action Network
- River Lea Catchment Group
- River Loddon Catchment Group
- River Thame Conservation Trust
- River Thames Society
- River Wandle Community Catchment Plan

- River Wye Catchment Group
- Roding Beam & Ingrebourne Catchment Partnership
- Royal Berkshire Fire & Rescue Service
- Royal Borough of Kensington and Chelsea
- Royal Borough of Kingston Upon Thames
- Royal Borough of Windsor & Maidenhead
- Royal Parks
- RSPB
- RWE Generation UK
- Rye Meads Catchment Partnership
- Scotiabank
- Scottish Water Horizons
- Sevenoaks District Council
- Severn River Trust
- Severn Trent Water
- Severn Trent Connect
- Slough Borough Council
- South Buckinghamshire District Council
- South East River Trust
- South East Water
- South East Water Choice
- South Oxfordshire District Council
- South Staffs Water
- South West Water
- Southern Water Services Ltd
- Spelthorne Borough Council
- SSE Water
- St Helen Without Parish Council
- Steventon Parish Council
- Stort River Partnership
- Stratford Upon Avon District Council
- Subsea Desalination
- Surrey Hills AONB
- Surrey Wildlife Trust
- Sutton and East Surrey Water Plc
- Sutton Courtney Parish Council
- Swindon Borough Council
- Tandridge District Council
- TEC
- Thame Catchment Partnership
- Thames 21
- Thames and South Chilterns Catchment Partnership
- Thames Anglers Conservancy
- Thames Estuary Partnership
- Thames Rivers Trust

- Thames Valley Angling Association
- Thames Valley Chamber of Commerce
- Thamesmead and Marsh Dykes Catchment Partnership
- The Bank of Nova Scotia
- The Bank of Tokyo-Mitsubishi UFJ, Ltd.
- The London Lee Catchment Partnership
- The Lower Thames (Maidenhead to Teddington) Catchment Partnership
- The Rib and Quin Catchment Partnership
- The Water Retail Company
- Three Sixty
- UNISON
- United Utilities
- Upper Lea Catchment Group
- Upper Thames Catchment Management Sub Group
- Upper Thames Clay Vales
- Vale of White Horse District Council
- Water Choice
- Water Plus Limited
- Water2Business
- Waterscan
- Waterwise
- Waverley Borough Council
- Welsh Government
- Wessex Water
- West Berkshire Council
- West Hanney Parish Council
- West Hendred Parish Council
- West Oxfordshire District Council
- Wey Landscape Partnership
- Wild Oxfordshire
- Wildfowl and Wetlands Trust
- Wiltshire and Berkshire Canal Trust
- Wiltshire County Council
- Wiltshire Wildlife Trust
- Windrush Catchment Group
- Woking Borough Council
- Wokingham Borough Council
- WWF-UK
- Wycombe District Council
- Yorkshire Water
- Tidal Thames Catchment Partnership
- Zoological Society of London (ZSL)

Annex 2: Email advising of the further consultation

In February 2018 we published our draft Water Resources Management Plan 2019, this set out how we proposed to meet our customers' needs for water until the end of the century, support housing and economic growth, whilst protecting and improving the environment.

We ran a public consultation on our draft plan and asked for your feedback. We received over 540 responses to the public consultation, as well as other feedback from our customers. Thank you to everyone who took part.

In this email we explain our consideration of your feedback, the changes we have made to our draft plan taking account of your comments and new information, and the documents that we have published today (3 October 2018). We also provide details of the further consultation and engagement on our revised draft plan.

Our consideration of your feedback to the public consultation

We have published a report, called the Statement of Response (SoR), which sets out our detailed consideration of the feedback we received to the public consultation and the changes that we have made to our draft plan. The Statement of Response comprises a number of parts, as listed below, please go to thameswater.co.uk/wrmp to read and download these documents.

Statement of Response Overview - An overview of the feedback from the public consultation and a summary of our revised draft plan. This is attached to this email.

Statement of Response Main Report - This presents an overview of the consultation process, the responses received, the main issues raised in the consultation, our consideration of them and the changes made to the draft plan, both as a result of feedback and new information.

Statement of Response Appendices - These provide the full responses received to the public consultation and our detailed consideration of the comments raised. Responses submitted by an organisation have been attributed to that organisation. Responses submitted by individuals have been anonymised and given a unique reference number, this will be sent by separate email. A list of the SoR appendices is provided in the Document List attached to this email.

