WSX12 - Water resources strategy and investment

Business plan
2025-2030

Wessex Water
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WSX12 - Water resources strategy and investment

CONTENTS

This supporting document is part of Wessex Water's business plan for 2025-2030.

Please see 'WSX00 – Navigation document' for where this document sits within our business plan submission.

More information can be found at wessexwater.co.uk

For annexes, see supporting document WSX61

Executive summary

Safe and reliable water and wastewater services are essential for our day-to-day lives and wellbeing. There is a need to plan for the long-term, to adapt to a changing climate and reverse the degradation of the natural world, to protect the planet and the life it sustains. To meet these challenges, we have developed an ambitious long-term plan to deliver excellent customer services and enhance the environment for nature and people. Within the context of our long-term plan, we must invest in water resources to maintain a safe and reliable water supply, ensure we are sustainably abstracting water from the environment and deliver these affordably for customers. This document presents the investment required to achieve this, and includes work to maintain the current supply system, as well as enhancement investment required to improve the supply system and adapt it to new challenges ahead.

There are three principal areas for investment:

- Water Resources Management Plan (Water Resources Enhancement) – Investments required as a result of our water resources management planning process. Our previous WRMP produced in 2019 had a surplus of supplies over demand, however, as a result of significant step-changes in statutory and regulatory licence change requirements in the near term, our supply-demand balance now forecasts a significant 80Ml/d deficit by 2035 (20% of peak demand), rising to 130Ml/d (30% of peak demand) by 2080 as a result of additional demand growth. A significant driver for licence changes relates to the need to protect chalk catchments, notably the Hampshire Avon. We have developed an adaptive plan to meet these future needs, which is built on an ambitious and achievable demand management strategy that includes smart metering, leakage reduction and water efficiency visits for both households and non-households. These activities in AMP8, in particular focussing on the Hampshire Avon catchment, will help to reduce abstraction from the catchment in the short term, whilst supply-side schemes are developed in AMP8 under our core programme, ready for delivery in AMP9, depending on which adaptive pathway is followed. AMP8 supply scheme development is therefore required to keep future pathways open and adapt to uncertainties in licence change needs, and other uncertainties affecting the Hampshire Avon catchment.
- WINEP programme – the WINEP programme for water resources is required to investigate the sustainability of our abstractions, as identified by regulators, and driven by the Habitats Regulations, Water Framework Directive and Environmental Destination. Between 2025 and 2030 we will investigate over 24 abstraction sites and undertake assessments of the impact of climate change on abstraction across our region. In particular, this will include 10 actions for the Hampshire Avon. These represent key activities as part of the WRMP adaptive programme – investigations will narrow down uncertainty in understanding of future need, that will feed into decision-making about which adaptive pathways to follow for AMP9 to meet licence change needs in 2035. Additional investigations are also being undertaken relating to fisheries and geomorphology.
- Asset maintenance and management – our asset maintenance and management strategy is focussed on dams and impounding reservoirs, raw water pumping stations, raw water mains, boreholes and springs. This includes catchment management work undertaken for drinking water compliance. Between 2025-2030 we propose to expand our work on borehole and spring monitoring and maintenance to maximise output of our existing sources and minimise water quality issues. We will also carry out enhanced catchment management at 11 high risk nitrate sites to manage nitrate risk and mitigate the requirement for future nitrate removal schemes.

1. Introduction

Safe and reliable water and wastewater services are essential for our day-to-day lives and wellbeing. There is a need to plan for the long-term, to adapt to a changing climate and reverse the degradation of the natural world, to protect the planet and the life it sustains. To meet these challenges, we have developed an ambitious long-term plan to deliver excellent customer services and enhance the environment for nature and people. Within the context of our long-term plan, we must invest in water resources to maintain a safe and reliable water supply, ensure we are sustainably abstracting water from the environment and deliver these affordably for customers. This document presents the investment required to achieve this, and includes work to maintain the current supply system, as well as enhancement investment required to improve the supply system and adapt it to new challenges ahead.

The document is structured as follows:

- Section 2 presents the investment case arising from the Water Resources Management Plan (WRMP) – we have a statutory duty to prepare and maintain a WRMP every 5 years to feed into our business plan. The plan forecasts available supplies compared to demand over the next 55 years to 2080, and identifies the best-value investments required to meet future deficits.
- Section 3 explains the Water Resources WINEP investigations, and through this process the sources that are to be included for investigation in the next AMP period. The potential outcome of these investigations to understand the sustainability of our abstractions, is one of the main drivers of the WRMP process and associated investments.
- Section 4 presents the case for asset maintenance and management of our existing water supply assets including in relation to catchment delivery.

2. Water Resources Management Plan

We have a legal duty to produce a Water Resources Management Plan every five years to set out what we plan to do to ensure a secure supply of water for our customers and to protect and enhance the environment for at least the next 25 years. In 2022 we developed a draft Water Resources Management Plan (WRMP) and consulted on the draft of this plan for 12 weeks between November 2022 and February 2023. We prepared a statement of response report documenting all the representations made by stakeholders and our responses to them and produced a revised draft final plan.

This section summarises the revised draft WRMP document, its relationship to performance commitments, and the case for supply-side enhancement expenditure in AMP8. Please also refer to document WSX14 and annex 2 in document WSX15 for further information relating to the accompanying demand-side investments that result from the WRMP process. See document WSX61 - Our water resources management plan for the WRMP and links to supporting WRMP technical appendices.

2.1. Enhancement Case

Table 1 summarises the enhancement case for supply-side scheme investment as a result of the water resources management planning process, and provides cross references to sections of this document that address each of the points raised. The enhancement cases for smart metering, leakage and water efficiency investment that make up our demand management strategy are presented in document WSX14 as they are funded from the Supply Network plus price control, although the drivers for investment are derived from the WRMP.

Table 1 Enhancement case summary for WRMP supply-side scheme investment

	Requirement	See section	Comment
A1.1.1 Need for enhancement investment			
A	Is there evidence that the proposed enhancement investment is required (ie there is a quantified problem requiring a step change in service levels)? This includes alignment agreed strategic planning framework or environmental programme where relevant.	2.5.5	Supply-demand balance driver from the Water Resources Management Plan
B	Is the scale and timing of the investment fully justified, and for statutory deliverables is this validated by appropriate sources (for example in an agreed strategic planning framework)?	2.6.2	Agreed Strategic Water Resources Management Planning Framework. Primary Driver is statutory licence changes
C	Does the proposed enhancement investment or any part of it overlap with activities to be delivered through base, and where applicable does the company identify the scale of any implicit allowance from base cost models?	NA	There is no overlap with activities to be delivered through base activity
D	Does the need and/or proposed enhancement investment overlap or duplicate with activities or service levels already funded at previous price reviews (either base or enhancement)?	NA	There is no overlap with activities delivered through previous price reviews
E	Is the need clearly identified in the context of a robust long-term delivery strategy within a defined core adaptive pathway?	2.7	AMP8 activity for which supply-side scheme enhancement is required is included on the core adaptive pathway.
F	Where appropriate, is there evidence that customers support the need for investment (including both the scale and timing)?	2.9	See also document WSX04.
G	Is the investment driven by factors outside of management control? Is it clear that steps been taken to control costs and have potential cost savings (eg spend to save) been accounted for?	2.5	
A1.1.2 Best option for customers			
A	Has the company considered an appropriate number of options over a range of intervention types (both traditional and non-traditional) to meet the identified need?	2.7	WRMP options appraisal process had an appropriate number and range of feasible options, based on Ofwat draft WRMP representation.
B	Has a robust cost–benefit appraisal been undertaken to select the proposed option? Is there evidence that the proposed solution represents best value for customers, communities and the environment over the long term? Is third-party technical assurance of the analysis provided?	2.7	Cost benefit presented in the WRMP, and draft plan has already been consulted upon
C	In the best value analysis, has the company fully considered the carbon impact (operational and embedded), natural capital and other benefits that the options can deliver? Has it relied on robustly calculated and trackable benefits when proposing a best value option over a least cost one?	2.7	Section presents comparison of least cost and preferred plan for the main WRMP planning scenario.
D	Has the impact (incremental improvement) of the proposed option on the identified need been quantified, including the impact on performance commitments where applicable?	2.2	Section 2.2 presents the impact of the preferred WRMP programme on performance commitments
E	Have the uncertainties relating to costs and benefit delivery been explored and mitigated? Have flexible, lower risk and modular solutions been assessed – including where forecast option utilisation will be low?	2.7.2; 2.7.3	Risk and optimism bias included in costs, and supply and demand options modularised
F	Has the scale of forecast third party funding to be secured (where appropriate) been shown to be reliable and appropriate to the activity and outcomes being proposed?	2.10	Relevant to SROs – refer also to Gate 2 documentation, but not relevant to supply-side enhancement case.

G	Has the company appropriately considered the scheme to be delivered as Direct Procurement for Customers (DPC) where applicable?	2.10	Relevant to SROs – refer also to Gate 2 documentation
H	Where appropriate, have customer views informed the selection of the proposed solution, and have customers been provided sufficient information (including alternatives and its contribution to addressing the need) to have informed views?	2.9	See also document WSX04
A1.1.3 Cost efficiency			
A	Is it clear how the company has arrived at its option costs? Is there supporting evidence on the calculations and key assumptions used and why these are appropriate?	2.7.3	Costs developed as part of the WRMP process
B	Is there evidence that the cost estimates are efficient (for example using similar scheme outturn data, industry and/or external cost benchmarking)?	2.7.3	Costs developed as part of the WRMP process
C	Does the company provide third party assurance for the robustness of the cost estimates?	2.7.3	Costs developed and assured by third party
Need for enhancement model adjustment			
D	Is there compelling evidence that the additional costs identified are not included in our enhancement model approach?	NA	
E	Is there compelling evidence that the allowances would, in the round, be insufficient to account for evidenced special factors without an enhancement model adjustment?	NA	
F	Is there compelling econometric or engineering evidence that the factor(s) identified would be a material driver of costs?	NA	
A1.1.4 Customer protection			
A	Are customers protected (via a price control deliverable or performance commitment) if the investment is cancelled, delayed or reduced in scope?	Document WSX26	Yes, PCD for supply and demand side WRMP schemes
B	Does the protection cover all the benefits proposed to be delivered and funded (eg primary and wider benefits)?	Document WSX26	
C	Does the company provide an explanation for how third-party funding or delivery arrangements will work for relevant investments, including how customers are protected against third-party funding risks?	NA	

2.2. Differences between Business Plan and revised draft WRMP submission

<u>Demand management strategy</u>

Wessex Water received a guidance letter from the EA on 5th July (Information Letter: EA/17/20023) asking us to consider phasing activities from PR24 into future price review periods to ensure our PR24 programme as a whole is deliverable, financeable and affordable for customers. As this letter was received just prior to submission of our revised draft WRMP, there wasn't time to update our WRMP based on this guidance, therefore there are some material changes in savings and costs presented in our revised draft WRMP and PR24 submissions.

The changes associated with this guidance relate to our demand management strategy and in particular a change to phasing of our smart metering programme and leakage reduction activities, reducing activity in AMP8 and increasing in AMP9 whilst ensuring we remain on-track to meet our statutory and long-term targets.

Smart metering

In our revised draft WRMP, we set out a plan to achieve 75% smart meter penetration across our region by the end of AMP8, increasing to 95% by the end of AMP9. For our PR24 business plan, AMP 8 activity was scaled back to achieve 40% smart meter penetration with the programme being focused on the Hampshire Avon area, still maintaining ambition to complete our roll-out to 95% of properties by the end of AMP9. Smart meter installation numbers for our revised draft WRMP and updated PR24 plan are shown below in Table 2.

Table 2 Cumulative number of AMI smart meters installed (HH and NHH) – WRMP / PR24 comparison.

	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35
WRMP AMI meters installed (000s)	52.31	161.53	270.59	379.14	487.22	516.93	546.76	576.49	606.17	632.76
PR24 AMI meters installed (000s)	51.58	103.11	154.70	205.91	256.74	334.03	411.31	488.38	565.31	639.68

Leakage

Linked in part to the reduction in smart metering ambition for AMP8 and associated impact on customer supply pipe leakage (CSPL) reduction, our overall AMP8 leakage reduction programme was scaled back for our PR24 submission. Our revised draft WRMP set out a plan to reduce leakage by 7.7 Ml/d in AMP8, with 2.7 Ml/d of this being CSPL reduction associated with smart metering. Activity was scaled back for our PR24 business plan to target a 3.5 Ml/d reduction in AMP8, with 1.5 Ml/d of this being CSPL reduction associated with smart metering. Forecast in-year leakage profiles for our revised draft WRMP and updated PR24 plan are shown below in Table 3.

Table 3 Forecast leakage – WRMP / PR24 comparison.

	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34	2034-35
WRMP Leakage - in year (Mld)	62.72	61.45	59.93	58.15	56.11	55.23	54.35	53.47	52.59	51.71
PR24 Leakage - in year (Ml/d)	63.33	62.75	62.04	61.23	60.29	58.57	56.86	55.15	53.43	51.72

2.3. Performance commitment summary

There are three performance commitments relating to achieving sustainable abstraction which focus on reducing overall demand: Leakage, Per Capita Consumption (PCC) and Business Demand. Our overall demand strategy, as derived through the Water Resources Management Plan process, will ensure we meet the requirements for licence reductions that are required to protect the environment, and are on a glidepath to achieving 2050 targets for PCC, leakage, and the Distribution Input target in 2037/38.

As described in section 2.2 above, in response to the July 2023 EA Information Letter 17/2023 to consider phasing activities from PR24 into future price review periods we have adjusted our demand management strategy for our business plan from that proposed in our revised draft WRMP24. This includes a reduction in our AMP8 smart metering programme, reducing target smart meter penetration for HH and NHH from 75% to 40% and a reduction in our Leakage activity, reducing our target leakage reduction from 7.7Ml/d to 3.5 Ml/d. Although these elements of our demand management strategy have now been phased to deliver less in AMP8, we still remain committed to achieving the same targets as proposed in WRMP24 by the end of AMP9. Due to this change in phasing of demand management activities, the performance commitment data for AMP8 below differs from that in our WRMP24.

2.3.1. Per Capita Consumption (PCC)

The PCC PR24 performance commitment is a measure of the percentage reduction of three-year average PCC in litres per person per day (l/person/d) from the 2019-20 three-year average baseline. Three-year average values are calculated from annual average values for the reporting year and two preceding years expressed in l/person/d.

The reported in year and three-year average figures from 2017-18 to 2022-23 are displayed in Table 4. The 2019-20 three-year average baseline figure is 137.83 l/person/d. So far in AMP7, the three-year average PCC has been increasing from the baseline which is attributed to the impacts on household water use in 2020-21 and 2021-22 from the Covid-19 pandemic. The 2022-23 in year PCC saw a reduction from the previous year and has returned to a level comparable to those seen in AMP6. Although working patterns have changed since before the pandemic, with more people now working from home for at least part of the week, the overall number of home-workers has declined since the height of the pandemic in 2020/21. In addition, the cost-of-living crisis and particularly increasing energy bills since September 2022 has resulted in customers making behavioural changes to reduce their use of water and especially hot water.

Table 4 Historic reported in year and three-year average PCC figures and percentage reduction from the 2019-20 three-year average baseline, highlighted in red.

	Units	AMP6			AMP7		
		2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Baseline PCC (in year)	l/h/d	135.9	139.3	138.3	151.8	144.9	138.8
Three-year average PCC - baseline	l/h/d			137.8	143.1	145.0	145.2
% Reduction from 2019-20 baseline - baseline	%				-3.9%	-5.2%	-5.3%

The forecasted figures from 2023-24 onwards, Table 5, are derived using the same methodology as the WRMP24, but using the adjusted demand management strategy figures as noted in section 2.3 and adjusted for the normal year scenario. The forecasted final plan percentage reduction in the three-year average PCC at the end of AMP8 is 2.0%, 135.0 l/person/d.

The baseline figures represent the PCC forecast in a do nothing additional to current efforts scenario. The worst-case scenario (P10) is the DYAA high PCC scenario minus the difference between the baseline and final plan three-year average. This results in a three-year average PCC of 146.0 l/person/d at the end of AMP8. The best-case scenario (P90) is the NYAA low scenario PCC minus the difference between the baseline and final plan three-year average. This results in a three-year average PCC of 125.7 l/person/d at the end of AMP8.

Table 5 Baseline 2019-20 and forecasted in-year and three-year average PCC figures, the percentage reduction from the 2019-20 three-year average baseline for both baseline and final plan and the best- and worst-case scenarios for the three-year average.

	Units	AMP6	AMP7		AMP8				
		2019-20	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
Baseline PCC (in year)	l/h/d	*138.3*	140.8	140.8	140.9	141.1	141.3	141.5	141.7
Final Plan PCC (in year)	l/h/d	*138.3*	140.8	140.8	140.0	138.2	136.6	135.0	133.5
Three-year average PCC - baseline	l/h/d	*137.8*	141.5	140.1	140.8	140.9	141.1	141.3	141.5
Three-year average PCC - final plan	l/h/d		141.5	140.1	140.5	139.6	138.2	136.6	135.0
% Reduction from 2019-20 baseline - baseline	%		-2.7%	-1.7%	-2.2%	-2.2%	-2.4%	-2.5%	-2.6%
% Reduction from 2019-20 baseline - final plan	%		-2.7%	-1.7%	-1.9%	-1.3%	-0.3%	0.9%	2.0%
P10 (worst case) three-year average	l/h/d				148.0	148.0	147.5	146.7	146.0
P90 (best case) three-year average	l/h/d				135.4	133.4	130.9	128.2	125.7

2.3.2. Leakage

The Leakage PR24 performance commitment is a measure of the percentage reduction of three-year average leakage in Ml/d from the 2019-20 three-year average baseline.

The reported in year and three-year average figures from 2017-18 to 2022-23 are displayed in Table 6 2019-20 three-year average baseline figure is 73.33 Ml/d. So far in AMP7, the three-year average leakage has decreased from the baseline, ending 2022-23 with a 9.3% reduction. The 2022-23 in-year leakage increased for the first time following a steady decline from 2017-18 due to a major summer breakout due to ground shrinkage caused by the long hot summer, and further break out in December and January due to sever cold weather events.

Table 6 Historical reported in year and three-year average Leakage figures and percentage reduction from the 2019-20 three-year average baseline, highlighted in red.

	Units	AMP6			AMP7		
		2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Baseline Leakage (in year)	Ml/d	76.5	75.6	67.90	65.10	63.30	71.20
Three-year average Leakage - baseline	Ml/d			73.33	69.53	65.43	66.53
% Reduction from 2019-20 baseline - baseline	%				5.2%	10.8%	9.3%

The forecasted figures from 2023-24 onwards, Table 7, are derived using the same methodology as WRMP24, but using the adjusted demand management strategy figures as noted in 2.1 and adjusted for the normal year scenario.

The forecasted final plan percentage reduction in the three-year average Leakage at the end of AMP8 is 16.6%, 61.19 Ml/d.

The worst-case scenario (P10) is the average of the three most recent 'worst' years (2017-18, 2018-19 & 2022-23) minus the difference between the baseline and final plan three-year average. This results in a three-year average Leakage value of 71.8 Ml/d at the end of AMP8. The best-case scenario (P90) has been calculated to reach a 2049-50 three-year average figure of 36.7 Ml/d which is a 50% reduction on the AMP6 three-year average. This results in a three-year average Leakage value of 58.5 Ml/d at the end of AMP8.

Table 7 Baseline 2019-20 and forecasted in-year and three-year average Leakage figures, the percentage reduction from the 2019-20 three-year average baseline for both baseline and final plan and the best- and worst-case scenarios for the three-year average.

	Units	*AMP6*	AMP7		AMP8				
		2019-20	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
Baseline Leakage (in year)	Ml/d	67.90	63.48	63.48	63.79	63.79	63.79	63.79	63.79
Final Plan Leakage (in year)	Ml/d	67.90	63.48	63.79	63.33	62.75	62.04	61.23	60.29
Three-year average Leakage - baseline	Ml/d	73.33	65.99	66.05	63.58	63.69	63.79	63.79	63.79
Three-year average Leakage - final plan	Ml/d		65.99	66.16	63.53	63.29	62.71	62.01	61.19
% Reduction from 2019-20 baseline - baseline	%		10.0%	9.9%	13.3%	13.2%	13.0%	13.0%	13.0%
% Reduction from 2019-20 baseline - final plan	%		10.0%	9.8%	13.4%	13.7%	14.5%	15.4%	16.6%
P10 (worst case) three-year average	Ml/d				74.4	74.0	73.4	72.7	71.8
P90 (best case) three-year average	Ml/d				61.0	60.7	60.0	59.3	58.5

2.3.3. Business Demand

The PR24 Business demand performance commitment is a measure of the percentage reduction of three-year average business demand in Ml/d from the 2019-20 baseline. Although we currently report this data as part of the Annual Performance Report, this is a new performance commitment for AMP8.

The reported in year and three-year average figures from 2017-18 to 2022-23 are displayed in Table 8. The 2019-20 three-year average baseline figure is 81.57 Ml/d. So far in AMP7, the three-year average has declined but in year values in 2021-22 and 2022-23 have increased since 2020-21. This can be attributed to a significant reduction in 2020-21 as a result of the Covid-19 pandemic, and the steady increase over the last two years reflects the return of workers and customers to businesses.

Table 8 Historical reported in year and three-year average Business demand figures and percentage reduction from the 2019-20 three-year average baseline, highlighted in red.

	Units	AMP6			AMP7		
		2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Baseline Business demand (in year)	Ml/d	81.86	83.8	79.06	70.61	74.63	78.00
Three-year average Business demand - baseline	Ml/d			81.57	77.82	74.77	74.41
% Reduction from 2019-20 baseline - baseline	%				4.6%	8.3%	8.8%

The forecasted figures from 2023-24 onwards, Table 9, are derived using the same methodology as WRMP24, but using the adjusted demand management strategy figures as noted in Section 3.2 and adjusted for the normal year scenario. The forecasted final plan percentage reduction in the three-year average Business demand at the end of AMP8 is 9.6%, 73.77 Ml/d.

The worst-case scenario (P10) is the sum of the average of the DYAA and NYAA high non-household consumption scenarios and a 1Ml/d conservative estimate for large new users in the region, minus the difference between the baseline and final plan three-year average. This results in a three-year average Business demand value of 84.6 Ml/d at the end of AMP8. The best-case scenario (P90) is NYAA low scenario non-household consumption minus the difference between the baseline and final plan three-year average. This results in a three-year average Business demand value of 70.9 Ml/d at the end of AMP8.

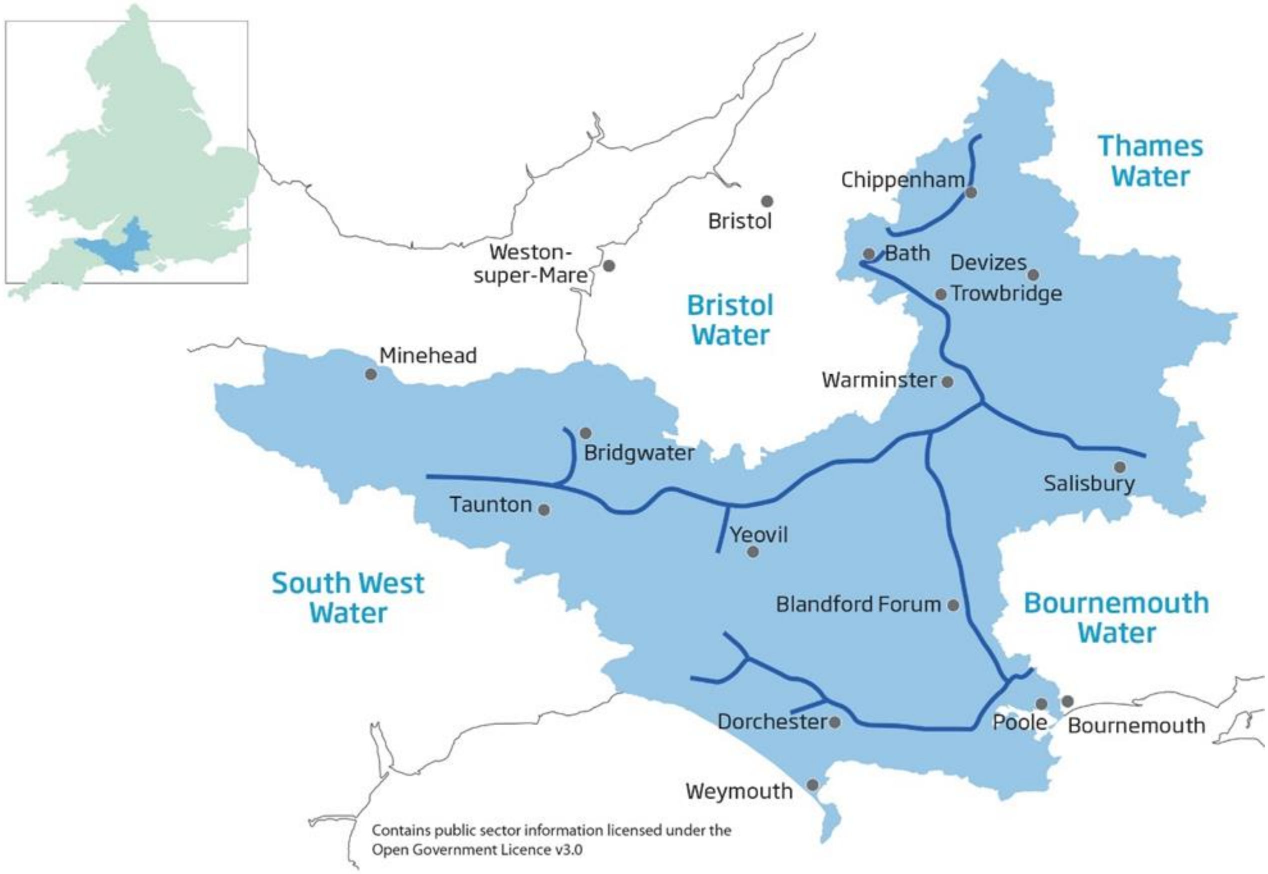
Table 9 Baseline 2019-20 and forecasted in-year and three-year average Business demand figures, the percentage reduction from the 2019-20 three-year average baseline for both baseline and final plan and the best- and worst-case

	Units	*AMP6*	AMP7		AMP8				
		2019-20	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
Baseline Business demand (in year)	Ml/d	79.06	78.98	78.77	78.49	78.20	77.86	77.67	77.49
Final Plan Business demand (in year)	Ml/d	79.06	78.98	78.77	77.91	76.47	75.02	73.76	72.53
Three-year average Business demand - baseline	Ml/d	81.57	77.20	78.58	78.75	78.49	78.18	77.91	77.67
Three-year average Business demand - final plan	Ml/d		77.20	78.58	78.55	77.72	76.46	75.08	73.77
% Reduction from 2019-20 baseline - baseline	%		5.4%	3.7%	3.5%	3.8%	4.2%	4.5%	4.8%
% Reduction from 2019-20 baseline - final plan	%		5.4%	3.7%	3.7%	4.7%	6.3%	8.0%	9.6%
P10 (worst case) three-year average	Ml/d				88.4	87.8	86.9	85.7	84.6
P90 (best case) three-year average	Ml/d				77.1	75.9	74.3	72.6	70.9

2.4. Supply Area

We supply 1.3 million people in the south-west of England with high quality drinking water. Our region is predominantly rural but includes the urban areas of Bath, Chippenham, Dorchester, Bridgwater, Poole, Taunton, Salisbury, and Yeovil (Figure 1).

Figure 1 The Wessex Water region, with key towns, neighbouring water companies and key water mains shown.

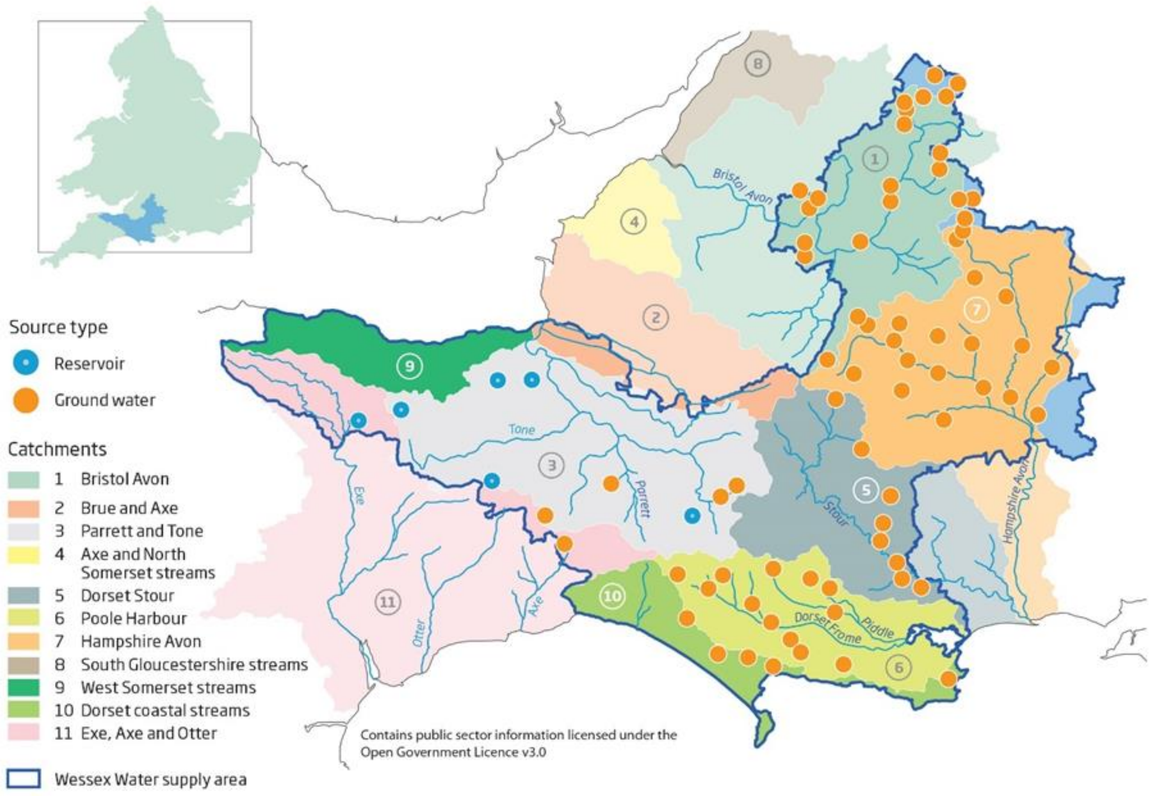


We supply our customers via 11,800 km of water mains to distribute approximately 340 million litres of water each day (Ml/d; key mains shown in Figure 1). We use more than 70 sources distributed across our supply area (Figure 2). Our sources range in capacity from less than 0.6 Ml/d to 45 Ml/d although we have a prevalence of small sources – over 50% have an average output of less than 6 Ml/d.

The main river catchments in the region include the Bristol Avon, which includes the Great Oolite aquifer, in the north, the chalk catchments of the Hampshire Avon, the Dorset Frome and Piddle, the Stour in East and South, and the Parrett and Tone in the West. The majority (75%) of the water we abstract for public water supply comes from groundwater sources. Important aquifers for us are located under Salisbury Plain, the Cotswolds and the Dorset Downs. The remainder of our water supplies (25%) come from impounding reservoirs located in Somerset.

Our region contains a wide range of important landscapes and habitats, and we are committed to playing our part in their continuous protection. The maximum volume of water that can be taken from each source (typically each day and each year) is specified in their respective abstraction licences which are granted by the Environment Agency. The conditions on a licence are the main way of ensuring that our abstractions do not have an unacceptable impact on the environment.

Figure 2 Wessex Water Supply Area showing location of reservoir and groundwater sources, and main river catchments.



The volume of water we abstract from the environment to supply to our customers has been steadily reducing since the mid-1990s. Annual average volumes of water that we put into our supply system have reduced from around 425 Ml/d in 1995 to approximately 340 Ml/d today.

The Wessex Water supply area contains a range of cultural heritage sites, including three World Heritage Sites, over 2,000 scheduled monuments, 108 historic parks and gardens, 4 historic battlefields, 6 protected wrecks in close proximity, and around 30,000 listed buildings. There are also a range of important landscape features, including 2 National Parks – Exmoor and the New Forest – overlapping with our supply area, 5 Areas of Outstanding Natural Beauty, 24 National Character Areas and 4 heritage coasts. Further details can be found in the WRMP24 Strategic Environmental Assessment technical appendix.

2.5. Planning Problem and Decision-making approach

This section summarises section 3 of our WRMP24 Main Technical Plan, please see this document for further details.

When developing a WRMP, if we identify a deficit in supplies compared to demand, we are required to develop a preferred programme of options to either increase supply or reduce demand so that we achieve an environmentally sustainable, secure supply of water.

For this round of Water Resources Planning, the joint regulatory guidance requires us to develop a best-value plan, which is one that considers other factors alongside economic cost and seeks to achieve an outcome that increases the overall benefit to customers, the wider environment and overall society. We are also required to consider if we need to develop an adaptive plan, which is a plan that can adapt to future uncertainties.

2.5.1. Baseline planning assumptions

Table 10 lists the assumptions incorporated into our baseline supply-demand balance forecast, that set the basis for solving the decision-making problem.

Table 10 Baseline planning assumptions for dWRMP24.

Area	Assumptions
Water Resource Zones	Supply Area
Base-year	2019-20
Planning horizon	2019-20 to 2079-80
Planning Scenarios	Dry Year Annual Average (DYAA) and Dry Year Critical Period (DYCP)
Supply Forecast	Estimated supplies availably in a drought with likelihood of 1 in 500 years, or 0.2% in any one year by 2039, and in 1 in 200 drought for alternative level of service prior to 2039.
Demand Forecast	DYAA and DYCP demand when demand is high before temporary use bans imposed.
Leakage	Leakage should remain static from the first year of the plan (2025-26) throughout the planning period
Customer Demand	Forecast without any further water company intervention; all AMP7 water efficiency and metering programmes should end.
Transfers	Existing transfers to the extent of bulk supply agreements
Sustainability Reductions	Impact of any confirmed or likely sustainability changes as identified for implementation in AMP8.
Drought options	No demand side (e.g. temporary use bans or non-essential use bans) or supply side options (e.g. drought permit options) included in the baseline plan supply-demand balance.

2.5.2. Key regulatory planning requirements and constraints.

The planning problem has a series of components:

- **Inputs** – the potential investment options to solve the problem.
- **Activity** – the methods used to solve the decision-making problem.
- **Outputs** – factors that contribute to achieving the outcomes – investments and components of the supply-demand balance.
- **Outcomes** – identify what we are trying to achieve, as represented by metrics that are included in best-value decision-making.

Regulatory planning requirements provide a series of soft or hard **constraints** on different areas of the planning problem, depending on the language used in the planning guidelines:

- **Must** refers to actions that are related to a statutory requirement.
- **Should** refers to actions that are believed to be needed to produce an adequate plan.

In addition to the statutory environmental planning requirements[1] , the key regulatory and government expectations on the planning problem are:

- **Drought resilience** – Supply system **should** be resilient to 0.2% (1 in 500) annual chance of failure caused by drought. This should aim to be achieved by 2039, or by 2050 at the latest. This is a constraint on the plan Outcome
- **Leakage** – We **should** plan as a minimum to meet Water UK's commitment to reduce leakage by 50% by 2050 (from 2017 levels). This is a constraint on Inputs and Outputs
- **Distribution Input** - We **should** plan as a minimum to meet Defra's water demand target set under the Environment Act 2021 to reduce the use of public water supply in England per head of population by 20% from the 2019-20 baseline by 31 March 2038[2]. This is a constraint on Inputs and Outputs
- **Household Demand** – **Should** take actions required to reduce per capita consumption to 110l/h/d by 2050. This is a constraint on the plan **Outputs**
- **Metering** - **Should** evaluate charging by volume on universal metering for water stressed areas, or if compulsory metering would be one of your preferred options. Government expects smart meters to become the standard meter installed. This is a constraint on **Inputs**
- **Drought Permit Options and Orders** – **should** plan to use drought permits and orders less frequently in the future. This is a constrain on **Inputs**.
- **Environmental benefit** – **should** plan to deliver overall positive environmental benefit and use Biodiversity Net Gain and Natural Capital to inform decision-making. This is a constraint on how plan **Outcomes** are assessed.
- **Smart metering** – We **should** plan to increase smart metering for households and businesses through accelerated investment between 2020 and 2030 as per the Environmental Improvement Plan to meet the Defra water demand target, as per the letter from Defra in March 2023. This is a constraint on **Inputs.**

2.5.3. Our Strategic Direction and best-value planning objectives

The challenges facing society today are extreme. There is a compelling need to plan for the long term, to mitigate and adapt to a changing climate, and to reverse the degradation of the natural world. This is to protect the planet itself, and all the people and life it sustains.

Our overall purpose is to improve public health, enhance the environment, and create value for the people we serve. Wessex Water's Strategic Direction Statement[3] is our long-term plan, that sets out our vision through to 2050. At its heart are eight outcomes that our customers and stakeholders have told us are their priorities: safe and reliable water supply, an effective sewerage system, affordable bills, excellent customer experience, sustainable abstraction, excellent river and coastal water quality, net zero carbon and increased biodiversity.

Based on the outcomes-led approach, and combining with the key regulatory planning constraints, Table 11 summarises our key plan criteria, and the associated metrics that will be used to derive the best-value plan, and how these relate to the outcomes and the policy requirements. These metrics capture the key trade-offs we need to consider in developing the WRMP between delivering drought resilience, the carbon and financial cost of achieving this, and the environmental benefit of doing so. These metrics align with the core regulatory planning guidance expectations.

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[1] Strategic Environmental Assessment, Water Framework Directive and Habitats Regulations Assessments.
[2] Defra Water demand target, Environmental Improvement Plan, and Plan for Water.
[3] Our strategic direction | Wessex Water

Table 11 Summary of Plan criteria, associated metrics, PR24 outcomes and policy requirements.

Criteria	Metric	PR24 Outcome	Policy Requirements
Programme Cost	Net Present Value (NPV)	Affordable Bills	Should consider a range of programmes including "least-cost", and consider how application of policy expectations affects costs
Drought Resilience	Timing of achieving 1 in 500	Safe, Reliable Water Supply; Excellent Customer Experience	Should achieve 1 in 500 no later than 2039, but explore sensitivity to this, no later than 2050
Carbon	Carbon Dioxide Equivalent Emissions	Net-Zero Carbon	Minimise carbon to contribute to Net-Zero by 2050
Biodiversity Net Gain	Biodiversity Score	Increased Biodiversity	Plan should provide net-gain at scheme and plan level
Natural Capital	Natural Capital Metric	Enhancing the Environment	Plan should deliver natural capital benefits
Abstraction reduction - Environmental Destination	Achieve Required Environmental Destination Licence Reductions	Sustainable Abstraction	Plan should explore an enhanced environmental scenario beyond the BAU and a "best environment" plan

In addition to the specific metrics considered above, the decision-making approach also incorporated WFD, SEA, INNS and HRA assessments as constraints to feasible options used in the decision-making tool.

As described above, there are regulatory and government expectations relating to leakage and household demand targets e.g., expectations on the inputs and outputs of the planning problem to meet the overall outcomes set out in Table 11. Meeting these constraints is considered in our programme appraisal.

2.5.4. Problem Characterisation, Decision-Making Method and Risk Composition

Our planning problem was identified as having a moderate level of concern, reflecting potentially significant supply demand imbalances driven by a range of factors (Table 12).

Table 12 Problem characterisation summary matrix.

		Strategic Needs Score ("How big is the problem")			
		0 (none)	**2 (small)**	**4 (medium)**	**6 (large)**
Complexity Factors Score ("how difficult is the problem")	**Low (<7)**				
	Medium (7-11)			X	
	High (11+)				

Changes in WRMP24 planning requirements since the development of the UKWIR guidance in 2016 require more complex planning methods to be adopted to an extent. These changes are the move to 1 in 500 system level response drought resilience, and the need to produce a best-value (multi-objective) and potentially adaptive plan.

Our assessments also account for potential future water trading agreements due to our involvement in inter- and intra- regional planning: a separate regional group problem characterisation assessment has been undertaken in the West Country Water Resources Group.

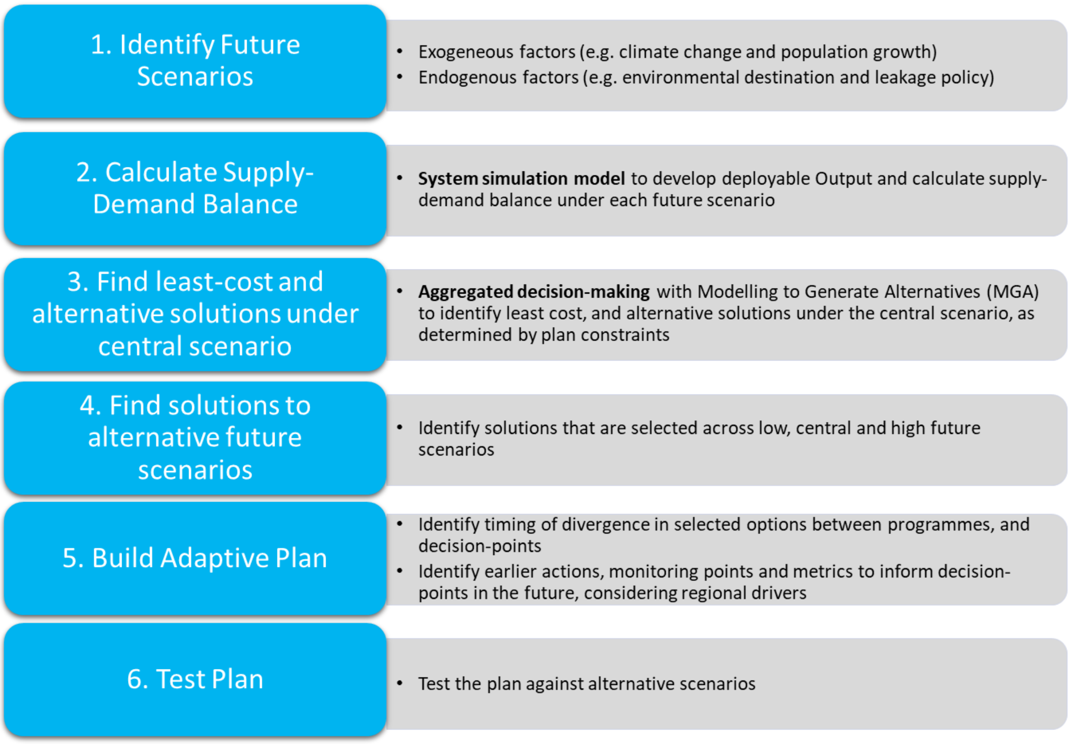
Our assessments highlight supply side factors outweigh the contribution from demand side factors to the problem characterisation. This is mainly driven by new requirements for a move to 1 in 500 system level response drought resilience and the scale and the extent of licence reductions under the Environment Agency's Environmental Destination programme.

Although overall demand has been falling since the mid-1990s and is predicted to continue, owing to reductions in leakage and commercial demands, and an increase in water efficiency through customer metering, the reductions are not enough to combat the forecasted supply side losses. Under a business-as-usual scenario, the Environmental Destination work may lead to licence reductions in the region of 60-70 Ml/d by 2050, mainly in the Chalk catchments of the Stour, Frome, and Piddle rivers.

Spatial and temporal variation of deficits resulting from above drivers, and uncertainty in how these might operate to meet annual average and critical period demand, increase the complexity of the problem. Based on the identification of a moderate level of concern, and guided by the UKWIR decision-making guidance, we chose to implement a hybrid decision making approach, and consistent with risk composition 2 of the risk-based planning guidelines, a scenario-based integration method, which enables us to develop an adaptive plan.

A summary of our decision-making approach is shown in Figure 3. In the adopted approach we have evaluated a range of future uncertainties affecting the planning problem and used these to construct multiple potential future scenarios alongside our central "most likely" future planning scenario, and derived the supply-demand balance under each of these futures. We have then undertaken our decision-making modelling with an aggregated decision-making tool to identify least cost and alternative plans under our central planning scenario, as affected by different planning constraints, government expectations on demand strategy, and environmental screening of poorly performing options. We then identified solutions to our planning problem under the alternative future scenarios and used these to build an adaptive plan which shown how our decision-making will adapt to future uncertainties.

Figure 3 Schematic of WRMP decision-making process



2.6. Baseline Supply-demand balance

This section summarises section 4 of our WRMP24 Main Technical Plan, please see this document for further details.

This section provides an overview of our supply and demand forecasts. Further details can be found in the WRMP24 Supply Forecast Technical Appendix and Demand Forecast Technical Appendix. Once we have a supply forecast and demand forecast, we can compare the two to identify if we have a supply-demand balance surplus or deficit. Before we do this, however, we must account for uncertainty.

2.6.1. Handling uncertainty in the supply-demand balance

Uncertainty in our plan is handled through two approaches. Baseline uncertainties associated with how much water we have and what demand would be like today under the extreme planning drought conditions are dealt with through **headroom analysis**, where we make an allowance in the supply demand balance for this uncertainty. Future uncertainties, associated with how demand and supplies might change in the future, are handled through **scenario analysis**.

Table 13 shows the future uncertainties that are considered in scenario uncertainty analysis, with reference to the plan section that provides further details of the derivation of the forecasts. For each factor a low, central, and high forecast has been derived to represent the range of future uncertainty in the factor. Our main central forecast combines the central forecasts from each uncertainty factor in the supply-demand balance. We have also generated alternative combinations of these factors to generate plausible future scenarios to develop our adaptive plan and test the chosen plan options.

Table 13 Scenario Uncertainty Factors

Scenario Uncertainty	Description
Environmental Destination	Uncertainty in the level and timing of environmental destination and sustainability reduction licence losses
Per capita consumption	Uncertainty in future household demand
Climate change emissions uncertainty	Uncertainty in the impact of climate change on available supplies
Population and Property Growth	Uncertainty in future population and property growth in the supply area
Non-Household demand	Uncertainty in future non-household demand
Water quality pollution (e.g., future Nitrate changes)	Uncertainty in water quality pollution (Nitrates) driven supply availability in drought

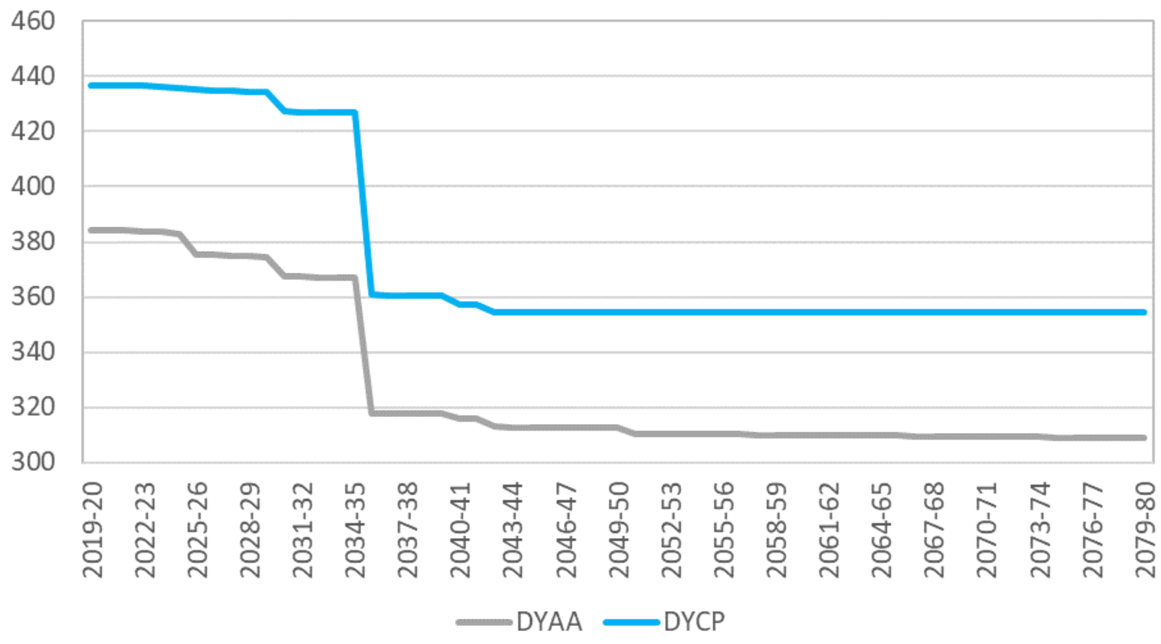
2.6.2. Water Supply Forecast

Our forecast of available water to supply to customers is constrained by the availability of water in the environment, the licenced quantities Wessex Water have available to abstract, and the infrastructure to abstract, treat and distribute the water to customers. This section outlines how we determine our current volume of water available for supply, and how we forecast how this might change over the planning period due to a range of factors such as sustainability licence reductions, and climate change impacts.