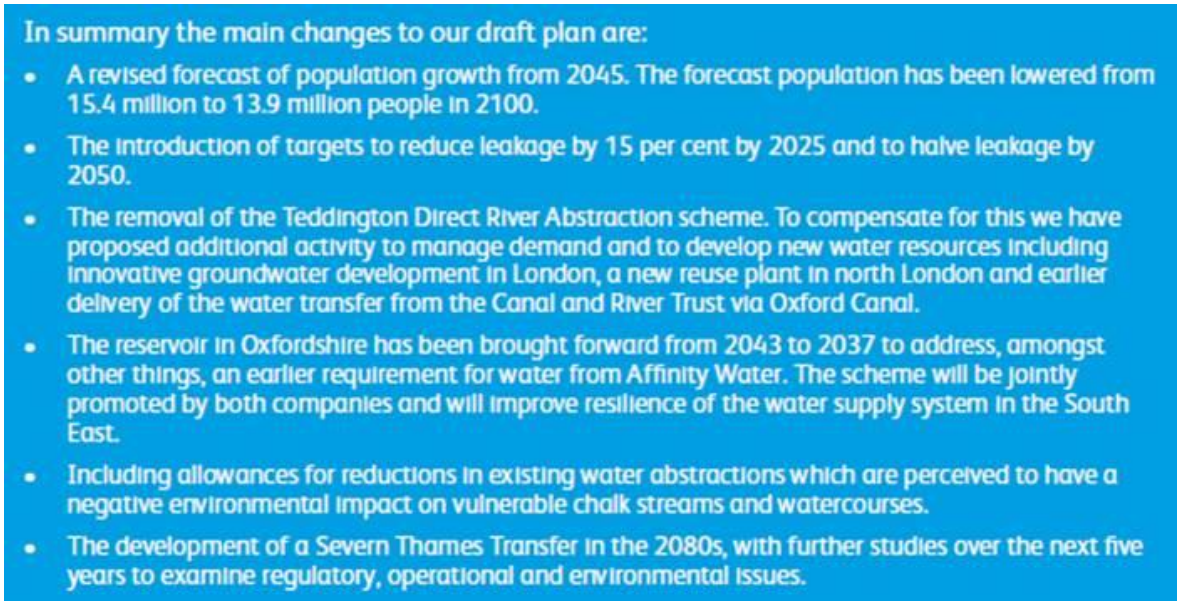
Revised draft plan

We have made changes to our draft plan in response to feedback and new information. The changes are clearly shown in the documents in highlighted text. We have published our revised draft plan on our website, please go to thameswater.co.uk/wrmp to read and download these documents. The revised draft plan comprises the following parts:

Executive summary

Technical report (Sections 1-11)

Technical appendices (Appendix A-BB).



We have also published new and updated technical reports. These include an updated feasibility report on transfers, environmental assessment of Teddington Direct River Abstraction scheme and the resilience assessment of the reservoir. These are available in the document library on our website https://www.thameswater.co.uk/sitecore/content/Corporate/Corporate/About-us/our-strategies-and-plans/water-resources/document-library/thames-water-reports.

A list of the revised draft WRMP19 documents, and new and updated technical reports, is provided in the Document List attached to this email.

Further consultation and engagement

Due to the changes we have made to our draft plan we have decided to provide an opportunity for further comment. We would like to hear any new comments that you have on the changes we have made. We request that you do not provide any comments on the plan where no changes have been made as these have already been addressed as part of the earlier consultation and our Statement of Response. **The period of further consultation is open from today, 3rd October 2018 for 8 weeks until 28th November 2018.**

Please send your feedback on the changes to our draft plan by:

We will also hold a local drop-in event and stakeholder meetings during the period of further consultation to give you a chance to talk to us about our revised draft plan. If you would like to be kept

informed of this further engagement, and future plans for water, please email: consultations@thameswater.co.uk

In spring 2019 we plan to publish an addendum to the revised draft WRMP19 setting out the consideration that we have given to representations received and any further changes required to be made to the revised draft WRMP19. Where we have not made any changes, the addendum will explain why that is the case, particularly if we have already addressed the matter in our Statement of Response.

We look forward to receiving your comments. Thank you for helping us to shape your water future.

If you have any questions or queries, please do not hesitate to get in touch by email consultations@thameswater.co.uk

Kind regards,

Dr Sarah McMath

Director of Strategy Planning and Investment, Thames Water

Please note you have been included in this email because you previously expressed interest in the Water Resources Management Plan (WRMP). If you no longer want to be included in further correspondence please email consultations@thameswater.co.uk and we will remove you from our mailing list.

Annex 3: Further public consultation questions

The consultation questions included in the online survey for the further consultation and also used with the customer online community are presented in the table below.

Consultation questions
1. In terms of managing demand for water, we have confirmed our commitment to reduce leakage by 15% by 2025 and put in place a new target of halving leakage by 2050 (see page 8 of the summary document embedded above). Please give us your comments about this change.
2. We have removed the Teddington Direct River Abstraction scheme. To compensate for this we have proposed additional activity to manage demand and to develop new water resources including innovative groundwater development in London, a new reuse plant in North London and earlier delivery of the water transfer from the Canal and River Trust via Oxford Canal (see pages 8 & 9). Please give us your comments about these revised proposals.
3. The reservoir in Oxfordshire has been brought forward from 2043 to 2037 to address, amongst other things, an earlier requirement for water from Affinity Water. The scheme will be jointly promoted by both companies and will improve resilience of the water supply system in the South East (see page 9). Please give us your comments about this change.
4. If you have any other general comments you would like us to consider please make them here, or upload your own document in the space provided.

Appendix A - Response to EA representation

Please see separate document.

Appendix B - Response to Ofwat's representation

Please see separate document.

Appendix C - Response to Natural England's representation

Please see separate document.

Appendix D - Response to Historic England's representation

Please see separate document.

Appendix E - Response to Natural Resources Wales's representation

Please see separate document.

Appendix F - Response to Customer Challenge Group's representation

Please see separate document.

Appendix G - Response to Consumer Council for Water's representation

Please see separate document.

Appendix H - Response to representations from stakeholder organisations

Please see separate document.

Appendix I - Response to representations from Individuals

Please see separate document.

Appendix J - Response to online representations

Please see separate document.

Appendix K – Technical note on resource options addressing stakeholder representations

Please see separate document.