The Water Resources Management Plan requires us to forecast how much water is available in the base year, and how this forecast will change throughout the planning period from 2019-20 to 2079-80. Our baseline Water Available For Use (WAFU) is derived from the combination of Deployable Output, an allowance for source outages, and any losses occurring due to system operation. This will change over time during the planning period due to licence reductions, climate change impacts, and changing water quality. To obtain our Total Water Available For Use (TWAFU), we combine WAFU with our imports from and exports to neighbouring water companies. More details on this process can be found in our WRMP24 Supply Forecast Technical Appendix.

We have forecasted our TWAFU to decrease over the planning period, from 384 Ml/d in 2020-21 to 343 Ml/d in 2079-80 in the DYAA scenario, and from 437 Ml/d in 2020/21 to 388 Ml/d in 2079/80 in the DYCP. The main drivers of this decrease in both scenarios are licence losses due to sustainability changes that will occur in 2035 and 2050. The decrease in TWAFU in the DYAA is also attributed to a gradual decline caused by climate change impacts, and a reduction in our imports from neighbouring water companies in 2025-26 (see Figure 4).

Figure 4 Timeseries of TWAFU over the planning period for the DYAA scenario.



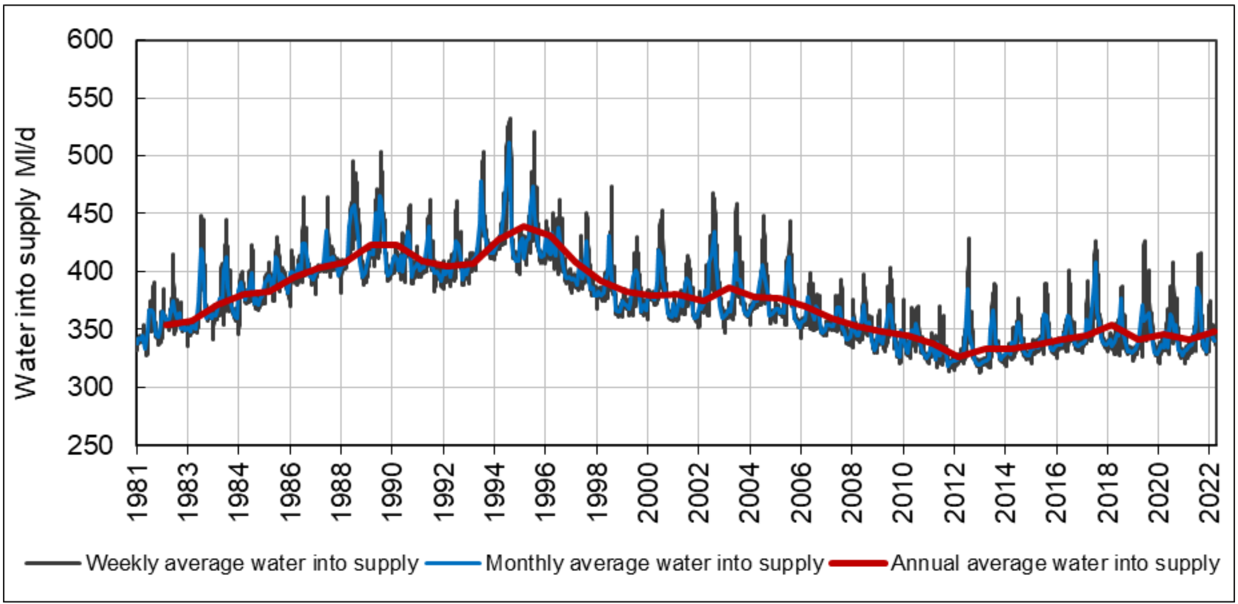
2.6.3. Water Demand Forecast

To understand and project how much water we will need to put into our distribution network each day (known as ‘Distribution Input’, or DI), we must forecast our future water demands. The demand forecast is built up from component forecasts of population, property, household water use patterns, commercial usage, leakage, and other minor elements. It takes account of projections made by Local Authorities of expected housebuilding rates in our area, the impact that increased metering and water efficient behaviours by our customers will have, and an allowance is made for the possible impact that climate change may have on water usage.

A demand forecast has been generated for a Dry Year Annual Average (DYAA) and Dry Year Critical Period (DYCP). Where needed, a Low, Central, and High forecast for each component of demand has been determined to support the assessment of uncertainty and scenario analysis.

The demand for water in the Wessex region has followed rising and falling trends through time but has generally decreased since the mid-1990s, as illustrated in Figure 5. Despite the population in our area rising from 1.1 million in 1994/95 to over 1.3 million in 2021/22. Peak week demands have fallen from approximately 525 Ml/d to around 425 Ml/d, and annual average demands have reduced from around 425 Ml/d to less than 350 Ml/d. This reduction in demand has occurred due to reduced leakage from the network, customers switching to a metered supply, increased efficient use of water by customers in homes and businesses, and reduced commercial demands following closures of some large user industrial sites.

Figure 5 Weekly, monthly, and annual average water into supply (demand



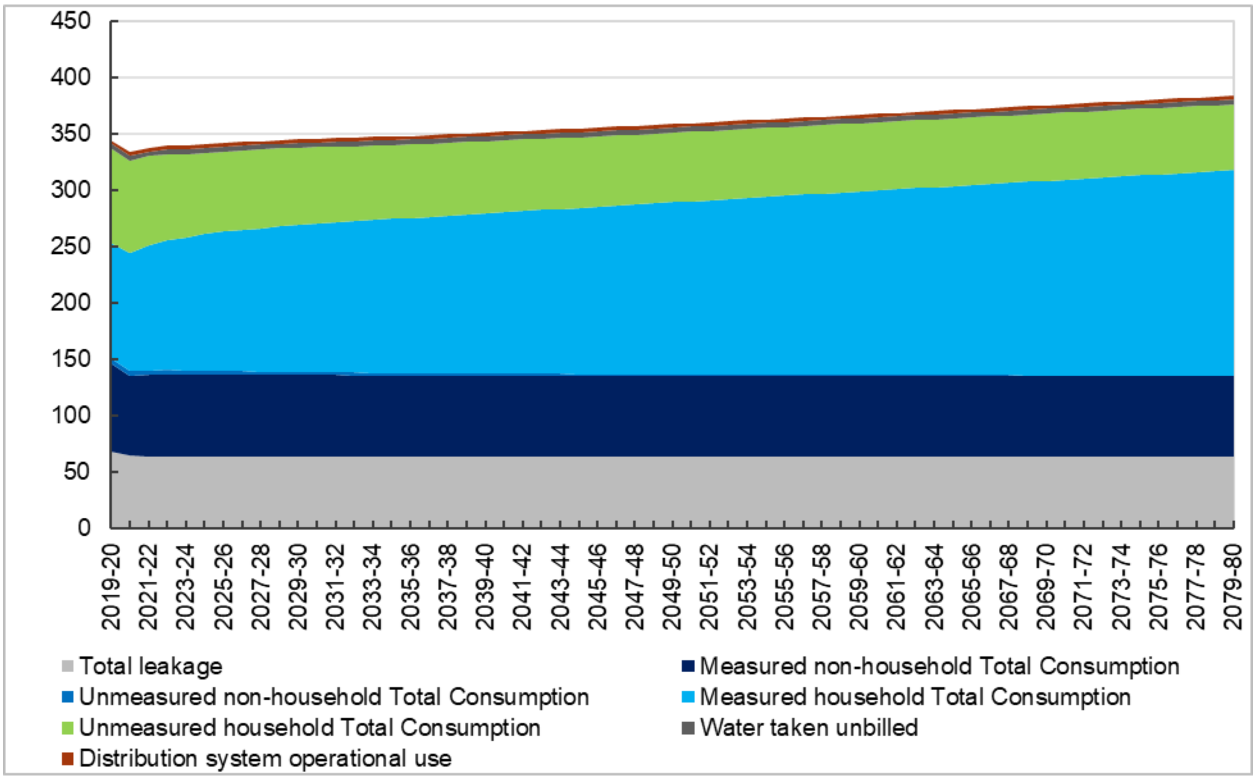
We have made a projection of future demands using 2019-20 as the base year, as this is the first year prior to the impact of Covid-19. Baseline demand is divided into categories for forecasting purposes (Table 14) and highlights household consumption as the main demand component, comprising 54% of Distribution Input. Nearly 70% of households were metered in the base year so measured consumption is the main component of household demand.

Table 14 Base year 2019/20 (un-normalised) water balance components.

Water Balance Component	Demand (Ml/d)	Demand (%)
Measured Non-Household Consumption	75.0	22.4%
Unmeasured Non-Household Consumption	4.1	1.2%
Measured Household Consumption	101.2	30.0%
Unmeasured Household Consumption	80.0	24.0%
Water Taken Unbilled	4.4	1.3%
Distribution System Operational Use	3.1	1%
Total Leakage	67.9	20.1%
Total Distribution Input (Demand)	335.7	-

For our central “most likely” planning scenario, overall demand is forecast to remain relatively stable with a rise of 53Ml/d from 2024-25 to 2079-80 (Figure 6). The main change driving this overall rise is an increase in measured household consumption, above and beyond a rise that would be expected as a result of unmeasured properties switching but resulting from changing overall forecast consumption trends.

Figure 6 Total demand forecast over the planning period in the DYAA scenario.



2.6.4. Target Headroom

To account for any uncertainty in our forecasted figures in all aspects of the supply demand balance calculation, we have carried out a headroom assessment. The headroom allowance is an additional amount of water available for use that acts as a safety buffer for our forecasts. Future uncertainties have been accounted for through scenario analysis, and baseline planning uncertainties associated with our baseline uncertainties in supply and demand today have been accounted for in the headroom allowance.

Headroom has been assessed for the uncertainty of reservoir and groundwater yield, bulk transfers, and the accuracy of both supply- and demand-side data. We have not made any headroom allowance for the uncertainty in vulnerable licences, including time limited licences, as per the WRMP guidance. Similarly, the impacts of gradual population and climate change on supply have not been accounted for in the headroom allowance and have instead been addressed in scenario analysis.

The change in headroom allowance over time is outlined in Table 15. The target risk profile was determined by selecting the 85th percentile in the base year, 2019-20, and then calculating the associated headroom value (14.41 Ml/d DYAA and 28.61 Ml/d DYCP) as a percentage of the dry year annual average distribution input for the year. This resulted in a headroom percentage of 4.2% for DYAA and 7% for DYCP scenarios. By fixing target headroom as a fixed percentage of distribution input through the planning period the uncertainty percentile decreases with time meaning that a greater level of risk is accepted in the future. The slight growth in headroom over time reflects the growth in distribution input in the future. For the DYAA scenario, supply uncertainties are the main component of headroom uncertainty, whereas for the DYCP scenario, uncertainty in groundwater yield is the main source of uncertainty, followed by uncertainty in peak demand.

Table 15 Headroom Allowances over time.

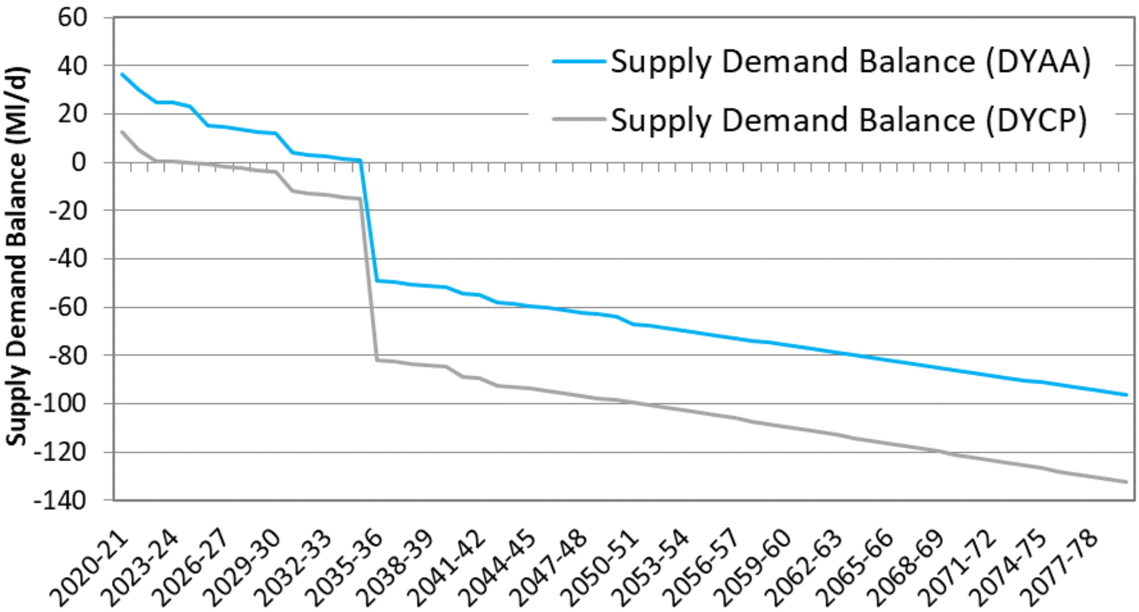
	2019/20	2024/25	2029/30	2034/35	2039/40	2049/50	2079/80
DYAA Headroom (Ml/d)	14.41	14.25	14.45	14.54	14.69	14.99	16.06
DYCP Headroom (Ml/d)	28.61	28.14	28.46	28.59	28.84	29.38	31.38

2.6.5. Basline Supply Demand Balance

The Supply-Demand Balance (SDB) has been generated for our central "most likely" planning scenario alongside a range of alternative futures. The supply-demand balance under the central planning scenario is shown in Figure 7 for the DYAA and DYCP scenarios. This scenario looks at what would happen in the future if we did nothing apart from hold leakage steady at current levels, do no more meter installations, but account for uncertainties such as climate change, and meet a 1 in 500 drought resilience.

The planning period starts with a surplus which gradually declines throughout the planning period primarily as a result of a growing demand forecast into a deficit by 2079-80. On top of this long-term trend, further declines in available water occur primarily due to licence losses in 2035, resulting in overall planning deficits of over 130Ml/d by 2079/80 under the DYCP scenario.

Figure 7 Supply Demand Balance for the DYAA and DYCP over the planning period.



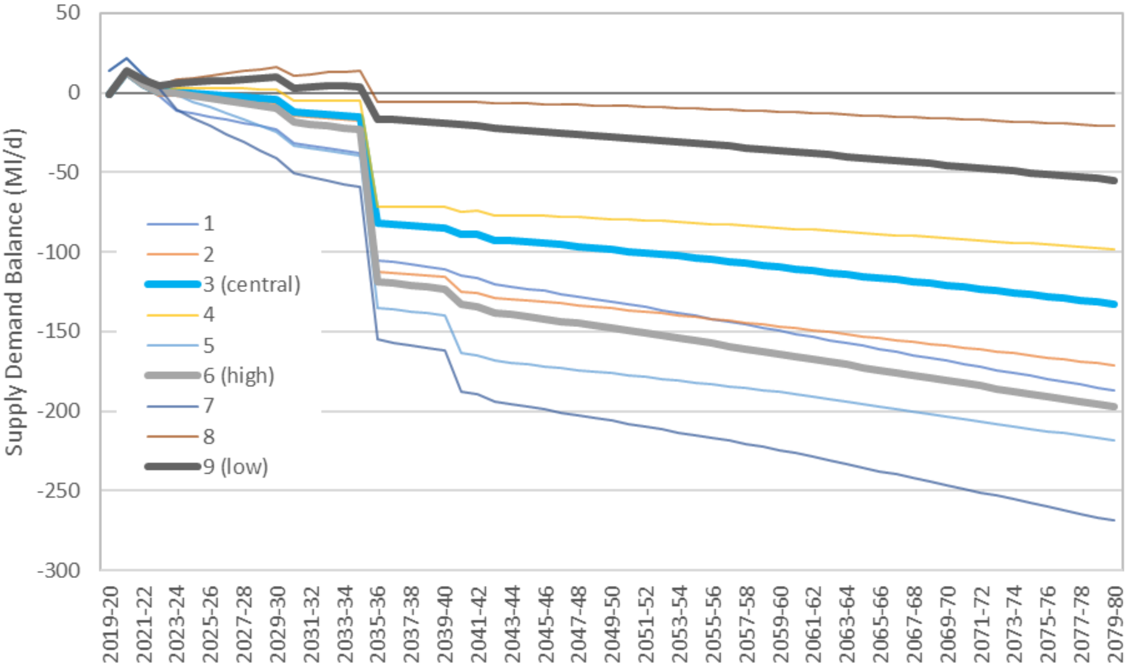
This baseline position is strongly influenced by the need to reduce our abstraction licences to further protect Chalk streams, and the requirement to plan for more extreme droughts than historically experienced. We have taken a balanced approach in our discussions with regulators concerning giving up licences and sources sooner, in order to protect supplies and not trigger the wrong solutions. It is important that adequate time continues to be given for our AMP cycle investigations to confirm the actual licence reduction requirements, so that the right licences are reduced at the right time.

To account for future uncertainties, we have generated alternative Supply-Demand Balance scenarios based on the future uncertainty factors, for which we generated low, central, and high forecasts. Table 16 shows how the alternative factors have been combined to produce a set of nine overall scenarios to develop and test our adaptive plan, and Figure 8 shows the range of supply-demand balances under each of the scenarios. The final deficit in 2079-80 under the DYCP scenario ranges in 2079-80 from approximately -21Ml/d to -268Ml/d. This range in these forecasts is primarily driven by different levels of demand growth, and the extent of licence reductions, which is the main driver of uncertainty in our plan.

Table 16 Supply Demand Balance scenarios considered.

SDB Scenario	Future Uncertainty Factors				
	PCC	Population and Property Growth	Non-Household Demand	Climate Change	Environmental Destination
1	Central	High	High	High	Central - main
2	Central	Central	Central	High	High - main
3 (central)	Central	Central	Central	Central	Central - main
4	Central	Low	Low	Low	Central - main
5	High	Central	Central	High	High - main
6 (high)	Central	High	Central	Central	High- main
7	High	High	High	High	High - main
8	Low	Low	Low	Low	Low- main
9 (low)	Low	Central	Central	Central	Low - main

Figure 8 DYCP Supply Demand Balance under alternative future scenarios (low, central, and high scenarios in bold).



To develop the adaptive plan, we have chosen from the scenarios a low, central, and high scenario to represent the spread of potential future supply-demand balance need. These scenarios have been chosen following Ofwat's final guidance on long-term delivery strategies that states then when combining plausible extremes of different factors, combining them together risks producing a very low probability scenario. Therefore, we have chosen the low, central and high forecasts to avoid these extreme and implausible scenarios/combinations of uncertainty (e.g., scenarios 5, 7, and 8). For each of these scenarios we have run the investment model to identify alternative plans, and investments selected across those plans to construct the adaptive plan.

We have also undertaken sensitivity testing of the plan to some alternative scenarios, which includes:

- Additional need from Veolia Water and MoD in the Hampshire Avon catchment from 2035
- Delaying meeting the 1 in 500 level of service to 2049-50
- Delaying licence changes and abstraction reductions from 2035-36 to 2042 for non-Hampshire Avon sources and for all licence changes.
- Scheme availability and scheme environmental uncertainty

2.7. Options Appraisal and Decision Making

This section summarises section 5 of our WRMP24 Main Technical Plan, please see this document for further details.

The consideration of options to increase supply and reduce demand across our water supply area has been carried out through a thorough options appraisal process based on the planning stages outlined in the Environment Agency's planning guidelines. The process involves four key stages with an increasing level of detail from high level screening in Stage 1, through to carrying out relevant environmental assessments and cost profiling in Stage 4:

- Stage 1: Development of the Unconstrained Options list
- Stage 2: Screening of the Unconstrained Options to produce a list of Feasible Options
- Stage 3: Technical review and analysis of the Feasible Options, reviewing the risks and benefits to produce a Constrained Options list (including the environmental and social assessment metrics).
- Stage 4: Constrained Options and environmental and social metrics are inputted into the EBSD model to generate a best-value preferred programme per scenario which is then reviewed as part of the options appraisal process.

Our options appraisal process identifies options at varying scales, from those that would assist localised areas of water stress, through to Strategic Resource Options (SROs) which would be promoted in conjunction with our neighbouring companies within the West Country Water Resources Group (WCWRG). On a national scale[4] , we have liaised with other water companies to identify any opportunities which would mutually benefit multiple regions. We have also identified the necessary options that would enable us to meet the requirements of the direction[5] and expectations[6] set out by government, including reductions to leakage and consumption. Full details of the options appraisal and decision-making approach are contained in the WRMP24 Options Appraisal Technical Appendix and the Decision-Making Technical Appendix.

2.7.1. Unconstrained options development

Our initial list of Unconstrained Options was developed by using the inputs outlined in the Environment Agency guidance. At this stage, no screening criteria was applied and a large list of over 360 options was generated. The

[4] Environment Agency (March 2020). Meeting our future water needs: a national framework for water resources
[5] The Water Resources Management Plan (England) Direction 2022, 28 April 2022
[6] Government expectations for water resources planning, 28 April 2022

starting point for collating our unconstrained list of options was reviewing our previous WRMP options lists (including those from WRMP14[7] and WRMP19[8]). To account for the evolution of our water supply network over recent years, and changes to the technology available within the industry, we updated and revised options where necessary.

Alongside the review of previous options, internal workshops and meetings were scheduled with colleagues from environmental teams to identify current licences which could be up for review, or potentially reduced, under WINEP investigations or the EA's Environmental Destination Programme. We also worked with our operational teams to assess how our existing assets, sites, and supply network could be improved or adjusted to increase available supply in the required areas of our network. In addition, we included the drought permit options from Wessex Water's latest drought plan[9] in the Options Appraisal process, in line with the guidance.

We worked with our consultants to develop potential reservoir storage options using analysis of GIS. Other new large scale water resource options, such as effluent re-use, desalination plants, and reservoir enlargement, were also assessed by consultants. To ensure that our work was consistent with the work being undertaken by other companies in the region, we liaised with the West Country Water Resources Group (WCWRG) and other neighbouring water companies to identify large scale water resource projects, Strategic Resource Options (SRO), that would provide benefits for the whole South-West region, as well as in the Water Resources in the South East (WRSE) area. SROs considered new raw and potable bulk transfers, as well as the Mendips Quarry reservoirs[10] and Poole effluent re-use[11], both of which are currently going through the gated process as part of The Regulators' Alliance for Progressing Infrastructure Development (RAPID).

On the demand side, consultants investigated the feasibility of customer side options deployed across the whole region in addition to leakage reduction options. Research included the use of customer challenge groups (CCGs) to understand the option types favoured by household and non-household customers. Including the development of some new options, an extensive unconstrained list of over 130 options was produced. Options that help to reduce both leakage and consumption were later combined or removed to avoid double counting. The separate options for both customer side and leakage management were then blended to create a range of scenarios to meet government expectations and to create an adaptive plan, in line with Ofwat expectations.

We advertised our expectation of a supply-demand deficit from future sustainable abstraction licence changes and restrictions on the Wessex Water Market Place[12] to seek third party support. This information was also shared with our neighbouring water companies to allow discussions surrounding water availability and trading opportunities throughout the WCWRG.

2.7.2. Feasible options screening and development

After the collation of the unconstrained list, the options were evaluated against screening criteria in order to produce a list of feasible options. Initially, this was relatively high level with the aim to highlight negative impacts and risks of options, as well as allowing for positive benefits to be recognised. Each option was scored according to the

[7] Wessex Water (July 2014). Water Resources Management Plan
[8] Wessex Water (Aug 2019). Water Resources Management Plan
[9] Drought plan | Wessex Water
[10] South West Water and Wessex Water (December 2021). Strategic Regional Water Resource Solutions: Gate one submission for Mendip quarries – new solution.
[11] Stantec (July 2021). Strategic Regional Water Resource Solutions: Preliminary Feasibility Assessment. Standard Gate One Submission for West Country South – Sources and Transfers.
[12] Water Resources Management Plan 24 - Option suggestions - Wessex Water

screening criteria outlined in the WRMP24 Options Appraisal technical appendix and assigned to either the 'Feasible List' or a 'Rejection Register', accompanied by details on the reason for rejection.

The decisions on where the cut-off point was drawn to derive the feasible options was inevitably subjective and was dependent upon creating a manageable list of options, as per the environmental assessment guidance[13]. Internal reviews assessed whether the 'Feasible List' would provide enough choice to meet the supply demand planning requirements (in terms of yield, lead time, and geographical location), as well as a good range of option types. It was also necessary to assess options which were exclusive of each other, such as two reservoir sites on the same river but flow levels mean only one could be constructed, to decide which was best to include in the 'Feasible List'.

Detailed assessments were then undertaken on each of the feasible options to generate a list of constrained options for programme development. Each supply and demand management option was scoped and designed, incorporating the type and location of water abstraction, water treatment, and transfers to service reservoirs. For example, for reservoir options, the approximate location, requirements for the embankment and routes for the pipelines were identified. For leakage and demand management options, a range of scenarios were developed to reduced leakage and consumption (using a mix of different metering technologies, leakage techniques, water efficiency projects and assumptions about government labelling of appliances).

Overall, 86 feasible options (7 demand options and 79 supply options) we taken forwards for inclusion in our decision-making modelling. These have included:

- Demand options - including various types of metering (including options around speed of smart metering roll-out), further leakage reduction (with different volumetric leakage targets to meet by 2050), water efficiency and rainwater harvesting.
- Supply options - including yield enhancement of existing sources, effluent re-use, desalination, aquifer storage and recovery, new reservoirs, network/transfer enhancements, and resurrecting currently unused sources. Between draft WRMP and final WRMP we included more modular options for some of the larger schemes to help ensure option were selected that were not over-sized.

2.7.3. Feasible options valuation

Once designed, options were valued and assessed to determine:

- Operational and capital costs (OPEX and CAPEX)
- Carbon emissions
- Strategic Environmental Assessment
- Water Framework Directive Assessment
- Habitats Regulation Assessment
- Natural Capital Assessment
- Biodiversity Net Gain Assessment

Further details of the cost assessments can be found in the WRMP24 options appraisal technical appendix, and where relevant the costing work was carried out in accordance with the Mott MacDonald Cost Consistency methodology developed for Ofwat's RAPID programme. The costs include accounting for Risk and Optimism bias.

[13] Environment Agency (Mar 2021). Water resources planning guideline supplementary guidance – Environment and society in decision-making

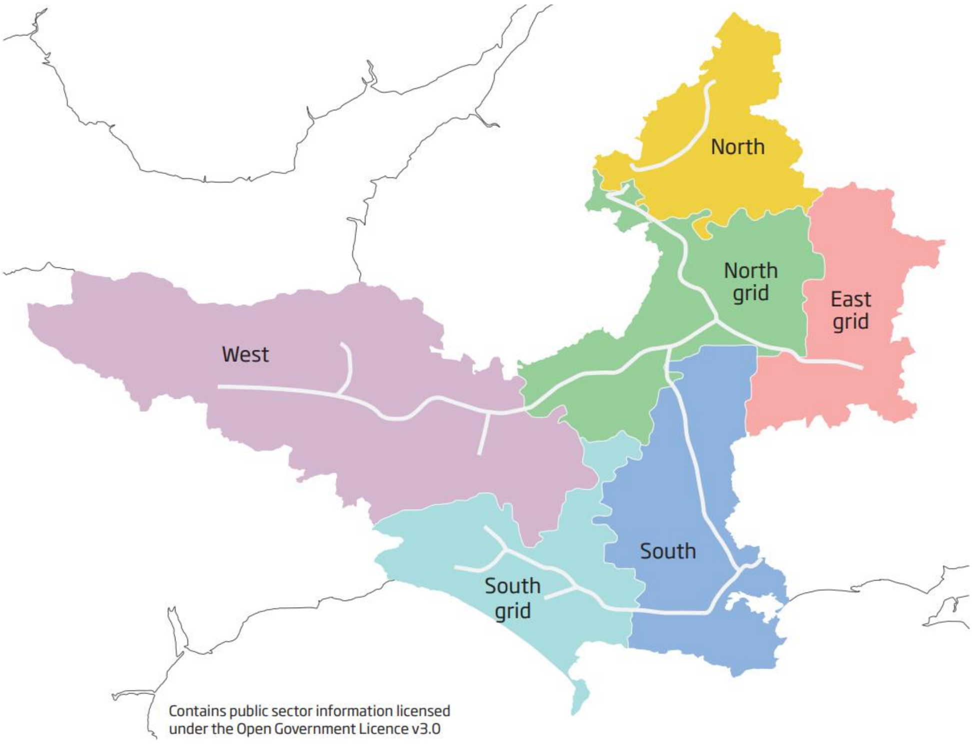
2.7.4. Decision-making modelling

To derive the least cost solution under alternative scenarios, we have adopted a hybrid decision-making approach, combining a least cost optimisation “EBSD” model, and our distributed system model for scenario testing. The decision-making approach proceeded as follows:

- EBSD model testing – run the least cost optimisation model for different supply-demand balance scenarios to identify solutions for different model run-types, including true least cost runs, and to derive alternative best-value scenarios that meet government expectations on demand management strategies and where the worst performing options environmentally are excluded from the optimisation. The model works by satisfying the constraints that the supply demand balance must be positive under both DYAA and DYCP planning scenarios simultaneously whilst finding the least cost solution. An aggregated decision-making approach was used to ensure that options were appropriately scheduled and least cost solutions identified.
- Scenario testing – undertake alternative scenario testing of the identified plans, including in relation to the timing of 1 in 500 resilience, and licence change scheduling.
- System simulation model testing – test the chosen options at key time-slices through the planning horizon in our distributed system simulation model to ensure the model can satisfy all local deficits, given the spatially localised focus of the environmental destination licence losses.

To help circumvent the need for significant iteration between an aggregated least cost model and system simulation modelling at specific points in the future to test the performance of the chosen solutions, we disaggregated the supply-demand balance into six Water Resources Sub Zones (Figure 9). All new supply options were assigned to an individual sub-zone, and transfer options that would typically be linked to specific supply-side schemes were included as transfers between the different zones. Demand reduction options were selected globally across zones, with proportional benefit in each zone. The advantage of the approach taken is that it allows us to account for the “downstream” costs associated with transfer options to move water from where it is created through demand reductions (which will mainly be achieved in demand centres) to where it is needed associated with licence reductions, as opposed to any assignment of specific transfer schemes to specific supply schemes.

Figure 9 Wessex Water supply area, with 6 sub-zones used for investment modelling, and the existing grid connections between zones.



Once we ran the true least cost optimisation runs, a key step in deriving the best value plan was to use some of the best value planning metrics to screen out unacceptable supply options from environmental grounds, prior to the best investment modelling. Based on the relative performance of options for WFD, SEA, carbon, Natural Capital and Biodiversity, options were initially grouped into three bands based on their annual average yield to ensure options were assessed comparably. The options were scored relative to the 50th percentile for each of the environmental metrics to allow the option performance against the average to be assessed. The worst performing options were removed from the investment model to some of the Some options were also rejected based on updated information on the scheme feasibility, whilst some schemes were kept in based on qualitative assessment or if the scheme was a regional SRO.

2.7.5. Feasible Demand Management Options Summary

Seven feasible demand management strategy options were considered (summarised in Table 17). Each option comprises one of four different leakage strategies, one of five smart metering strategies and one of four water efficiency strategies. Strategies for each area represent different levels of ambition towards achieving associated demand reduction targets. All options include the same assumed savings arising from government water efficiency labelling on appliances (Defra scenario 1) as per the WRMP guidelines.

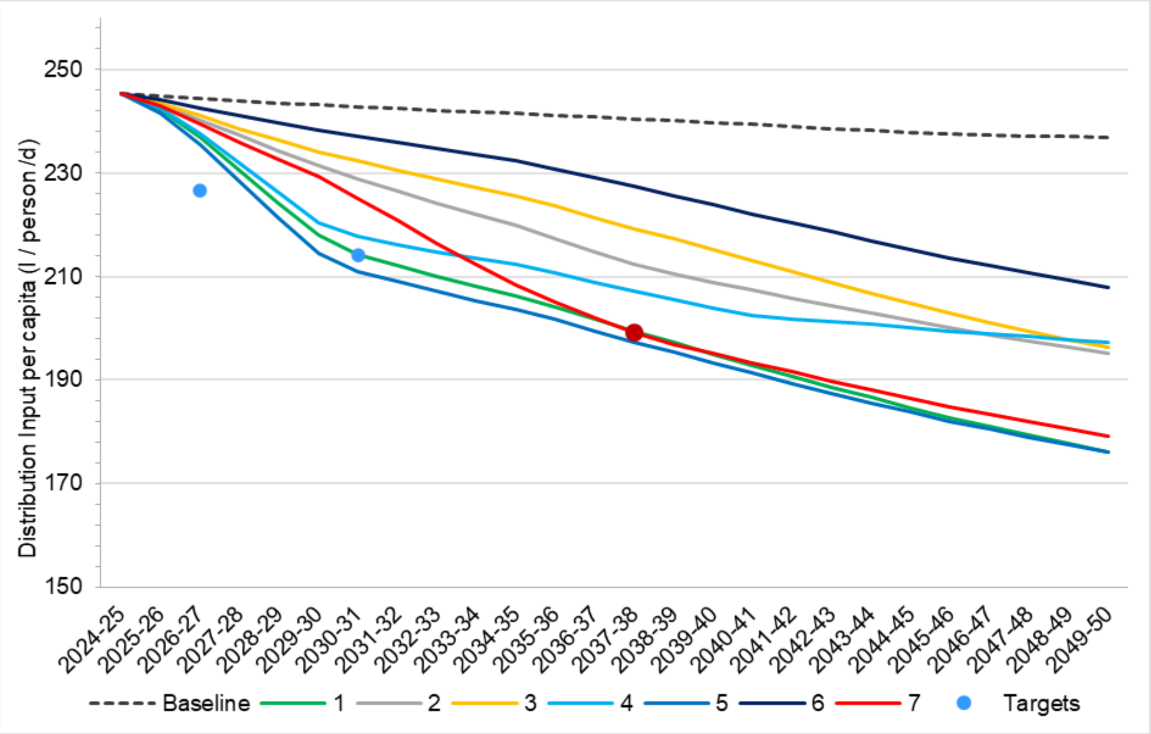
In response to the July 2023 EA Information Letter 17/2023 to consider phasing activities from PR24 into future price review periods we have adjusted our demand management strategy for our business plan from that proposed in our revised draft WRMP. This includes a reduction in our AMP8 smart metering programme, reducing target smart meter penetration for HH and NHH from 75% to 40% and a reduction in our Leakage activity, reducing our target leakage reduction from 7.7Ml/d to 3.5 Ml/d.

Table 17 Demand management strategy options considered and alignment with statutory and other targets.

Option Name	Option Description	DI reduced by 20% by 31/03/38	Leakage reduced by 50% by 31/03/50	PCC reduced to 110 l/p/d 31/03/50	NHH demand reduced by 15% by 2050	Total demand saving (Ml/d)
Demand Strategy 1	**Leakage:** Linear to 2050 **Metering:** Full smart metering by 2030 **HH WE:** largest feasible scale by 2030 **NHH WE:** largest feasible scale by 2030 **WE labelling:** Defra Scenario 1	Yes	Yes	Yes	Yes	2030: 36.50 2038: 60.12 2050: 92.74
Demand Strategy 2	**Leakage:** Slow to 2050 **Metering:** Full smart metering by 2037/38 **HH WE:** 2/3 largest feasible scale by 2037/38 **NHH WE**: 2/3 largest feasible scale by 2030 **WE labelling:** Defra Scenario 1	No	No	No	No	2030: 17.02 2038: 41.02 2050: 63.46
Demand Strategy 3	**Leakage:** Hold from 2040 **Metering:** Full smart metering by 2050 **HH WE:** 1/3 largest feasible scale by 2050 **NHH WE:** 1/3 largest feasible scale by 2050 **WE labelling:** Defra Scenario 1	No	No	No	No	2030: 13.23 2038: 30.95 2050: 62.10
Demand Strategy 4	**Leakage:** Hold from 2040 **Metering:** Full smart metering by 2030 **HH WE:** Home Check largest feasible scale by 2030 **NHH WE**: largest feasible scale by 2030 **WE labelling:** Defra Scenario 1	No	No	No	No	2030: 32.88 2038: 48.62 2050: 66.50

Demand Strategy 5	**Leakage:** Fast to 2030 **Metering:** Full smart metering by 2030 **HH WE:** Home Check largest feasible scale by 2030 **NHH WE:** largest feasible scale by 2030 **WE labelling:** Defra Scenario 1	Yes	Yes	Yes	Yes	2030: 41.44 2038: 63.08 2050: 92.74
Demand Strategy 6	**Leakage:** Slow to 2050 **Metering:** 50% smart metering by 2050 **HH WE:** Home Check 1/6 largest feasible by 2050 **NHH WE:**1/6 largest feasible by 2050 **WE labelling:** Defra Scenario 1	No	No	No	No	2030: 6.89 2038: 19.23 2050: 44.43
Demand Strategy 7	**Leakage:** Linear to 2050 **Metering:** 40% smart metering by 2030, 95% by 2035. **HH WE:** Home Check largest feasible scale by 2030 **NHH WE:** largest feasible scale by 2030 **WE labelling:** Defra Scenario 1	Yes	Yes	Yes	Yes	2030: 19.89 2038: 60.69 2050: 88.16

Figure 10 Demand management options alignment with statutory distribution input target NYAA (including interim targets in 26/27 and 31/32)



Of the seven demand management strategy options considered, options 1, 5 and 7 meet the statutory target for 20% reduction in distribution input (DI) per capita by 2037/38 (see Figure 10). Options 1, 5 and 7 also meet other key targets on leakage reduction (50% reduction by 2050), and per capita consumption (PCC, reduction to 110 l/h/d by 2050). All options apart from option 6 meet the target to reduce NHH demand by 9% by 2037/38 and three options (1,5 and 7) meet the 2050 NHH demand reduction target of 15%. Most options fail to meet interim targets in 2026/27 and 2031/32 for DI and leakage reduction, however as these targets are non-statutory and only represent a guideline glidepath, we are satisfied that our feasible options show an adequate range of ambition, considering our forecast position at the start of AMP8 and with statutory and key targets being met in several options.

2.7.6. Feasible Supply Options Summary

Following screening, a list of 79 feasible supply options was developed and consist of a range of option types, as outlined in Table 18. Each of these options would supply a different annual average and critical period supply-demand benefit to different regions of our supply network and would carry different delivery lead times. Each of these factors are key inputs into the decision-making process.

Table 18 Number of each option type in the feasible list.

Option type	Description	Number of feasible options
Demand Reduction Portfolios	Portfolio options to reduce demand, including leakage, smart metering and water efficiency	7
Desalination	Construction of a new desalination plant	1
Drought Option, Temporary Use Bans and Levels of Service	Options related to the drought plan, drought permits, or drought resilience	4
Water reuse	Reuse of treated effluent in our supply network	6
Groundwater	New borehole sources, use of underutilised existing licences, reinstatement of mothballed sources, and Aquifer storage and recovery	17
Import	New imports or increase to existing imports from neighbouring water companies into our network	13
Works capacity increases	Increases in the capacity of existing treatment works	3
Reservoir	Construction of new, or upgrades to current water storage reservoirs or pump storage	17
Internal Transfers	Construction of new, or upgrades to current transfers within the supply network	18
Total		**86**

These options include Strategic Resource Options of Poole Effluent Re-use and variants of the Mendip Quarries options in terms of yield and connection to our supply system. Since the development of our draft plan, and following discussion with South West Water as part of our regional plan development, Cheddar 2 option is excluded from the feasible options list as it will be selected as part of South West Water's WRMP.

2.7.7. The Preferred "Most Likely" Plan

This section describes how the best value preferred "most likely" plan has been chosen, prior to the development of the adaptive plan, through assessment of the least cost plan and how this compares to alternative "best-value" programmes. Further details can be found in the WRMP24 Supply demand balance, decision-making and uncertainty technical appendix.

We have developed three different alternative plans to our **central** supply-demand balance to derive our **preferred "most likely" plan**. These alternative plans are designed to help shape our chosen best value plan:

- **Plan 1** – the **true least cost** plan derived with no constraints on demand management strategy or consideration of environmental metrics
- **Plan 2** – plan options constrained to those that meets government expectations on 50% leakage reduction by 2050, 110l/p/d per capita consumption target by 2050, and the Defra 20% reduction in per capita distribution input (demand) by 2037/38
- **Plan 3** – plan that meets government expectations, and also derived with the worst performing environmental options screened out from the decision-making tool.

The decision-making tool was run based on the input/options constraints identified above for each plan to derive three alternative portfolios of options scheduled to solve the supply-demand balance across the planning period. Additional system simulation modelling was undertaken to test that the portfolio of options was successful in solving the spatially distributed supply demand balance at the 2035-36 time-slice – the main driver of supply-demand balance deficit. A comparison of the options selected for each of the three plans is outlined in Table 19.

Across plans, a 1 in 200 level of service to 2039-40, temporary use bans and drought permit options are selected to 2050, alongside some smaller supply side enhancement schemes, a 7Ml/d import from Bristol Water, and a more significant change in our system to increase reservoir capacity in the West and transfer this, alongside surplus created through demand reductions, to the East.

Under the true least cost plan, one of the lowest demand reduction benefit scenarios - Demand Strategy 6 - is selected alongside Poole Effluent re-use and a larger import from Bristol Water to solve licence change needs in 2035. Under Plan 2 (meet demand targets) and Plan 3 (meet demand targets + environmental screening) the same options are selected; Demand Strategy 7 which includes more ambitious leakage, smart metering, and water efficiency activity to meet government demand targets is sufficient to meet most of the licence changes required in 2035, without investment of more significant and potentially environmentally damaging supply-side schemes. Therefore, in addition to the options selected across all scenarios, only two additional smaller supply side schemes are required and not until later in the planning period (from 2049).

Table 19 Types of options selected in the central scenario for each of the plans (first year of option benefit shown in brackets).

<table>
<tr><th></th><th>Plan 1 -
True Least Cost</th><th>Plan 2 -
Meets Demand Targets</th><th>Plan 3 -
Demand Targets +
Environmental screening</th></tr>
<tr><td>Options selected across all scenarios</td><td colspan="3">• 9.16 Temporary Use Bans (2025-26)
• 9.19 Reduced Level of Service 1 in 200 to 2039-40, 1 in 500 from 2040-41 (2025)
• 41.01 and 41.06 Drought Permit Options to 2050 (2025-26)
• 59.01 Stream Support option – Upper Stour (2025-26)
• 39.01 and 39.02 Under-utilised licences in North Bath and North Warminster (2063-64 and 2035-336, respectively)
• 70.06 Increased peak reservoir capacity output and CALM main reversal from West WRSZ to East WRSZ (2035-36)
• 70.01 Import Increase from Bristol Water and internal transfers (2035-36)</td></tr>
<tr><td>Demand Management Strategy</td><td><u>Strategy 6</u>:
Total Demand Saving:
• 2030: 6.89 Ml/d
• 2038: 19.23 Ml/d
• 2050: 44.43 Ml/d
Leakage: Slow to 2050
Metering: 50% smart metering by 2050
HH WE: Home Check 1/6 largest feasible by 2050
NHH WE:1/6 largest feasible by 2050
WE labelling: Defra Scenario 1</td><td><u>Strategy 7:</u>
Total Demand Saving:
• 2030: 28.48 Ml/d
• 2038: 57.90 Ml/d
• 2050: 91.61
Leakage: Linear to 2050
Metering: Full urban smart metering (75%) by 2030, rural by 2035. Non-compulsory measured billing.
HH WE: Home Check largest feasible scale by 2030
NHH WE: largest feasible scale by 2030
WE labelling: Defra Scenario 1</td><td><u>Strategy 7:</u>
Total Demand Saving:
• 2030: 28.48 Ml/d
• 2038: 57.90 Ml/d
• 2050: 91.61
Leakage: Linear to 2050
Metering: Full urban smart metering (75%) by 2030, rural by 2035. Non-compulsory measured billing.
HH WE: Home Check largest feasible scale by 2030
NHH WE: largest feasible scale by 2030
WE labelling: Defra Scenario 1</td></tr>
</table>

Supply Options Selected	• 52.02 Poole Water Recycling and Transfer - Stour use - 50% (2035-36) • 70.03 Bristol Bulk Import and internal transfers (2035-36) • 38.11 Under-utilised Licence - East Dorchester Source (2040-41) • 34.1 Amesbury Boreholes (Hampshire Avon) (2035-36) • 18.28 North Bath Resilience (2040-41)	• Under-utilised licence - East Weymouth Source (2063-64)	• Under-utilised licence - East Weymouth Source (2063-64)

The programme of options selected for each of the three plans has been reviewed against the key metrics (Table 20) in order to determine our preferred programme.

Table 20 Comparison on plans in terms of best-value criteria (NC = Natural Capital; BNG = Biodiversity Net Gain)

Plan	Programme Cost	Drought (1 in 500 resilience by 2039/40)	Environment		Carbon tCO_2 equivalent	Abstraction reduction - Environmental Destination	Government Demand Expectations
	(£NPVm)		NC	BNG			
Plan 1	£550M	2039/40	-76	22	290,724	Meets 2035 licence reductions	No
Plan 2	£834M	2039/40	-39	14	397,103	Meets 2035 and licence reductions	Yes
Plan 3	£834M	2039/40	-39	14	397,103	Meets 2035 licence reductions	Yes

All plans meet abstraction licence reductions in 2035 as well as providing drought resilience to 1 in 500 drought by 2039/40. Plan 2 and Plan 3 meet the government demand reduction targets, and in doing so achieve this at a greater programme cost and carbon cost. The higher programme cost is associated with the higher cost of the demand management strategy, and the higher carbon cost is mainly driven by the carbon cost over the whole planning horizon to 2080 of reducing leakage by 50% by 2050 and the carbon cost associated with holding this steady for the remainder of the planning period. In comparison the carbon cost of Plan 1 is smaller as the demand reduction strategy volume, coupled with new supply-side schemes is balanced slightly more by reduced carbon emissions associated with abstraction licence reductions.

As a result of fewer supply-side schemes, Plan 2 and Plan 3 score more favourably than Plan 1 in relation to Natural Capital losses and plans score similarly in terms of Biodiversity Net Gain, but with fewer losses as a result of fewer supply side schemes, and as a result of the screening process of environmentally worse options. The majority of the negative performance scores result from transfer options which are assumed could be mitigated via best practice construction methods and pipeline routes to avoid certain routes or habitats.

Of the demand management strategies that meet government policy expectations and the statutory DI target, Strategy 7 which is selected in Plan 2 and Plan 3 is more acceptable under our AMP8 affordability and acceptability testing for PR24 than the other strategies due to the slower roll out of smart metering.

Based on the assessment of least cost versus alternative best-value planning scenarios, Plan 3 is the preferred plan. Whilst the plan comes at a greater financial and carbon cost that the least cost plan, the plan meets government targets for demand reductions, and the higher costs for reducing demand are required to meet the statutory DI target on 2037/38. Whilst the plan comes with a larger carbon cost over the lifetime of the planning horizon, much of this carbon cost is associated with reducing leakage to 50% of 2017-18 levels by 2050 and holding steady for the remainder of the planning horizon. We expect much of this activity will have lower future carbon costs through our activity to achieve net zero carbon[14].

As part of Plan 3, Demand Management strategy 7 is considered to be the best value strategy as it:

- Meets government targets for PCC, leakage and non-household demand reduction.
- Meets statutory government target for DI reduction.
- Does not ‘over deliver’ on the above at significant cost to customers, through appropriate phasing of smart metering.
- Is ambitious enough to impact on requirement for future supply side schemes in areas affected by licence reductions.
- Is considered acceptable to customers, measured billing will be encouraged but only compulsory through change of occupier.
- Associated programmes of work are considered deliverable.

A key benefit of this strategy is that by meeting 2035 targets for licence reductions through demand management measures, the strategy is reducing abstraction from the environment whilst supply side schemes are put in place by 2035. This strategy therefore has more of a benefit in the short term on the supply demand balance and abstraction from the environment (Figure 11**Error! Reference source not found.**). This provides more of a benefit in the short term to chalk catchments such as the Hampshire Avon where the majority of sites targeted for licence reductions are located. In the Hampshire Avon, the need to offset future population growth through demand reductions to ensure no additional abstraction from the catchment is required is a key driver for preference of Plan 3.

[14] Carbon and climate (wessexwater.co.uk)

Figure 11 Comparison of Supply-Demand Balances between plans.

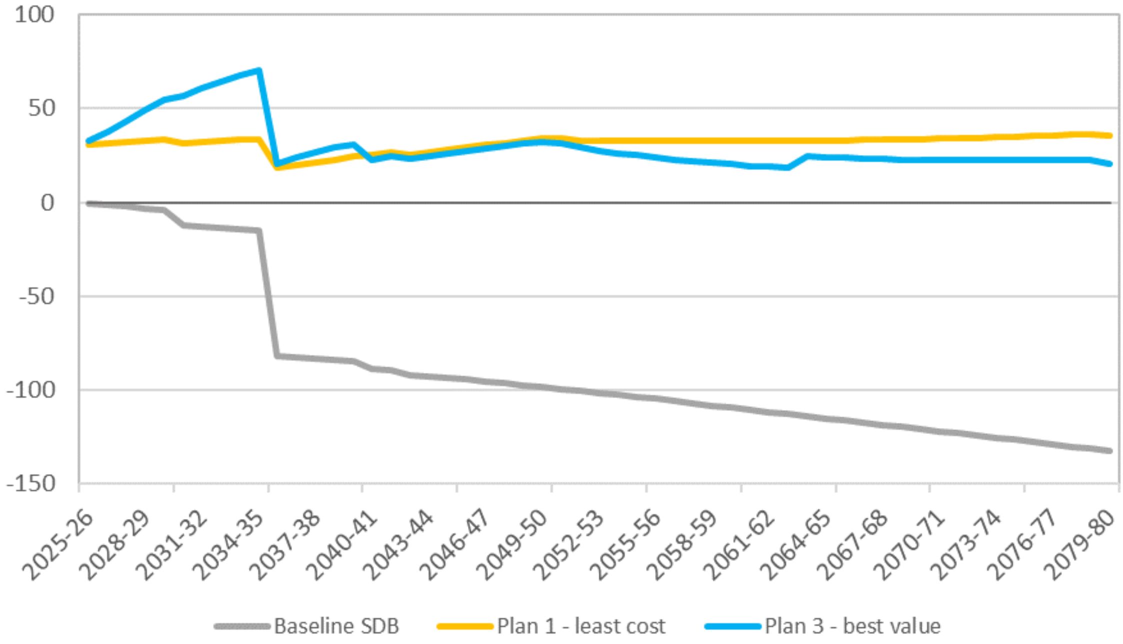
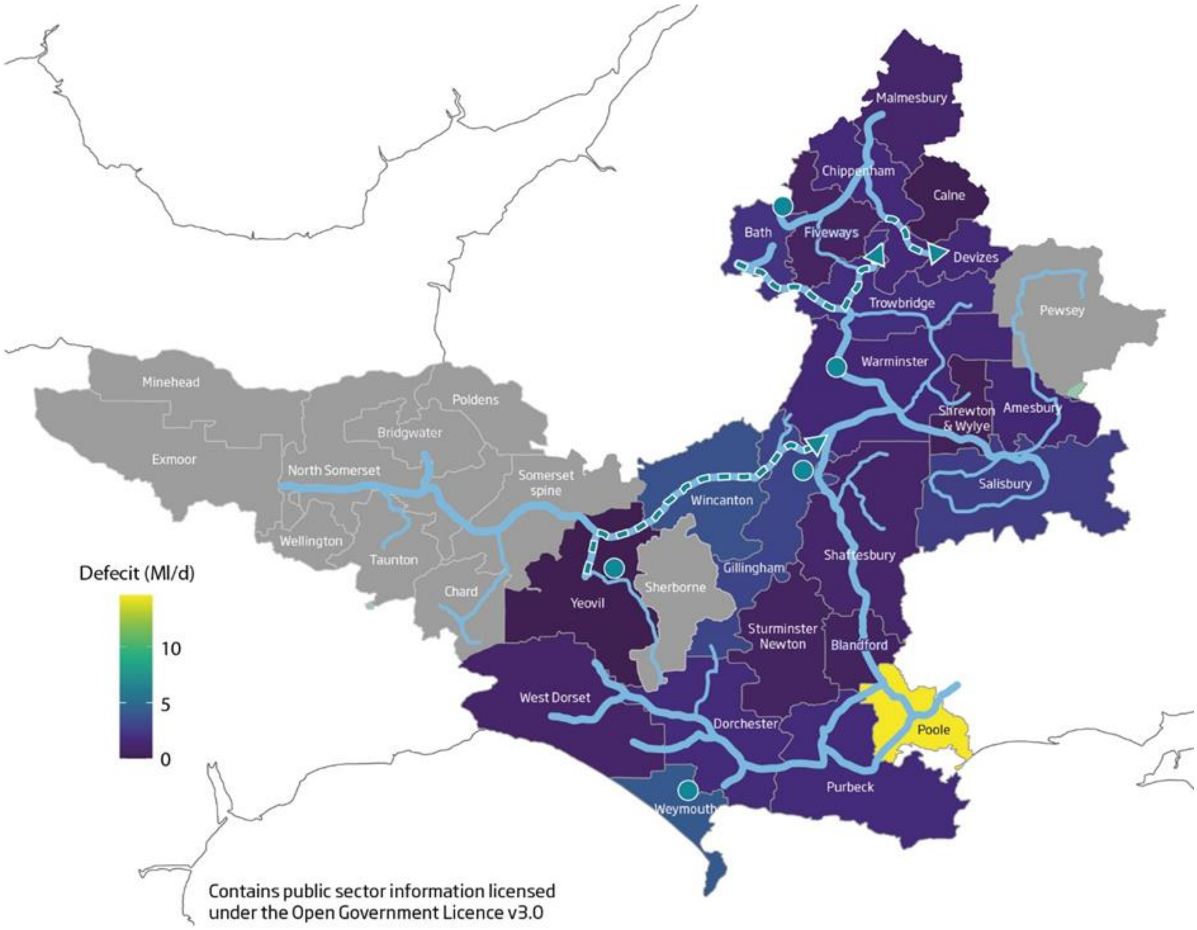


Figure 12 shows the spatial location of baseline supply-demand balance deficits under the central supply-demand balance scenario in 2035-36, overlain with the location of selected supply options. Demand management measures provide the main source of supply-demand balance benefit. By reducing demand at key demand centres, our existing grid system allows the benefit of these reductions to be moved through the supply system. The two key supply-side options that provide changes to the way in which the supply system will operate are option 70.06, which will increase peak reservoir output in the West and, alongside the benefit of demand reductions made in the West of the supply system, this water will be moved East from Yeovil towards Warminster to help meet peak demands in the groundwater dominated parts of our supply system. The other option is 70.01, which will increase the import of water from Bristol Water, and move this water into our supply system and onwards to the Devizes area to help meet the licence reductions in the Upper Western Arm of the Hampshire Avon catchment.

Whilst the preferred plan has been identified that meets the central planning scenario, there are key uncertainties in future need, as well as other drivers that need to be considered to derive our preferred adaptive plan, that are considered in Section 2.6. Demand management strategy 7 as selected in Plan 3 is also selected under the higher need future scenario, and therefore to adapt to a greater potential need for licence changes in 2035, it features under the core pathway.

Figure 12 Spatial location of baseline supply-demand balance deficits overlain with location of selected supply sources and transfers under the preferred "most likely" plan.



2.8. Preferred Adaptive Plan

This section summarises section 6 of our WRMP24 Main Technical Plan, please see this document for further details.

In addition to the identification of a preferred "most likely" plan under the central planning supply demand balance scenario, in this section we consider alternative future scenarios to ensure our plan can adapt to future uncertainties. Further details can be found in the WRMP24 Supply Demand Balance, Decision-Making and Uncertainty technical appendix.

2.8.1. Key future uncertainties

The key future uncertainties that have been considered in developing the adaptive plan are:

- Supply demand balance scenarios – alternative supply demand balances, as summarised in 2.4, where uncertainty in future licence reductions, demand growth and climate change are considered. We have developed our adaptive plan using plausible low and high supply-demand balance scenarios, as shown in Section 2.4.
- Demand management strategy effectiveness – the effectiveness of future demand management measures is uncertain, as demand is influenced by a range of factors beyond the control of the company, including future climate change, changing demand resulting from post-covid changes and in response to changing

economic circumstances and the recent cost of living crisis. We have tested whether whilst investing in Demand Strategy 7, only half the benefits of the strategy are achieved.

- Additional need from Ministry of Defence Sites and Veolia Water Services – Alongside licence reductions in the catchment to achieve sustainable abstraction for Wessex Water, both the Ministry of Defence and Veolia Water Services may require additional volumes of water to meet their future needs that those already accounted for in our central supply-demand balance, which in part depends on the outcome of subsequent environmental investigations in the 2025-2030 period. We have modelled scenarios where an additional 9.84Ml/d is required. These additional demands would be in the eastern part of our supply system in the Hampshire Avon.
- Hampshire Avon options – one solution to meet the needs of licence changes in the Hampshire Avon catchment for both Wessex Water and other users' needs is to combine existing abstractions and move them further downstream to different locations that have more water in the river and then supply this water back upstream to existing demand centres. Investigations are being taken forwards under the WINEP programme in the 2025-2030 period to assess option feasibility. Whilst these options have not been selected under our preferred "most likely" plan, it is important our plan adapts to uncertainty in availability under other plausible future scenarios.

Whilst these factors can be considered in isolation, it is important to consider them together, as combinations of these factors evolving in the future are plausible - e.g., additional need in the Hampshire Avon catchment but no additional options in the catchment available. Therefore, in addition the preferred "most likely" plan, and based on some of the option selection under some scenarios, we have developed the following alternative scenarios to develop the adaptive plan[15]:

- Lower Need scenario – Supply-demand balance follows the low need supply demand balance.
- Higher Need Alternative Programme 2 (AP2) - Supply-demand balance follows a high need scenario (supply-demand balance scenario 6).
- Higher Need Alternative Programme 3 (AP3) – Hampshire Avon options not available - Supply-demand balance follows a high need scenario (supply-demand balance scenario 6), but not Hampshire Avon options are available to be selected.
- Central Alternative Programme 4 (AP4) – Demand Management Strategy 7 less effective – supply-demand balance follows the central SDB scenario, demand savings achieved only follow the savings associated with Demand Strategy 3 (approximately half of the savings).
- Central Alternative Programme 5 (AP5) – Demand management less effective + Hampshire Avon options not available - supply-demand balance follows the central SDB scenario, the demand management strategy is less effective, and Hampshire Avon options are not available.
- Central Alternative Programme 6 (AP6) – Additional need from MoD and Veolia - supply-demand balance follows the central SDB scenario, and there is additional need in the Hampshire Avon from MoD and Veolia.
- Central Alternative Programme 7 (AP7) – Additional need from MoD and Veolia and no Hampshire Avon Options.

[15] We also considered the scenario where under the preferred "most likely" plan there was not Hampshire Avon options available, however these were not selected under the main pathway (Note: AP == Alternative Pathway and Cen == Central).

Please also note that the names of the alternative programmes has been selected to line up with the accompanying planning tables, and also to the Ofwat long term delivery strategy (PR24 long-term delivery strategies - Ofwat), where the preferred "most likely" WRMP plan is presented as an alternative programme to the Ofwat core programme. Therefore the preferred "most likely" plan in the WRMP is referred to as Alternative Programme 1 (AP1), and the alternative scenarios

To develop the adaptive plan, we have run the decision-making tool based on the above supply-demand balance scenarios and option constraints.

2.8.2. Options Selected Across Scenarios

The first step in developing the adaptive plan is to assess the options selected across alternative scenarios, to identify common options, and understand the start dates of the different options to inform decision-making and trigger timing. Table 21 shows the options selected under the alternative planning scenarios. With the exception of the demand management strategy, the options are ordered from top to bottom in the table by the frequency with which the option is selected.

Under the alternative central scenarios (AP1-4) Demand Strategy 7 is selected as a mandated scheme to explore alternative futures to the preferred "most likely" plan. However, the option is selected as the least cost option under high need SDB scenarios AP1 and AP2. Under the low future SDB, Demand Management Strategy 6 is selected, which has approximately a 3rd of the demand saving benefit of Strategy 7, alongside the 5 options that are included under all scenarios – drought measures, reduced levels of service and a stream support option.

Table 21 Options selected under alternative scenarios, as indicated by the date at which scheme development needs to start. Grey shading of option names indicates those options taken forwards in the Ofwat Core Programme.

ID	Option Name	Preferred AP1	Low	High AP2	High AP3	Cen. AP4	Cen. AP5	Cen. AP6	Cen. AP7
57.07	Demand Strategy 7	2025		2025	2025	2025	2025	2025	2025
57.06	Demand Strategy 6		2025						
9.19	Reduced levels of service, moving to 1:500 to 1:200	2025	2025	2025	2025	2025	2025	2025	2025
9.16	Temporary Use Bans	2025	2025	2025	2025	2025	2025	2025	2025
41.01	Drought Permit - Stour catchment	2025	2025	2025	2025	2025	2025	2025	2025
41.06	Drought Permit - Bride catchment	2025	2025	2025	2025	2025	2025	2025	2025
59.01	Upper Stour Stream Support	2025	2025	2025	2025	2025	2025	2025	2025
39.01	Underutilised licence – North Bath	2056		2048	2028	2028	2028	2057	2053
39.02	Underutilised licence: North Warminster	2028		2028	2028	2028	2028	2028	2028
70.06	Increased Reservoir Capacity and East Transfer	2026		2026	2026	2026	2026	2026	
22.04	Weymouth Source Improvements	2054				2026	2026	2054	2054

52.02	Poole Water Recycling and Transfer – Stour use 50%			2025	2025	2025	2025		
70.01	Bristol Import and onwards transfer I	2026		2026				2026	2026
38.01	Underutilised licence due to water quality: Purbeck			2028			2053		2050
70.02	Bristol Import and onwards transfer II				2026	2026	2026		
38.12	East Weymouth Source – treatment improvements			2046	2046				
34.1	Amesbury boreholes			2025		2055			
32.36	New Reservoir: Bristol Avon			2034	2032				
33.01	Groundwater: Aquifer Storage Recharge - Wareham Basin			2043	2028				
18.1	West Reservoirs transfer upgrade			2056	2057				
30.02	Pump Storage – Quantock Reservoir			2051	2052				
21.13	Salisbury to Amesbury to Tidworth transfer			2070	2057				
38.11	Underutilised licence: East Dorchester Source			2028	2028				
23.01	Yeovil Reservoir increased peak capacity								2027
18.28	North Bath Resilience				2029				
55.05	North Grid to South Grid reinforcements - 5.5Ml/d				2026				
54.06	Mendips to Grid – 50% capacity				2049				
21.12	Pewsey resilience			2049					
25.03	Grid reinforcements – Wylye valley				2057				

70.03	Bristol Import and onwards transfer III			2026					
70.04	Bristol Import and onwards transfer IV				2026				
70.05	Bristol Import and onwards transfer V								2026
70.07	Hampshire Avon Boreholes and Transfer							2025	

Under the two higher need scenarios, alternative programme 2 and 3, more options are selected to solve the supply-demand balance. In AP2, this includes 3 options brought forwards, two in to AMP8, that are also included in the preferred “most likely” programme (39.01, 39.02 and 70.06). In the shorter term, the largest options selected to meet the higher need environmental licence reduction need in 2035 include 52.02 Poole water recycling scheme, Amesbury boreholes scheme (34.1) in the Hampshire Avon, and an increased import from Bristol Water (70.03). There are also some larger schemes selected to meet longer term need (33.01 and 54.06). Under AP3 – where Hampshire Avon options are unavailable - scheme selection is similar; most schemes also selected under AP2 are brought forwards, and in addition an increased import from Bristol is selected alongside a longer-term transfer of 17.5Ml/d from Mendip quarries.

Under the central alternative programmes, a less effective demand management strategy (AP4) results in the selection of 52.02 Poole water recycling scheme, and increase in transfer from Bristol Water (70.02) instead of option 70.01 to move water further into the Hampshire Avon, alongside the selection of Amesbury boreholes in the Hampshire Avon (34.1) later on in the planning horizon in 2055. If the demand management strategy is less effective and the Hampshire Avon options are not available (AP5) then the same schemes are selected as with AP4, except instead of the Amesbury boreholes (34.1) option 38.01 underutilised licence at Purbeck source is selected in 2053.

If under the central SDB scenario additional need is also required by the MoD and Veolia Water Services (AP6) then the new borehole option in the Hampshire Avon and onwards transfer is selected from 2025 (70.07). If, however there is additional need, but no Hampshire Avon options (AP7) then instead of a more local supply solution, then the primary plan change is to bring in additional water from Bristol Water (70.05) which distributes the water further into the Hampshire Avon catchment into Salisbury to meet the additional need from 2026.

2.8.3. Adaptive pathways

Based on the scenario analysis undertaken, the adaptive plan and associated pathways have been developed accounting for Ofwat’s PR24 and beyond – Final guidance on long term delivery strategies[16]. The development of the adaptive pathways is as follows.

[16] PR24-and-beyond-Final-guidance-on-long-term-delivery-strategies_Pr24.pdf (ofwat.gov.uk)

Ofwat Core Programme

All activities which are selected under all scenarios are considered no- and low-regret options and are included in a **core pathway** as these activities need to be undertaken to be ready for all plausible future scenarios. This includes:

All activities under the low scenario – the only option selected under the low scenario that differs to the other scenarios is the demand management strategy. However, given Demand Strategy 7 is required under the preferred “most likely” programme to meet government policy expectations, and is also required to meet needs under the two high SDB programmes (AP2 and AP3), and that the strategies are mutually exclusive, means **Demand Management Strategy 7** is selected under the core pathway. Further details about the Demand Management Strategy 7 can be found in the WRMP24 Demand Management Strategy technical appendix.

All activities selected under all scenarios – drought permit options (41.01 and 41.06), temporary use bans (9.16), the local stream support option (59.01) and reduced levels of service (9.19).

Activities to be ready for all plausible future scenarios – Programmes AP2 to AP7 are included in the plan alongside the preferred “most likely” programme (AP1) as the plan alternative pathways/programmes. Under the core programme, in addition to those schemes being taken forwards across all scenarios, there are 12 additional schemes to be taken forwards under the core pathway in AMP8 2025-2030. These options are being selected in the core programme because across all pathways the earliest start date fall between 2025 and 2028, and therefore activity is required under those schemes to keep alternative future pathways open.

For these schemes, to keep future pathways open, we plan to take these 12 options forwards through the design and development phases (enabling work) of the schemes towards the date of the next WRMP (draft in 2027 and revised draft/final plan in 2028) towards the **trigger point** for determining which future pathway to follow in 2030. Of the supply schemes being taken forwards in AMP8, a number of the schemes have common source and transfer elements – for example there are several schemes that utilise an import from Bristol Water and onwards transfer to different parts of the supply system. The costs included in the plan under the core pathway for scheme design and development do not duplicate these elements.

The key reason for needing to take a range of options forwards in AMP8 is due to the significant need that must be met in 2035, and the key uncertainties that need to be resolved in the next planning period. Six options are also selected under the core pathway, which have their earliest start dates across pathways from 2028 (39.01, 39.02, 38.01, 33.01, 18.28 and 38.11). We will narrow down our future uncertainties by the time of the next draft plan in 2028, and use dWRMP28, and the information gathered to date, to determine whether these additional six schemes need to be taken forwards. For these schemes, depending on the outcome of dWRMP28 in 2027-28, we would seek AMP9 transition funding to take these options forwards to design and development, to inform our decision point in 2030.

The key areas of uncertainty, and therefore the key aspects that will be monitored on the core pathway, are as considered above for alternative pathways, and principally include:

Required licence reductions and other needs – the main driver for our supply-demand balance reductions is licence changes in 2035. However, there is significant uncertainty in the amount of licence changes required, which will only be resolved when the investigations into source sustainability are completed under the WINEP programme in AMP8. Overall there are 38 water resources WNEP investigations in AMP8. In addition, there is further need in the Upper Hampshire Avon catchment from MoD and Veolia water.

To identify the most appropriate solution for the catchment, as with other locations, it is important to have a complete understanding of all future needs so that future investment is efficient. To help achieve this, we have set up the Upper Hampshire Avon Water Resources Steering Group to align understanding of future catchment need and solutions that meet all needs to help protect the catchment in the long-term. Further detail can be found in the WRMP24 Upper Hampshire Avon Water Resources Strategy technical appendix. By the next WRMP, we will not have complete conclusions from investigations so will seek to use the information to date for the draft WRMP in 2027 and revised draft WRMP in 2028 to narrow down our uncertainty in which future pathway will likely be followed, subject to a complete set of investigation outcomes by 2030 to determine which pathway and programme is to be followed.

Future demand – there is uncertainty about the forecast of future demand growth, as accounted for in the alternative SDB scenarios, as well as uncertainty in the effectiveness of demand side measures that will be implemented in the Wessex Water area – including in the effectiveness of smart metering, which will be rolled out in the Wessex Water area for the first time. Between now and the next WRMP development, and by 2030 we will monitor and gather data on demand reductions and demand forecasts.

Supply side scheme investigation – The design and development steps undertaken for those options in the Hampshire Avon will help inform feasibility of those schemes from an environmental perspective, to then determine whether these local schemes can be taken forwards. By the next WRMP we expect only interim outcomes of these investigations, but will use this information to inform the decision-making process for WRMP28.

Alternative Pathways

As identified under the core pathway above, work undertaken in AMP8 will help inform:

- a decision point in 2027-28, aligned and informed by the next WRMP as to whether alternative schemes need to progress for design and development from 2028 towards the trigger point in 2030.
- a trigger point in 2030 where one of the alternative pathways will be followed.

Table 22 shows the options that will be selected under the different alternative programmes and implemented following the trigger point in 2030. Table 18 shows the approximate likelihood of following each pathway from 2030 (where the core is followed to 2030), and the Net Present Value (NPV) of following each pathway. As per progress our activity in AMP8, we will gather further information to narrow down the uncertainties on which pathway is most likely.

Table 22 Likelihood and NPV cost of the alternative pathways

Programme	Description	Approximate Likelihood Post 2030	NPV
Ofwat core	Ofwat Core Pathway	20%	£754m
AP1	Preferred “most likely” programme	21%	£834m
AP2	High Alternative Need	10%	£1,259m
AP3	Higher Alternative Need and Hampshire Avon Options Not Available	10%	£1,368m
AP4	Central need and Demand management less effective	10%	£917m

AP5	Central need, demand management less effective and Hampshire Avon options not available	5%	£923m
AP6	Central need and additional need from MoD and Veolia	12%	£921m
AP7	Central need, additional need from MoD and Veolia and no Hampshire Avon options available	12%	£932m

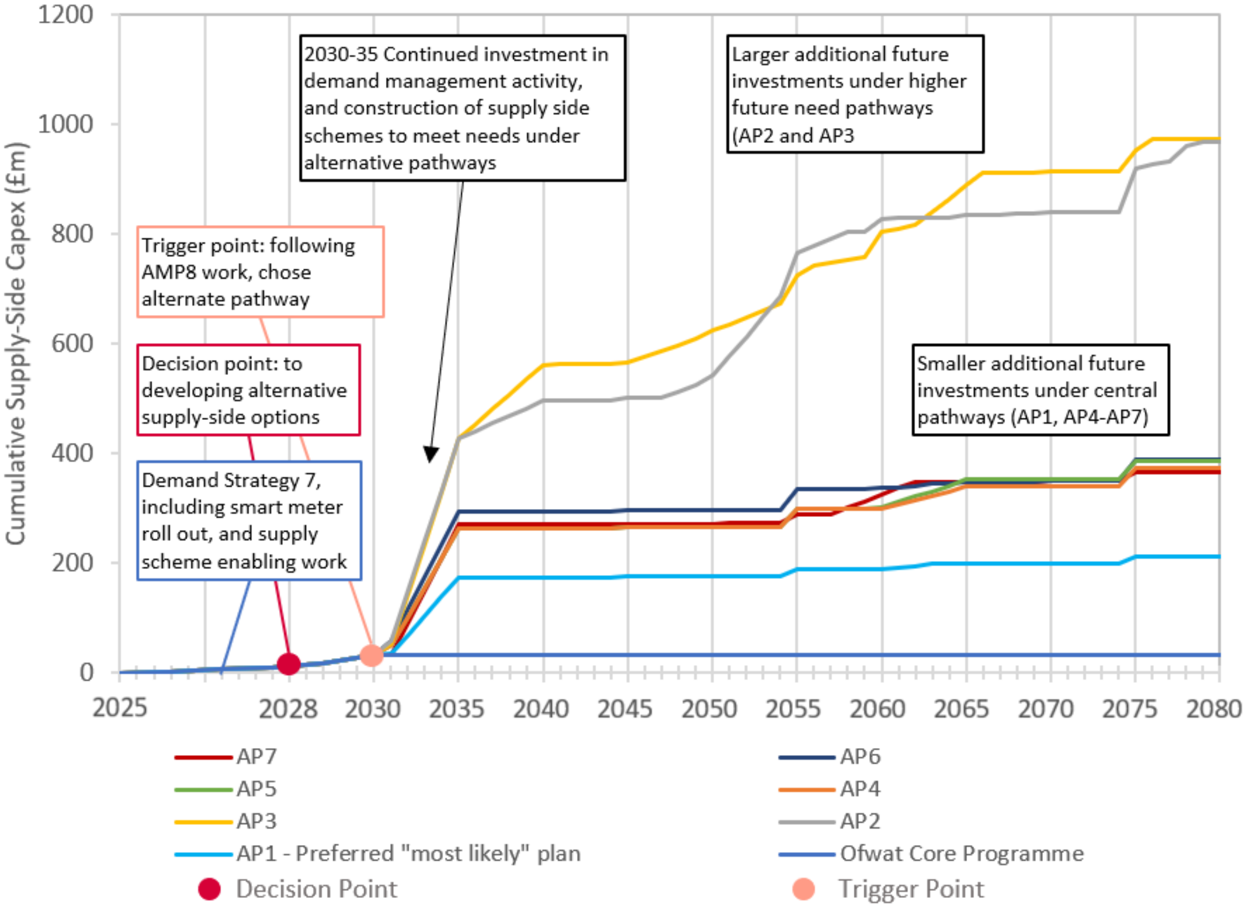
The key decision to be made to follow each pathway are summarised in **Error! Reference source not found.** alongside the monitoring plan in *Table 23*. The adaptive plan is also shown schematically in Figure 13Table *23 Monitoring and enabling activities as part of the adaptive plan.*

Table 23 Monitoring and enabling activities as part of the adaptive plan.

Area	Monitoring/ Enabling Activity	Metrics being measured	Relation to Decision/Trigger Point
Supply and Demand Side Options Benefits	Design and development of all schemes that may progress under each pathway to construction in AMP9	Yield, Cost, Overall feasibility (planning/environmental barriers), notably environmental feasibility of options in the Hampshire Avon catchment	By 2027/28 inform WRMP29 scheme selection, and by 2030 to inform trigger point for following alternative pathways
	Strategic scheme investigations of Mendip Quarries and Poole Water Recycling Scheme	Yield, Cost, Overall feasibility (planning/environmental barriers), Proportional need across potential beneficiary companies	By 2027/28 inform WRMP29 scheme selection, and 2030 to inform trigger point
	Demand Management Strategy: Smart metering, water efficiency and leakage effectiveness.	Water saving benefits at household/non-household level of metering and water efficiency measures (both internally and nationally), cost, customer acceptability.	By 2027/28 inform WRMP29 scheme selection, and by 2030 to inform trigger point
	System modelling	- Regional and company modelling of internal transfers and strategic schemes	By 2027/28 to inform WRMP29 to inform scheme benefit assessment
Supply Demand Balance Components	WRMP annual review, and development of supply-demand balance components	Annual monitoring of: distribution input, non-household demand, household demand (as related to effectiveness of metering and water efficiency programmes), metering (installations	By 2027/28 inform WRMP29 baseline for supply-demand balance scenarios and need of whether to progress additional schemes for design and development in AMP8.

		compared to forecast) and leakage	
	WINEP investigations	Licence losses required and associated drought Deployable Output, and timing of licence losses required	by 2027/28 inform WRMP29 supply demand balance scenarios, and 2030 to inform scheme feasibility of Hampshire Avon options and licence reductions needed
Policy direction and external developments	Population, Household growth and planning	- New Local Authority Plans and changing developments on household growth. - ONS census 2021 and updated forecasts	by 2027/28 inform WRMP29 and growth forecasts compared to low and high growth scenarios
	Regional and neighbouring company, and other user needs in shared catchments	Developments in licence changes required for South West Water in Stour and Hampshire Avon, and MoD/Veolia licencing requirements in Hampshire Avon.	By 2027/29 to inform WRMP29 strategic scheme benefit and selection, and whether we need to move to
	Liaison with Environmental Groups, Natural England, and the Environment Agency	Environmental policy changes, developments of chalk stream group (CABA) and Moors protection policies	by 2027/28 inform WRMP29 supply demand balance scenarios and licence loss policies
	Water efficiency labelling	Government policy on water efficiency labelling: implementation and likely savings	By 2027/28 inform WRMP29 scheme selection and yield benefits

Figure 13 - WRMP24 adaptive plan showing alternative pathways and alternative investments (shown for reference against supply-side capex investment to see specific investment timing).



2.8.4. Key Features of Our Preferred Adaptive Plan (best value plan)

This section provides further details and justification of our preferred adaptive plan including our demand management strategy and supply side strategy. Regulatory environmental assessments and WINEP investigations included as part of our preferred plan are detailed in section 3.

Demand management strategy

Our demand management strategy comprises demand reductions arising from programmes of activity relating to:

- The roll out of smart metering to households and non-households
- Water efficiency support for households and non-households
- Leakage reduction
- The introduction of water efficiency labelling by government

This section contains details of how our demand management strategy will be specifically applied in the Hampshire Avon catchment and how government mandated demand reduction targets for the sub-components of water demand will be addressed. Further details can be found in the WRMP24 Demand Management Strategy and Upper Hampshire Avon Water Resources Strategy technical appendices to our revised draft WRMP24.

In response to the July 2023 EA Information Letter 17/2023 to consider phasing activities from PR24 into future price review periods we have adjusted our demand management strategy for our business plan from that proposed in our revised draft WRMP24. This includes a reduction in our AMP8 smart metering programme, reducing target smart meter penetration for HH and NHH from 75% to 40% and a reduction in our Leakage activity, reducing our target leakage reduction from 7.7Ml/d to 3.5 Ml/d. Although these elements of our demand management strategy have now been phased to deliver less in AMP8, we still remain committed to achieving the same targets as proposed in our revised draft WRMP24 by the end of AMP9.

Smart metering

A significant smart metering roll out is at the heart of our demand management strategy to ensure we deliver the statutory demand reduction target and reduce the requirement for future supply side schemes. The rollout of advanced metering infrastructure (AMI) smart meters to 95% of households and non-households in our region by 2035 will provide high resolution usage data allowing us to better target both leakage reduction and water efficiency services.

We plan to install 257,000 smart meters by 2030 covering 40% of properties (HH and NHH) in our region. We are comfortable this speed of rollout is deliverable following market engagement sessions held with prospective suppliers, and review of deliverability of our proposed plan by Artesia. Our initial smart meter roll-out will focus in the Hampshire Avon catchment and surrounding areas where supply resilience is at risk due to planned abstraction licence reductions. Our approach to the roll-out of smart metering aims to deliver the maximum demand reduction benefits in the most efficient way.

We will continue with our compulsory change of occupier metering policy and all new connections will also have a smart meter. Where customers are currently unmetered, we will install smart meters, but will not automatically switch them to metered charging. We will use the meter installation as an opportunity for engagement around water use and water saving and will encourage customers to switch to metered bills. We will still collect smart usage data from these properties that initially remain on unmeasured billing enabling us to identify and support reduction in supply pipe leakage and plumbing losses. We forecast that initial demand reduction linked to leakage and plumbing losses, coupled with customers transferring to measured bills voluntarily or through change of occupier over time will be sufficient to ensure we meet our statutory distribution input reduction target by 2037/38.

In addition to the demand reduction benefits of smart metering to the environment from reduced abstraction, there are also direct benefits for customers and for us through the significant opportunities it provides for enhanced customer services. Our smart metering roll out will include the launch of an app or digital portal that enables customers to view their water use information and understand where savings can be made thus empowering them to be more in control of their bill.

We will be able to easily alert customers to changes in their usage that might indicate a leak. Links with our water efficiency and leakage programmes will support customers in resolving these issues far sooner than is possible with only 6-monthly meter read information.

Regular, timely and insightful engagement underpinned with smart metering data will enable us to drive change in water use habits at home through behavioural comparison methods and facilitate community scale change when roll-out and supporting promotional campaigns focus in specific areas such as the Hampshire Avon.

We'll also seek to embed other services within this digital platform to add more value to the customer offering – our vision is that customers will be able to use the app to report a leak, track a job, use our water efficiency calculator, order water saving devices and pay their bill.

In the 2025-30 period we'll also be able to explore how smart data can be used within innovative tariff structures to stimulate further demand reductions.

Household water efficiency

The availability of high-resolution consumption data arising from the smart metering roll out will facilitate ever better targeting of water efficiency services, and in particular our Home Check programme for household customers. Our existing Home Check programme which involves an in-home visit from a technician to fit water saving devices, check for plumbing leaks and offer tailored behavioural advice on water saving, targets the highest water using households using 6-monthly meter read information to maximise the savings per visit. The availability of hourly data will allow even more effective targeting and the rapid identification of continuous flows to reduce the run time of plumbing losses from leaking toilets and taps. Our Home Check service offers free plumbing leak fixes for customers that need it.

From 2025-2030 our preferred programme will include 12,000 standard Home Check visits and 4,800 plumbing leak fix visits a year. This is a significant increase in activity level from the current period (2020-25) which is seeing us deliver around 4,500 standard visits and 750 plumbing leak fix visits a year. Our experience of delivering in-home support to customers in programmes like these since 2016 will make the expansion of this Home Check programme feasible when paired with the smart metering programme to provide data and insight to target and drive the focus areas.

To help us meet the statutory demand reduction target by 2037/38 we expect to step up the Home Check activity level from 2030 to over 17,000 standard visits and over 8,500 plumbing leak fixes a year. This will represent a further significant increase in scale, and is undoubtedly ambitious, but will follow a further five years of delivery, monitoring, innovation and collaboration with customers though our water efficiency and smart metering programmes.

An example of the innovation we are currently applying to our Home Check service is our community ‘Rainsavers’ project in Chippenham. This trial involving over 200 households has seen us expand the Home Check offering to include the installation of free water butts and ‘soaker hoses’ to include garden water savings into the programme. A soaker hose is a porous pipe that, in this context, allows a water but to rapidly drain the water being collected during a rainstorm directly into borders and vegetable patches. Importantly though, the soaker hose is diverting rainfall away from combined sewers and therefore represents a holistic approach that benefits not only demand management but also our drainage and wastewater strategies. The findings from this project, undertaken in 2023, are still being assessed but customer feedback is indicating that it has expanded the community’s awareness of the issues of water use and rainfall drainage and that there is an appetite for engagement of this nature.

Learning from innovative approaches like ‘Rainsavers’ will help to shape and optimise the delivery of our future water efficiency engagement programmes and overall adaptive plan.

Government water labelling

The water resource planning guideline requires us to include in our preferred plan the assumption that government will introduce mandatory water labelling for appliances from 2025/26.

A mandatory water efficiency label will give consumers the information they need to make informed decisions when purchasing new water using products for their home. It will also help developers and water companies to improve water efficiency in buildings. It will likely involve a tiered labelling approach that allows products to be rated at levels of water consumption, similar to the energy efficiency label. The label would be applied to common household products such as toilets, taps, shower outlet devices, dishwashers and washing machines.

As per the September 2022 Defra consultation on labelling we have assumed that labelling will be introduced without associated changes to building standards or regulations. The impact of this scenario will be to reduce per capita consumption by 1.5 litres per person per day by 2035 and by 13 litres by 2050. For the Wessex Water supply region this amounts to savings of 2.2 Ml/d by 2035 and nearly 20 Ml/d by 2050.

To ensure customers understand and engage with the new water labelling information our preferred plan includes an allowance for engagement campaigns and activities to help realise the demand savings plus engagement with building developers. While changes to building standards are not being included in this government measure at this time, we are keen to support future work in this area through partnerships, research and lobbying.

Non-household (business) demand

Our smart metering roll out will include non-household properties and we commit to working with MOSL, retailers and business users to ensure the data captured by smart meters is appropriately available within the market to improve billing accuracy and stimulate demand reductions through the identification of continuous flows which may be indicative of wastage, plumbing losses and external leaks.

In 2022 we relaunched a non-household water efficiency programme following a hiatus of several years since market separation. Our current programme has focussed support to schools and has been delivered through collaboration with both retailers and the Department for Education. The programme focusses on identifying and resolving leaks and wastage arising from toilets, urinals and taps. In 2022-23 we visited 91 schools; this activity was one of the most cost-effective elements of our water efficiency strategy.

Our preferred plan for non-household demand management for 2025-30 will include over 160 visits a year to non-households to fix leaks and reduce water wastage. We anticipate continuing to work with schools and other not-for profit or community focussed organisations. This programme will be supported by the smart metering roll out that will provide high resolution usage data to identify continuous flows – which can be investigated for leaks/wastage – and therefore enhance targeting.

Our assumed model of delivery for the non-household water efficiency programme of visits is wholesaler-led, although collaboration with retailers is integral to the engagement with individual business users. We are actively engaged with the Retailer-Wholesaler Group's Water Efficiency Sub-Group which we see as a vehicle to support innovation for collaboration between wholesalers and retailers to enhance water efficiency in the non-household market.

The combination of a smart metering for non-households and the targeted water efficiency programme will ensure we meet the targets to reduce business demand by 9% by 2037/38 and 15% by 2050.

A Final Effluent Matrix – developing non-potable alternatives for business users

Water use tends to spike on hot summer days, as people shower more, try to keep cool and hose their gardens. These summer peaks bring cost and network strains; peak asset capacity has to be funded, and sometimes it can be challenging to supply demand quickly enough, even if water resources are plentiful.

In collaboration with the Environment Agency, we will test the provision of alternative, non-potable water derived from treated wastewater effluent for land-based use during summer peaks – for instance, to water golf courses or nourish potato crops. We could offer this alternative supply to such customers during prolonged dry weather. It could be both a lower cost option and a more reliable supply for such customers, while reducing peak potable load for the benefit of all users.

With the Environment Agency, we are developing rules to govern the safe use of recycled wastewater effluent on land: a Final Effluent Matrix to mirror the Safe Sludge Matrix that governs sludge-to-land practices. The could set out, for instance, which use cases require UV disinfection and which don't, and specify that reuse should be within the catchment to which the effluent would usually be discharged, so as not to deprive rivers of flow.

We will be piloting the idea in summer 2024.

Leakage

We are committed to meeting the regulatory target of 50% leakage reduction by 2050, based on a 2017/18 leakage baseline. Our preferred plan forecasts a 3.5 Ml/d leakage reduction between 2025 and 2030. To achieve this, we will build on our current leakage reduction strategy with greater focus on expanding our acoustic logging and smart network capabilities, using data to bring about efficiencies in the 'find and fix' backbone of our operation.

Smart metering data will also play a key role in our leakage reduction strategy, allowing us to identify and resolve customer supply pipe leaks to realise associated benefits much sooner than current detection methods allow. Smart meter data will also enable a better understanding of zonal flow balance, helping identify areas of higher leakage to focus 'find and fix' activities.

In addition to these 'fix' activities we will also expand strategies that prevent future leakage such as pressure management. By focusing on both fix and prevent elements, our leakage reduction strategy will enable us to meet our targets and achieve sustainably low levels of leakage.

Leakage forecasting and prediction

We have created an early concept stage model which uses historical results to forecast future requirements. The model analyses the relationship between night flows on the network and reported leakage levels to establish area-based volumetric targets for our field teams to attain.

We are now working to expand the model to analyse multi-variable relationships inclusive of wider components known to impact leakage levels, such as rainfall, soil moisture deficit, sunshine hours and seasonal demand.

Once good relationships are established, the aim is to cross reference data at a District Metered Area (c.1000 connection) level to establish if certain criteria result in a predictable leakage outcome. This would enable us to get on the front foot and be on hand to find and fix leaks more quickly.

Hampshire Avon

To help protect the Hampshire Avon catchment, there is a regulatory requirement from the EA and NE to ensure that first, new growth in the catchment is not met through additional abstraction, so that abstraction would remain at recent actual levels, and second, that abstraction will be reduced as soon as practicable. A key cited driver to keep abstraction at recent actual levels is to avoid the imposition of "Water Neutrality" which may inhibit planned development growth.

To help achieve this and reduce pressure on the catchment whilst environmental investigations are undertaken to identify the holistic need for the catchment, and prior to implementation of supply side solutions in 2035 to meet this holistic need, we plan to focus demand management activities within the catchment to help ensure new growth can be met through existing abstraction. The integrated supply grid will also allow us to move water into the catchment that is created through demand reductions over a broader area. Further details can be found in the WRMP24 Upper Hampshire Avon Water Resources Strategy and the Demand Management Strategy technical appendix of our WRMP24.

Meeting National Demand targets

Under the Environment Act 2021, a statutory water demand target has been set to reduce the demand of water from public water supply per head of population in England by 20% by 2037/38 from the 2019/20 baseline. The

Environmental Improvement Plan[17] outlines how this target is to be achieved through various policies and expectations of water companies on consumption and leakage.

To achieve the water demand target, expectations are to reduce household water use (per capita consumption) to 122 litres per person per day, reduce leakage by 37% and reduce non-household water use (business demand) by 9% by 31 March 2038. These are part of the trajectory to achieving 110 l/p/d household water use, a 50% reduction in leakage and a 15% reduction in non-household water use by 2050. It should be noted that the leakage target uses a different baseline of the 2017-18 in year reported figure, as stated in the Water targets Detailed Evidence Report[18].

Supply side strategy

As part of the Agency's Environmental Destination programme we will commit to continuing to protect Chalk streams by substantially reducing further our affecting abstraction licences over the next 30 years (resulting in a 50 Ml/d loss in supply by 2050). This will be achieved initially through demand management measures so that we can meet new growth without increasing abstraction from the catchment, prior to the implementation of supply-side schemes to reduce abstraction in 2035.

Investigations (in AMP8 and beyond) will be required under the WINEP programme to assess the actual impact of our groundwater abstractions on river/stream flows in order to corroborate environmental destination requirements. This is essential so that we can reduce uncertainty in future needs, and implement the most effective long term

solutions, both for Wessex Water's customers, but also for other users, notably in the Hampshire Avon catchment.

During AMP8 we will take forwards design and development of several schemes under our core pathway to ensure our plan can adapt to the significant near term uncertainty in licence reductions in 2035. These are 'least regret' investments since many of them appear in all plan options.

As we can't fully discount the far long term need for new regional strategic resource options such as Poole effluent re-use and/or a new reservoir in the Mendips, and these schemes still feature in more severe possible futures we have modelled, we aim to continue to investigate these with South West Water as our main partner on the West Country Water Resources Group.

2.9. Customer research

Document WSX04 – a summary of our customer research explains the customer research undertaken across our plan, of which insight from the sustainable abstraction outcome has directly fed into our WRMP decision-making. Table 24 summarised how our plan addresses the customer research insight.

Table 24 The line of sight from customer insights on sustainable abstraction to the actions and investments in our plan.

Key customer insight	How our plan addresses the insight
Customers are aware that their personal water use has an impact on the environment, however, many	Our demand management strategy will help raise awareness of the value of water and importance of water conservation –

[17] Environmental Improvement Plan 2023 - GOV.UK (www.gov.uk)
[18] Water targets Detailed Evidence report.pdf (defra.gov.uk)

<table>
<tr><td>have not yet taken action to reduce their consumption.</td><td rowspan="6">we’re keen to support customers to see themselves and their home as an important part of their local water system and environment.

Our investment proposals include:
• The installation of smart meters to 40% of households and non-households by 2030 with the aim of reaching 95% by 2035. Our programme will focus in the Hampshire Avon catchment initially to deliver the demand reduction savings in the area where the greatest environmental benefits will be realised.
• An expansion of our water efficiency programme to support over 60,000 households and over 800 non-households by 2030 to increase customer awareness of their consumption, help them to reduce water use and wastage (i.e. internal leaks), manage their bills and help protect the environment.

The combination of smart metering and an expanded water efficiency programme will meet customer expectations for helping them to reduce their water usage and manage their bills.</td></tr>
<tr><td>Customers either underestimate their water usage or don’t pay attention to it at all.</td></tr>
<tr><td>There is some desire amongst customers to reduce their water consumption.</td></tr>
<tr><td>There is a large proportion of household customers who are not interested in installing a smart meter and would prefer them not to be compulsory.</td></tr>
<tr><td>Household customers are interested in the perceived benefits of smart metering, namely more control over their consumption as well as more accurate bills and potentially lower bills.</td></tr>
<tr><td>Non-household customers are more positive about smart metering and their perceived benefits.</td></tr>
<tr><td>High levels of leakage drive negative perceptions of the water sector and are the responsibility of water companies to address.</td><td rowspan="2">Leakage reduction is an important part of our demand management strategy, and we recognise its importance to customers – we need to demonstrate our continued efforts to reduce leakage if we are to ask customers to participate in their own water saving measures as part of our water efficiency and smart metering proposals.

Our leakage reduction strategy will deliver 3.5 Ml/d of water savings between 2025 and 2030. This will be achieved through a combination of faster detection of supply pipe leaks arising from smart metering, an expansion of our acoustic logging capabilities and by delivering efficiencies in the ‘find and fix’ backbone of our leakage management operation. We are committed to halving leakage by 2050.</td></tr>
<tr><td>Leakage is commonly a preferred solution for reducing demand and reliance on abstraction, and not addressing this can negatively impact efforts to reduce demand.</td></tr>
<tr><td>Customers expressed strong support for reducing reliance on abstraction from vulnerable sources, even beyond the proposed targets for reduction, and to pursue a combination of alternative supply and demand options.</td><td>Our plan is committed to reducing abstraction from the most environmentally sensitive sources. Our investment proposals contain a combination of demand-side and supply-side measures which will focus in areas that bring the greatest environmental benefits and will help meet the EA’s proposed abstraction licence reductions in 2035.

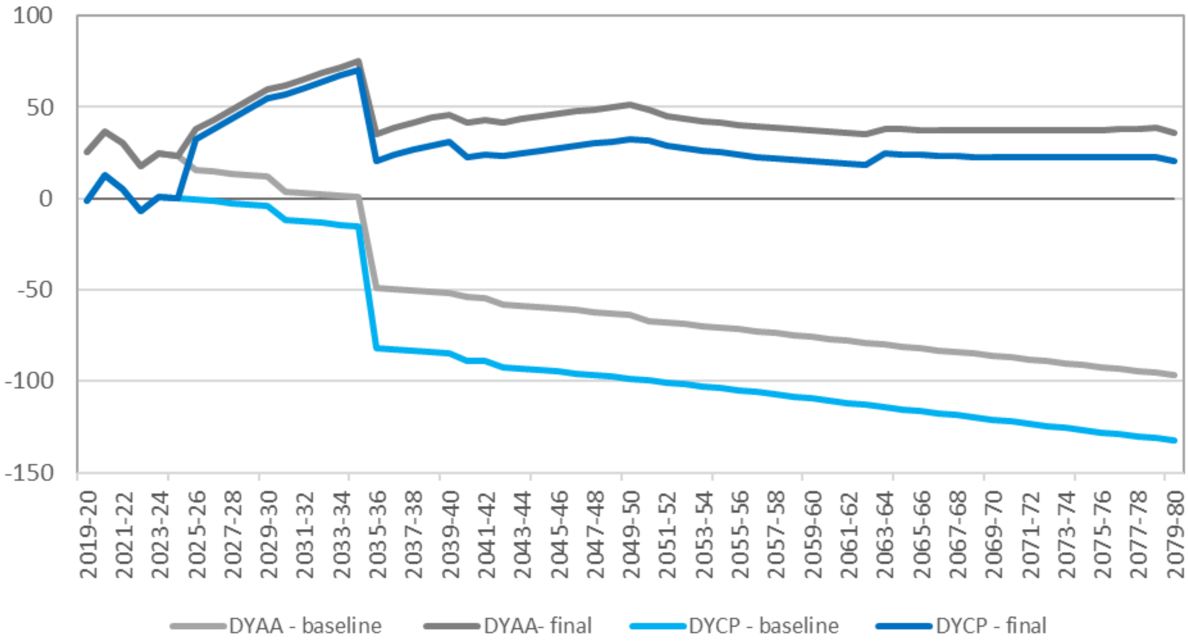
As part of our adaptive plan, we are also taking forward some Strategic Resource Options in collaboration with the West Country Water Resources Group, to ensure we are appropriately prepared if these are needed to meet long-term resource needs.</td></tr>
</table>

2.10. Final SDB and steps towards AMP9/WRMP29

2.10.1. Final Supply Demand Balance

The final central SDB for both the DYAA and DYCP scenarios are presented against the baseline in Figure 14. Under both scenarios, the main driver of the final supply demand balance is demand management reductions in the short term to achieve licence reductions in 2035. At the end of the planning period, in 2079-80, the final SDB in the DYAA is forecasted to be 36 Ml/d. For the DYCP, the 2079/80 SDB is 20 Ml/d.

Figure 14 Baseline and Final Supply Demand Balance (Ml/d) for the DYAA and DYCP.



2.10.2. Summary and vision towards WRMP29

We have presented an affordable plan supported by customers, to deliver a positive supply demand balance, and therefore a secure supply of water to 2079-80, which meets a 1 in 500 level of service for emergency drought orders by 2040, and also delivers important abstraction licence reductions to help protect Chalk streams in 2035 and 2050.

A key part of this plan is the delivery of demand reductions through a broad approach to smart metering, helping both household and non-household customers to be more water efficient, so that we can build drought resilience in the region, and appropriately adapt to future uncertainties in WRMP29. A key benefit of this approach is that it will offset future demand growth in the Hampshire Avon, and reduce pressure on the chalk catchment prior to the implementation of longer term schemes.

As shown in our adaptive plan, to inform our next key planning decision point in 2027-28, when we will produce our next plan (WRMP29) we will undertake a range of investigations and enabling works to reduce planning uncertainties, in particular:

- Effectiveness of demand reduction strategies – through implementation, we will improve understanding of demand reductions and costs associated with smart metering and water efficiency activities in the region, as well as nationally, alongside government policy direction on water efficiency.

- Supply scheme investigation – we will continue our work with neighbouring water companies as part of the West Country Water Resources Group to improve understanding of cost, yield benefit and feasibility of larger scale and shared schemes and develop our regional modelling capability to better understand cross-company system water use under drought with strategic schemes. These include Strategic Resource Options (SROs) as summarised in the next section. We will also progress through more detailed design and development (enabling works) phase the schemes that are required to be built under AMP9 under all alternative pathways, and in doing so work to refine understanding of scheme design, costs and yield benefits.
- Environmental investigation – we will work to narrow down uncertainty of future needs for licence reductions and timing of these reductions, in collaboration with regulators and neighbouring companies in the region, in particular in the Chalk catchments of the Piddle, Frome, the Stour and Hampshire Avon.
- Demand growth – we will monitor and update our forecasted demand growth based on updated Local Authority information, alongside monitoring of demand post pandemic to understand likely trajectories of household and non-household demand.
- Regional Modelling – we are currently developing our new regional models which will provide greater understanding of inter-regional needs and connectivity requirements to improve our regional option selection for WRMP29.
- Upper Hampshire Avon Catchment – we will lead the new steering group to coordinate understanding of future needs in the catchment, and the supply solutions to be implemented to meet all users needs for 2035. In the interim we will focus our demand reduction strategies for the benefit of the catchment, prior to implementation of new supply-side schemes.

We look forward to continued engagement and communication with all stakeholders as we develop our plans further towards WRMP29.

2.11. Strategic Options

In response to calls from government and regulators, and in recognition of the long lead-in time and challenges of developing new strategic water resources, at PR19 Ofwat allocated £469m nationally for companies to investigate and develop 17 strategic water resource solutions (SRO) during 2020-25.

In the West Country there were three water resource solutions that were funded to follow a gated process to be overseen by a new regulatory alliance called RAPID.

All of the West Country SROs have now passed through gate two. There have been a number of refinements of the portfolio of schemes and scope of the solutions during the process:

- The draft regional water resources plan for the West Country showed that the region faced deficits over the planning horizon, mainly due to new requirements to reduce abstractions from groundwater aquifers and sensitive rivers. Although the original concept at PR19 was that the strategic water resource solutions would provide new water resources for transfer to neighbouring regions it was agreed that the water was required in-region.
- In recognition of the growing need for additional water resources in the West Country a potential new solution, Mendip quarries, was added into the process as a new solution following a later timeline.

Collaboration between the solution partners and all the water companies involved in the national programme has been key to the success of the projects to date. As programme managers for the West Country SROs Wessex Water have been actively involved in the All company working group (ACWG), interactions with RAPID and with the Environment Agency's National appraisal unit. The team are fully committed to continuing this collaboration in the next phases of the projects.

The three schemes now progressing towards gate three are:

- Bristol reservoir source and transfer, comprising construction of the second reservoir in the Mendips, water treatment and transfers south to provide resilience to Wessex Water in Somerset and enable a bulk transfer to South West Water's Devon area.
- Poole water recycling and transfer. This scheme includes effluent recycling from Poole wastewater treatment works, and diversion of flow to the River Stour after advanced treatment and subsequent re-abstraction to provide a shared resource between Wessex Water and Bournemouth Water.
- Mendip quarries, an innovative solution to repurpose a quarry in the Mendips at the end of its mineral extraction life as a water storage reservoir. Associated infrastructure includes water abstraction from the River Avon downstream of Bath and water treatment. Two conveyance transfers have been investigated to date with refinements expected following the development of an integrated regional water resources simulator.

The solution partners are Wessex Water, South West Water and Bristol Water. Southern Water ceased as a partner following the change to in-region solutions in 2022.

The forecast cost for the three SROs in AMP7 is £23.5m, which compares with the total allowances provided at PR19 of £17.0m for the three original schemes. The increase is primarily due to the addition of a new solution (Mendip quarries).

For the next AMP the forecast cost through to the schemes being 'construction ready' comprises £36.4m for development plus £78.4m for land and pre-construction capex.

2.11.1. Gated process

The gated process related to the funding of investigations and development of water resources solutions. There are four gates overall. At each gate, companies submit information about their work on a solution, which is assessed to ensure companies are making progress on investigation and development of solutions. A decision is then made as to whether a solution should continue to be allowed funding to further investigate and develop a solution to the next gate.

All of the SROs have now passed through gate two and are progressing towards gate three. The gate submissions and RAPID decision documents for each gate are all published on RAPID's website: the-rapid-gated-process. below summarises the dates of our submissions and decisions from RAPID.

Figure 15 Gate submissions and RAPID decisions.

SRO	Gate one		Gate two		Gate three	Gate four
	Sub-mission	Final decision from RAPID	Sub-mission	Final decision from RAPID	Proposed sub-mission	Proposed sub-mission
West Country North sources & transfers	Sept 2020	Jan 2021	Nov 2022	July 2023	Mar 2025	June 2026
West Country South sources & transfers	July 2021	Dec 2021	Nov 2022	July 2023	Mar 2025	June 2026
West Country - Southern Water transfer	July 2021	Dec 2021	Ceased	Ceased	n/a	n/a
Mendip quarries – new solution	Dec 2021	May 2022	July 2023	Draft due Oct 2023, final Jan 2024	June 2028	Sept 2029

There have been several changes to the scope of the solutions, their purpose and timelines.

The draft regional plan for the West Country, that was issued as an emerging plan in January 2022 and a draft plan in 2023, showed that the region faced deficits over the planning horizon to 2050, mainly due to new requirements to reduce abstractions from groundwater aquifers and sensitive rivers. Although the original concept of the strategic water resource solutions at PR19 was that they would provide new water resources for transfer to neighbouring regions, in our case to Water Resources South East (WRSE), it became apparent that the water was required in-region.

In addition the draft regional water resource plan for WRSE identified better value options and did not select the West Country options. Therefore, it was agreed with RAPID that the scope of the schemes should be changed to address in-region needs only.

The scheme specific changes that have been agreed during the gated process are set out below:

West Country North sources & transfers, now renamed Cheddar two source and transfer

- The scheme was renamed at gate one as Cheddar two source and transfer.
- At gate one it was agreed that the scheme could not be delivered by 2027, which was Southern Water's deadline for a solution for their Hampshire zone, and the scheme was moved from the accelerated timeline to the standard timeline.
- In April 2022 during the gate two period the WCRWG provided evidence to RAPID that the water provided by the scheme was required in-region and that further work on the potential transfer to Southern Water should cease. This was agreed by RAPID in May 2022. The subsequent gate two submission concentrated on an in-region option to transfer the water to Wessex Water, as an option to be assessed in Wessex Water's WRMP decision making.
- However, the scheme was not selected in Wessex Water's draft WRMP. The gate two work was also caried out prior to the drought in South West Water during summer 2022. Subsequently it has been identified that the scheme may have a role in providing additional supplies to the Devon area. This is mentioned further in the section below on current proposals.

West Country South sources & transfers, now renamed Poole water recycling and transfer

- In July 2021 South West Water received approval to progress the Roadford pumped storage scheme under their Green recovery initiative. Furthermore, the gate one report showed that transferring the water from Roadford in Devon to Southern Water was not viable. Therefore, at gate one the Roadford element and its associated transfer was stopped.
- The scheme was renamed at gate one as Poole effluent recycling and transfer.
- As part of the same package as for the Cheddar scheme mentioned above, in April 2022 the WCRWG provided evidence to RAPID that the water provided by the scheme was required in-region and that further work on the potential transfer to Southern water should cease. This was agreed by RAPID in May 2022. The subsequent gate two submission concentrated on a shared in-region option to transfer the water to Wessex Water and Bournemouth Water.
- The Poole scheme was selected as a shared scheme in both Wessex Water's and South West Water's draft WRMPs.

West Country - Southern Water transfer – ceased at gate one

- As noted above, this scheme was dependent on the West Country South sources & transfers scheme.
- At the gate one decision point the Roadford transfer component was removed from the scope, and the remaining part of the scheme was merged with the West Country South sources & transfers, and renamed Poole effluent recycling and transfer.

- As part of the same package as for the Cheddar scheme mentioned above, in April 2022 the WCRWG provided evidence to RAPID that the water provided by the scheme was required in region and that further work on the potential transfer to Southern water should cease. This was agreed by RAPID in May 2022.

Mendip quarries

- There have not been any changes to the scope of the project. The core scheme presented in the gate two submission in July 2023 is for an in-region use. Potential transfers out of region are treated as future opportunities only.

2.11.2. Current proposals

All three strategic resource option scheme have reached gate two. Two schemes, Cheddar two source and transfer and Poole water recycling and transfer, have received the final decisions from RAPID and are now progressing towards gate three.

RAPID's draft decision on the Mendip quarries scheme is expected by 12 October 2023, which is after the submission date for PR24 business plans. The final decision is scheduled to follow by 18 January 2024. The gate two submission recommended that the scheme should progress to gate three. In June 2023 prior to submission of the gate two reports a detailed presentation was given to RAPID covering the scope, conclusions and recommendations, which was well received. There have been six post-submission queries which have all been responded to without major issues. Therefore at the time of writing there is no reason to consider that RAPID will not approve the scheme for progression to the next gate, subject to various recommendations and actions for gate three.

The work to gate two has shown that the schemes are technically feasible and deliverable subject to resolving outstanding risk and environmental concerns. The parallel WRMPs have also identified the need for new water resources in the region. The objectives of the further phases of work in gate three and gate four are to reach a point where construction can commence. The principal activities required include: further technical development, environmental monitoring and assessment, pre-planning activities in the run up to planning applications, obtaining consents, land acquisition and running a DPC procurement exercise.

The three schemes now progressing towards gate three are:

- Cheddar two source and transfer, comprising construction of a second reservoir at Cheddar, water treatment and transfers to the south-west to provide resilience to Wessex Water in Somerset and enable a bulk transfer to South West Water's Devon area.
- Poole water recycling and transfer. This scheme includes effluent recycling from Poole wastewater treatment works, and diversion of flow to the River Stour after advanced treatment and subsequent re-abstraction to provide a shared resource for Wessex Water and Bournemouth Water.
- Mendip quarries, an innovative solution to repurpose a quarry in the Mendips at the end of its mineral extraction life as a water storage reservoir. Associated infrastructure includes water abstraction from the River Avon downstream of Bath and water treatment. Two conveyance transfers have been investigated to date with refinements expected following the development of an integrated regional water resources simulator.

The current proposals for each of the schemes are summarised in Table 25.

Table 25 Summary of current Strategic resources options

SRO	Yield Ml/d		Scope	Need
	Average	Peak		
Cheddar two source and transfer	14	36	• Construction of second reservoir at Cheddar (9,000 Ml) • Water treatment works • A transfer to South West Water (SWW) by displacement comprising: o Potable water bulk transfer to Wessex Water in the Taunton area o Network reinforcement in Wessex Water's Somerset area o A bulk transfer into SWW's water resource zone during droughts • Following the construction of inter-zonal connections by SWW (as proposed elsewhere) it would be possible to transfer some of the benefit to the Roadford and Colliford zones by displacement.	To provide additional drought resilience to South West Water's Devon and Cornwall area as identified in their revised draft WRMP. It would also bring additional resilience benefits to Wessex Water's West Somerset area.
Poole water recycling and transfer	12.5	25	As gate two report • Pumping station and raw water pipeline • Water recycling plant • Wetland prior to discharge to River Stour • 15 km environmental buffer • River intake at Longham.	A shared resource. For Bournemouth Water it will facilitate a reduction in abstraction from the River Avon. For Wessex Water it will offset a proposed reduction in abstraction from the groundwater sources in the River Stour catchment.
Mendip quarries	46	106	As gate two report • Repurposing a quarry in the Mendips (28.500 Ml) • Abstraction from River Avon downstream of Bath • Pipelines and water treatment works • A potable transfer to Wessex Water • A raw transfer to augment the River Stour • Abstraction in Bournemouth water resource zone.	A shared resource to provide peak supplies to Wessex Water and Bournemouth Water. The scheme is selected in the preferred plan for Bournemouth Water area. The scheme is not selected in Wessex Water's preferred plan but is part of the adaptive plan.
Total	73	167		

Figure 16 Overall diagram of the SROs

2.12. Water Resources Management Plan Investment Summary

The investment arising from the Water Resources Management Plan can be divided into demand side and supply side measures/investment. Demand side investment associated with the WRMP including smart metering, non-household and household water efficiency and leakage is included in WSX14. Consistent with our WRMP adaptive plan, and as presented in Table CW8, AMP8 2025-2030 includes expenditure on a series of supply-side schemes under the core pathway, as summarised in Table 26.

Table 26 Supply-side scheme enhancement investment.

	2025/26	2026/27	2027/28	2028/29	2029/30
Supply-side scheme enhancement investment (£m)	£4.04	£4.33	£4.33	£4.0	£4.80

3. Water resources investigations and implementation WINEP actions

Table 27 Enhancement case summary for WINEP.

	Requirement	See section	Comment
Need for enhancement investment			
A	Is there evidence that the proposed enhancement investment is required (ie there is a quantified problem requiring a step change in service levels)? This includes alignment agreed strategic planning framework or environmental programme where relevant.	WSX12 – 3.1	Investigations have statutory and non-statutory drivers where risks and issues have been identified by regulators. Requirements relate to Habitats Regulations, Water Framework Directive and Environmental Destination.
B	Is the scale and timing of the investment fully justified, and for statutory deliverables is this validated by appropriate sources (for example in an agreed strategic planning framework)?	WSX12 – 3.1	The timing for these investigations and deliverables has been directed by the EA's PR24 driver guidance in accordance with the relevant requirements.
C	Does the proposed enhancement investment or any part of it overlap with activities to be delivered through base, and where applicable does the company identify the scale of any implicit allowance from base cost models?		No
D	Does the need and/or proposed enhancement investment overlap or duplicate with activities or service levels already funded at previous price reviews (either base or enhancement)?		No
E	Is the need clearly identified in the context of a robust long-term delivery strategy within a defined core adaptive pathway?	WSX54	Yes – Long Term Delivery Strategy
F	Where appropriate, is there evidence that customers support the need for investment (including both the scale and timing)?	WSX04	Yes – Customer Research
G	Is the investment driven by factors outside of management control? Is it clear that steps been taken to control costs and have potential cost savings (eg spend to save) been accounted for?	WSX12 – 3.5	Costs have been developed through a bottom up approach based on previous similar work and, where appropriate through costed options appraisals in previous investigations.

Best option for customers			
A	Has the company considered an appropriate number of options over a range of intervention types (both traditional and non-traditional) to meet the identified need?	WSX12 – 3.5	Investigations scoping has been undertaken with regulators at a high level. Implementation actions have been identified through previous investigations (and options appraisals)
B	Has a robust cost–benefit appraisal been undertaken to select the proposed option? Is there evidence that the proposed solution represents best value for customers, communities and the environment over the long term? Is third-party technical assurance of the analysis provided?	WSX12 – 3.5	Costs have been developed through a bottom up approach based on previous similar work and, where appropriate through costed options appraisals in previous investigations.
C	In the best value analysis, has the company fully considered the carbon impact (operational and embedded), natural capital and other benefits that the options can deliver? Has it relied on robustly calculated and trackable benefits when proposing a best value option over a least cost one?	WSX12 – 3.5	Best value analysis undertaken using EDA tool
D	Has the impact (incremental improvement) of the proposed option on the identified need been quantified, including the impact on performance commitments where applicable?	N/a	N/a – not connected to any Performance Commitments
E	Have the uncertainties relating to costs and benefit delivery been explored and mitigated? Have flexible, lower risk and modular solutions been assessed – including where forecast option utilisation will be low?	N/a	N/a
F	Has the scale of forecast third party funding to be secured (where appropriate) been shown to be reliable and appropriate to the activity and outcomes being proposed?	N/a	N/a
G	Has the company appropriately considered the scheme to be delivered as Direct Procurement for Customers (DPC) where applicable?	N/a	N/a
H	Where appropriate, have customer views informed the selection of the proposed solution, and have customers been provided sufficient information (including alternatives and its contribution to addressing the need) to have informed views?	N/a	N/a
Cost efficiency			
A	Is it clear how the company has arrived at its option costs? Is there supporting evidence on the calculations and key assumptions used and why these are appropriate?	WSX12 – 3.5	Costs have been developed through a bottom up approach based on previous similar work and, where appropriate through costed options appraisals in previous investigations.
B	Is there evidence that the cost estimates are efficient (for example using similar scheme outturn data, industry and/or external cost benchmarking)?	WSX12 – 3.5	Costs have been developed through a bottom up approach based on previous similar work and, where appropriate through costed options appraisals in previous investigations.

C	Does the company provide third party assurance for the robustness of the cost estimates?	WSX12 – 3.5	Our approach to costing remains unchanged from PR19, using bottom-up cost assessments that were subject to consultant benchmarking at that time.
Need for enhancement model adjustment			
D	Is there compelling evidence that the additional costs identified are not included in our enhancement model approach?	N/a	N/a
E	Is there compelling evidence that the allowances would, in the round, be insufficient to account for evidenced special factors without an enhancement model adjustment?	N/a	N/a
F	Is there compelling econometric or engineering evidence that the factor(s) identified would be a material driver of costs?	N/a	N/a
Customer protection			
A	Are customers protected (via a price control deliverable or performance commitment) if the investment is cancelled, delayed or reduced in scope?	WSX26	WINEP outputs are included within the EA's Environmental Performance Assessment. There is a PCD concerning the delivery of investigations.
B	Does the protection cover all the benefits proposed to be delivered and funded (e.g. primary and wider benefits)?	N/a	N/a
C	Does the company provide an explanation for how third-party funding or delivery arrangements will work for relevant investments, including how customers are protected against third-party funding risks?	N/a	N/a

3.1. WINEP investigations and implementation actions context

Over the past 25 years we have worked in partnership with the Environment Agency and others to investigate sources where there are concerns that the volume of water we are licensed to take has unacceptable impacts on local watercourses, groundwater levels and the wildlife that they support. This section describes how we investigate these sources and the work that the company is committed to over the period 2025 – 2030 to improve river flows through sustainable abstraction.

Our investigations typically follow the process summarised in Figure 17. They are instigated when our regulators identify a risk that our abstractions may affect achievement of environmental targets. Sources identified through this process are included in the WINEP for investigation in the next AMP.

Figure 17 Summary of WINEP investigation lifecycle

The investigation phase commences with a scope of work being agreed and a monitoring plan put in place to collect the information required to determine the effect of abstraction. We monitor a range of environmental variables such as river flow, groundwater levels, water quality and aquatic ecology (plants, fish and insects). This information is analysed and used to develop models that can simulate the effects of different abstraction regimes under a range of environmental conditions.

The outcome of these investigations is reported to our regulators and other stakeholders and a course of action agreed for implementation in subsequent investment periods. Historically some investigations have led to reductions in licensed volumes or other mitigation measures being made, whilst others have found that the environmental effects of our abstractions are not significant and no changes to our abstractions have been required. Any confirmed changes to abstraction licences are incorporated into our Water Resources Management Plan's (WRMP) baseline supply forecasts.

We recognise that ensuring the sustainability of abstraction licences is an ongoing process, particularly to ensure compliance with the Water Framework Directive and the Common Standards Monitoring Guidance. Between 2025 and 2030 we will investigate over 24 abstraction sites. In addition, we will perform a number of catchment wide investigations to assess the impact of climate change in combination with abstraction across the region. These investigations fall under five drivers and constitute 38 individual lines in the WINEP, see Table 28.

Table 28 Summary of AMP8 water resources WINEP investigation drivers.

Primary WINEP driver code	Description	Number of WINEP investigation actions	Completion date
WFD_NDINV_WRFlow	Investigation to determine the likelihood that future abstraction will cause deterioration in any element affecting the ecological status of a water body and identify effective solutions	22	31/12/2026
EDWRMP_INV	Investigations, options appraisals or feasibility studies for actions identified within the WRMP to meet regional planning requirements that do not fit with WFD driver requirements	9	31/12/2026
WFD_INV_WRFlow	Investigation to determine impact of abstractions and appraisal of options or an effective solution to achieve good ecological status (surface water)	1	31/12/2026
WFD_INV	Investigations of actions to improve water quality in terms of relevant WFD status objectives	2	30/04/2027

HD_INV	Investigation and/or options appraisal to determine impacts of Water Company activities, or permit/licence conditions/standards on a European Site or Ramsar site or to determine the costs and technical feasibility of meeting targets	4	30/04/2027
	Total	38	

In the following sections we set out details of the water resource investigations and implementation actions in the WINEP. Due to the nature conservation importance of the Hampshire Avon, our AMP8 water resources investigation and implementation actions in this catchment is set out explicitly in Section 3.1.1 Our water resources investigations elsewhere are set out from Section 3.2.1 to 3.2.4, with details of the implementation actions in Section 3.3

3.1.1. Water resources in the Hampshire Avon catchment

The Wessex Water region is blessed with a number of chalk streams, primarily across Dorset and Wiltshire, with some designated as Sites of Special Scientific Interest (SSSIs) and Special Areas of Conservation. Wessex Water has long recognised their importance, working with environmental and other groups over the last 25 years to understand the pressures on them and take steps to protect them (Figure 18). The national Catchment Based Approach (CaBA) Chalk Streams Group recently proposed the Chalk Stream Restoration Strategy to give these rivers greater environmental protection. Within this strategy, water companies with chalk stream catchments were asked to nominate a chalk stream in their region and lead on developing a flagship improvement project with local partners. Wessex Water, with input from the Poole Harbour Catchment Partnership, have chosen the headwaters of the Dorset Frome, comprising the Frome downstream to Maiden Newton, the River Hooke and the Wraxall Brook and funded through an AMP8 WINEP action (see document WSX16 - Waste Water Networks Plus Strategy and Investment).

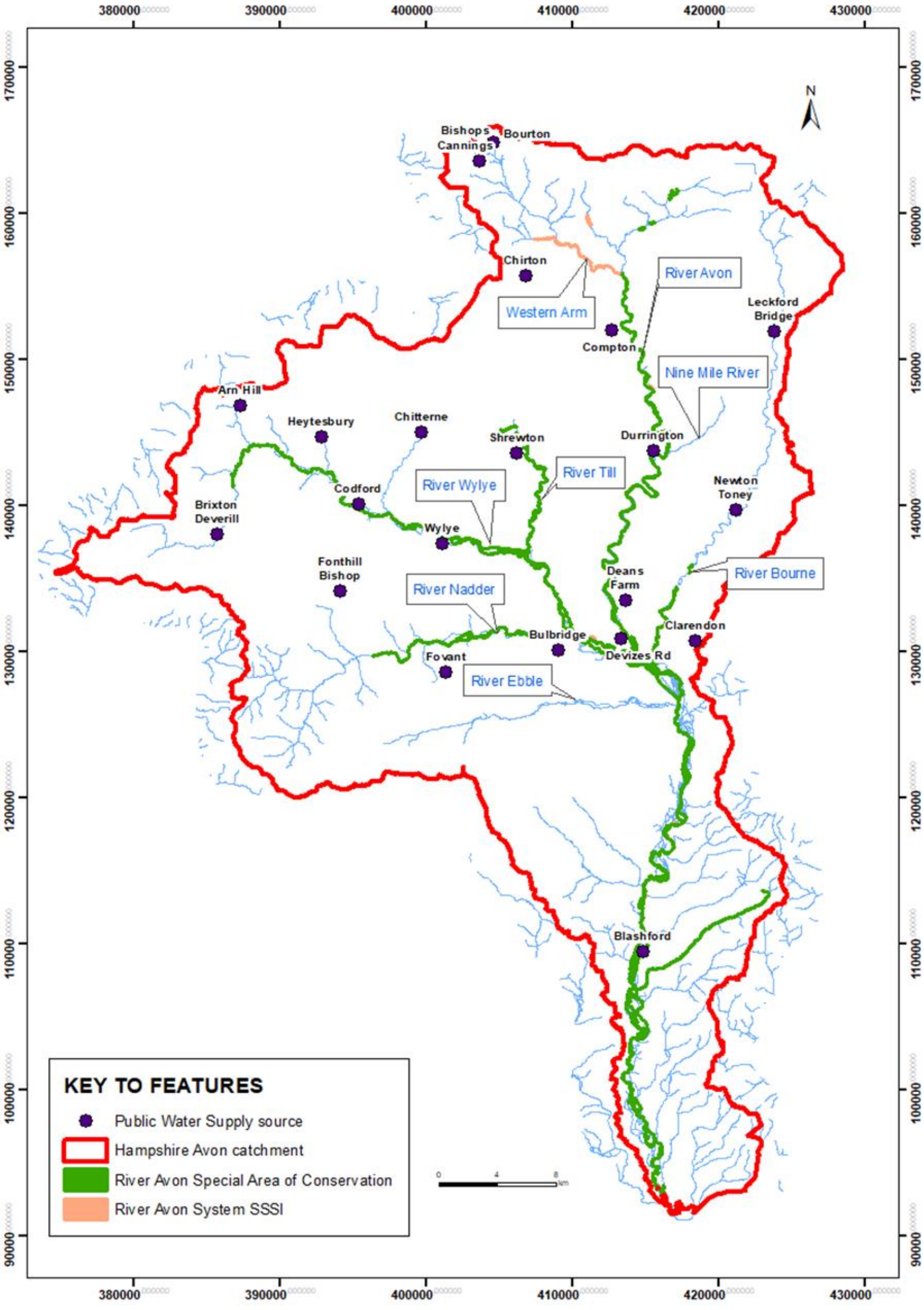
Figure 18 The River Nadder at Quidhampton, part of the Hampshire Avon SAC and SSSI.

The Hampshire Avon and its tributaries are a chalk river system of international importance. The majority of the perennial (Hampshire) River Avon and part of one of the winterbournes (River Till) is designated as a Special Area of Conservation (SAC). The SAC reaches overlap the River Avon Site of Special Scientific Interest (SSSI), except for the SSSI reach along the lower half of the Western Arm (Figure 17). The SAC (& SSSI) designation is due to the inherent richness of flora and fauna of the River Avon which drains predominately chalk aquifers. Specifically, the presence of internationally rare and vulnerable species and classic chalk stream habitat underpin the designation:

- Watercourses of plain to montane levels with Ranunculion fluritantis and Callitricho-Batrachion vegetation (classic chalk stream habitat).
- Population of Atlantic salmon (Salmo salar).
- Population of bullhead (Cottus gobio).
- Population of brook lamprey (Lampetra planeri) and sea lamprey (Petromyzon marinus).
- The river and adjoining land a habitat for populations of Desmoulin's whorl snail (Vertigo moulinsiana).

The conservation objectives are to maintain the river as a habitat for these species.

Figure 19 Hampshire Avon; extent of River Avon SAC and Western Arm SSSI designations and location of Wessex Water abstractions.



Previous investigations and their outcomes

The River Avon SAC is designated under the 1992 European Commission's Directive on the Conservation of Natural Habitats and Wild Fauna and Flora (implemented through the Habitats Regulations in the UK). Under the Habitat Regulations (Hab. Regs.) all competent authorities including the Environment Agency (EA), were required to assess all existing permissions ('Review of Consents', RoCs) which may impact upon the SAC and the interest features for which it was designated. The Hab. Regs. requires the impact of each consent to be determined, both alone and in-combination with other consents.

Wessex Water was funded during the AMP4 period (2005 to 2010) to collect the information required by the EA to assess the impact of its abstractions by March 2008. The changes in river flow due to abstractions were screened against 'allowable river flow reductions' provided by the EA. The findings from that investigation resulted in the EA requiring abstraction reduction at sources in the River Wylye and River Bourne catchments, totalling 23.5 Ml/d.

A concurrent AMP4 study assessed demand and supply options to meet a shortfall in supply due to the RoCs work. This identified using underutilised licensed sources in the Stour catchment to provide the replacement water. To enable this water to be used the company's 'Grid' was constructed over the next 10 years. Whereby new pipelines, pumping stations and service reservoirs were constructed to better connect the network so that water could be moved north from the Stour catchment when required. The Grid went 'live' in early 2018 and the sustainability reduction licence changes came into effect on 1 April 2018.

In 2016 new guidance[19] (Joint Nature Conservation Committee 2016) was issued to screen whether SSSI and SACs rivers were in 'favourable condition'. The guidance is called the Common Standard Monitoring Guidance (CSMG) for rivers. The CSMG screening criteria for flow (acceptable reductions) are in some instances more stringent than used in the RoC work undertaken AMP4.

The EA instigated an AMP7 study, completed by Wessex Water in March 2022, to determine the implications of applying the CSMG flow targets to part of the River Avon SAC and Avon SSSI (Avon upstream of Salisbury), River Till and Western Arm) i.e., what abstraction (licence) reductions would be required to meet the CSMG flow targets. The study found areas of non-compliance with flow targets and that approximately 5.5 Ml/d additional flow was required, requiring almost 16 Ml/d annual average abstraction reduction (almost 20 Ml/d peak).

For reasons stated earlier, implementing these reductions would put customer supplies at risk unless adequate replacement water resources can be found. However, much uncertainty remains to be resolved before a comprehensive plan can be developed and implemented to address flow non-compliance. There is a requirement to assess our other sources in the parts of the catchment not investigated in the AMP7, which may identify the need for further abstraction changes, whilst we also need to assess the likely effects of climate change on resource availability. Wessex Water are not the only abstractors in this catchment; Veolia Water and Ministry of Defence (MoD) operate a number of comparatively small abstractions to service military sites in the catchment. In AMP7 Veolia Water investigated their abstractions and identified the need for reductions, whilst modelling has shown that the MoD abstractions (previously exempt from the abstraction licensing regime) also contribute to non-compliance with flow targets.

A comprehensive strategy is required to deliver a sustainable abstraction regime in the catchment, meeting environmental need whilst ensuring customer supplies are not put at risk. In the following section we describe how the AMP8 WINEP programme will inform the development of that strategy. This includes the 'quick wins' that can be

[19] Joint Nature Conservation Committee (2016) Common Standards Monitoring Guidance for Rivers

implemented now, the investigations to resolve uncertainty and on the ground habitat improvements to compensate for non-compliance with flow targets whilst a plan is developed.

Our plan for PR24

Our AMP8 WINEP identifies 10 actions for the Hampshire Avon catchment that have been informed by previous investigations, will help to resolve uncertainty going forward or compensate for impacts on the river whilst we work with others to resolve flow issues over the longer term. These are shown in Table 29 and described further below.

In addition to the WINEP actions, the Environment Agency and Natural England have expressed concern about the impact of abstraction from the River Till. Groundwater modelling has demonstrated an unacceptable impact of this abstraction, which has an abstraction licence of 2.27 Ml/d but due to site constraints, the full licensed volume cannot be taken. In November 2022 we committed to reducing abstraction to recent actual abstraction volumes, protecting the River Till and wider SAC from increases in abstraction. This is a measure that we can implement immediately and does not put customer supplies at risk. For this reason, it is not included with the AMP8 WINEP i.e., we will implement this before 2025.

Table 29 AMP8 Water Resources WINEP actions in the Hampshire Avon catchment.

Primary WINEP driver code	WINEP ID	Action name	Number of WINEP actions	Completion date
HD_INV	08WW100048a	Wylye, Bourne and Nine Mile River Investigation	1	30/04/2027
EDWRMP_INV	08WW100050c	Hampshire Avon Environmental Destination Investigation	1	30/04/2027
HD_INV	08WW100048b	Hampshire Avon alternative abstraction approach investigation	1	30/04/2027
HD_INV	08WW100048c	Hampshire Avon resource relocation investigation	1	30/04/2027
WFD_NDINV_WRFlow	08WW100093a	WxW_SS57 WFD ND investigation	1	30/04/2027
WFD_NDINV_WRFlow	08WW100099a	WxW_SS26 WFD ND investigation	1	30/04/2027
WFD_NDINV_WRFlow	08WW100100a	WxW_SS47 WFD ND investigation	1	30/04/2027
WFD_NDINV_WRFlow	08WW100101a	WxW_SS14 WFD ND investigation	1	30/04/2027
WFD_NDINV_WRFlow	08WW100102a	WxW_SS76 WFD ND investigation	1	30/04/2027
HD_IMP	08MU100851a	Hampshire Avon Partnership Project (Resilient Avon)*	1	31/03/2030
		Total	10	

* Although listed here, this action will result in benefits to water quality and fisheries, biodiversity and geomorphology

The Wylye, Bourne and Nine Mile River Investigation will extend the work of the AMP7 CSMG investigation to these parts of the Hampshire Avon SAC system. This will determine the scale of changes to abstraction required across the catchment to ensure compliance with flow targets, reducing uncertainty and allowing a holistic plan to be implemented in AMP8. To address longer term uncertainty due to climate change, we will be undertaking catchment- level investigations to estimate the impacts of climate change on the yield of our sources and changes to river flow across our region; one of these investigations will cover our sources in the Hampshire Avon catchment (further information in Section 3.1).

Our water resources investigations assess the effect of abstraction on river flows against environmental flow targets (acceptable reductions from natural flows). Our regulators have requested that we trial an alternative assessment approach in AMP8, quantifying abstraction in terms of available recharge (rainfall); we will do this in our Hampshire Avon alternative abstraction approach investigation.

The options appraisal in our AMP7 CSMG investigation identified the potential for relocating some of our abstractions in the Hampshire Avon catchment from the headwaters further downstream to the Salisbury area. Groundwater modelling demonstrates that this would allow river flow targets to be met in both the upper catchment and in the area of new abstraction. However, the development of a new groundwater source requires significant exploratory work to determine a suitable location for abstraction, understand whether the required yield is available and to address the (currently unknown) site-specific constraints that may arise. Our Hampshire Avon resource relocation investigation will explore this.

The WINEP also includes actions to investigate five actions under a Water Framework Directive No Deterioration Driver. Four of these studies relate to sources that are currently disused due to poor raw water quality. These investigations will determine whether resuming abstraction at these sources will have unacceptable environmental impacts and recommend a course of action, such as revocation of the licences. The other investigation relates to determining the impact our active abstraction on the Fonthill Brook and Teffont Stream, both of which flow into the River Nadder upstream of SAC designated reach (Figure 19). Further information on our No Deterioration WINEP investigations can be found in Section 3.1.2.

The Hampshire Avon Partnership Project (Resilient Avon) is a 10 year[20] partnership project involving Bournemouth Water, Wessex Rivers Trust and Wiltshire Wildlife Trust and delivering multiple natural capital benefits for water resources, water quality and fisheries, biodiversity and geomorphology, full details of which can be found in document WSX16 - Waste Water Networks Plus Strategy and Investment. Outcomes include restoration of natural processes, barrier easement/removal and targeting of measures to address landowner and farmer impacts. In the context of our abstractions, this action will deliver on-the-ground improvement in the interim period whilst non-achievement of CSMG flow targets due to our abstractions continue.

3.2. Water resources investigation WINEP actions

3.2.1. No Deterioration Investigation

These WINEP investigations are mostly driven by the Water Framework directive with the majority (22) concerned with the deterioration of river WFD status which could occur if the abstraction at these sources were to operate to the fullest extent of the abstraction licence. The investigations are summarised in Table 30.

[20] Subject to match funding and funding at PR29

Table 30 AMP8 water resources No Deterioration investigations.

Primary WINEP driver code	WINEP ID	Action name	Number of WINEP actions	Completion date
WFD_NDINV_WRFlow	08WW100040a	Unused licence investigation – at WxW_SS108	1	31/12/2026
WFD_NDINV_WRFlow	08WW100040b	WxW_SS146 and WxW_SS141 No Deterioration Investigation	1	31/12/2026
WFD_NDINV_WRFlow	08WW100040c	Unused licence investigation – WxW_SS28	1	31/12/2026
WFD_NDINV_WRFlow	08WW100040d	Unused licence investigation – WxW_SS105	1	31/12/2026
WFD_NDINV_WRFlow	08WW100040e	Unused licence investigation – WxW_SS25	1	31/12/2026
WFD_NDINV_WRFlow	08WW100040f	WxW_SS152 no deterioration investigation	1	31/12/2026
WFD_NDINV_WRFlow	08WW100040g	WxW_SS56 no deterioration investigation	1	31/12/2026
WFD_NDINV_WRFlow	08WW100040h	WxW_SS9 no deterioration investigation	1	31/12/2026
WFD_NDINV_WRFlow	08WW100090a	Cotswold Limestone Water Resources Partnership Investigation	1	31/03/2030
WFD_NDINV_WRFlow	08WW100091a	Middle Stour sources WFD ND investigation (WxW_SS42)	1	31/12/2026
WFD_NDINV_WRFlow	08WW100091b	Middle Stour sources WFD ND investigation (WxW_SS126	1	31/12/2026
WFD_NDINV_WRFlow	08WW100091c	Middle Stour sources WFD ND investigation (WxW_SS132)	1	31/12/2026
WFD_NDINV_WRFlow	08WW100092a	WxW_SS79 WFD ND investigation	1	31/12/2026
WFD_NDINV_WRFlow	08WW100093a	WxW_SS57 WFD ND investigation	1	31/12/2026
WFD_NDINV_WRFlow	08WW100095a	WxW_SS1 WFD ND investigation	1	31/12/2026
WFD_NDINV_WRFlow	08WW100096a	WxW_SS20 WFD ND investigation	1	31/12/2026
WFD_NDINV_WRFlow	08WW100097a	St Catherine Brook WFD ND investigation	1	31/12/2026
WFD_NDINV_WRFlow	08WW100099a	WxW_SS26 WFD ND investigation	1	31/12/2026
WFD_NDINV_WRFlow	08WW100100a	WxW_SS47 WFD ND investigation	1	31/12/2026

WFD_NDINV_WRFlow	08WW100101a	WxW_SS14 WFD ND investigation	1	31/12/2026
WFD_NDINV_WRFlow	08WW100102a	WxW_SS76 WFD ND investigation	1	31/12/2026
WFD_INV_WRFlow	08WW100047a	WxW_SS126 and WxW_SS157 Groundwater Investigation	1	31/12/2026
WFD_NDINV_WRFlow	08WW103158a	WxW_SS61 WFD ND investigation	1	31/12/2026
		Total	23	

Four of the sites included are spring sources and currently unused due to a high risk of poor raw water quality. These investigations will concentrate on the potential impact to ecology if these abstractions were operational but will likely be limited to localised ecological assessment and basic hydrological modelling.

Others form a significant part of the water resources network such as in the middle reaches of the Stour and build on significant existing data and research. These investigations will consist of more significant hydrogeological monitoring and modelling due to their complexity. The investigation work programme will include the drilling of new observation boreholes with the express purpose of assessing groundwater movement in the area (Figure 20). In addition, river flow monitoring and winterbourne surveys will confirm and calibrate hydrogeological models. These data will then be used to identify the extent to which each source could affect the WFD status of river waterbodies in the area under future abstraction regimes. The WFD_INV_WRFlow investigation on sites WxW_SS126 and WxW_SS157 will follow a similar programme of work with the aim of assessing the extent of impact form the current operation of the site.

Figure 20 Geological explorations as part of our AMP7 Middle Bristol Avon groundwater investigation. Drilling rig (left) and retrieved geological core (right).

3.2.2. Environmental Destination Investigation

In AMP9 Wessex Water will conduct nine EDWRMP_INV driven investigations (Table 31). This driver supports investigations informing the long-term Environmental Destination targets set out in the Water Resources Management plan.

Most Wessex Water investigations under this driver are concerned with the potential impact of climate change on underlying hydrological condition and the consequence of these changes for abstraction, and the impacts of abstraction. This work will involve modelling using predicted climate change scenarios for the region, will inform the next iteration of the Water Resources Management Plan and support future regional water resources planning. Investigations include sources and rivers in all major operational catchments in the Wessex Water region. Additional work under this driver include assessments for the restoration of wetlands and priority habitats across the region as well as contributions to collaborative regional work on long term planning.

Table 31 AMP8 water resources Environmental Destination investigations

Primary WINEP driver code	WINEP ID	Action name	Number of WINEP actions	Completion date
EDWRMP_INV	08WW100050a	Poole Harbour Environmental Destination Investigation	1	30/04/2027
EDWRMP_INV	08WW100050b	Dorset Coastal Streams Environmental Destination Investigation	1	30/04/2027
EDWRMP_INV	08WW100050c	Hampshire Avon Environmental Destination Investigation	1	30/04/2027
EDWRMP_INV	08WW100050d	River Stour Environmental Destination Investigation	1	30/04/2027
EDWRMP_INV	08WW100050f	Water Resources for Wetlands and Priority Habitats investigation	1	30/04/2027
EDWRMP_INV	08WW100050g	Parrett system Environmental Destination Investigation	1	30/04/2027
EDWRMP_INV	08WW100050h	Bristol Avon Environmental Destination Investigation	1	30/04/2027
EDWRMP_INV	08WW100084a	Company contribution to Regional Plan environmental destination	1	30/04/2027
EDWRMP_INV	08WW100085a	Wimbleball Environmental Destination Investigation	1	30/04/2027
		Total	9	

3.2.3. Habitats Directive Investigations

Four water resources investigations are driven by the Habitats Directive due to the potential for abstraction to impact protected sites Table 32. These are primarily located in the Hampshire Avon and assess the existing abstraction regimes impact against the Common Standards Monitoring Guidance and WFD flow targets in the Hampshire Avon on the Bourne, Wylye and Nine Mile River. Additional investigations concentrate on the potential for alternative groundwater abstraction locations close to Salisbury and assessments of sustainable abstraction. The final investigation driven by the Habitats Directive addresses the knowledge gap surrounding the impact of Wessex Water operations on the Somerset Levels and Moors. This includes water spilling into the rhyne system and will involve a water balance assessment including the numerous abstractions in the Parrett and any imports, exports or final effluent returns to the catchment.

Table 32 AMP8 water resources Habitats Directive investigations

Primary WINEP driver code	WINEP ID	Action name	Number of WINEP actions	Completion date
HD_INV	08WW100048a	Wylye, Bourne and Nine Mile River Investigation	1	30/04/2027
HD_INV	08WW100048b	Hampshire Avon alternative abstraction approach investigation	1	30/04/2027
HD_INV	08WW100048c	Hampshire Avon resource relocation investigation	1	30/04/2027
HD_INV	08WW100121a	Quantifying the impact of Wessex Water abstraction on summer water availability in the Somerset Levels and Moors Ramsar.	1	30/04/2027
		Total	4	

3.2.4. Additional Water Resources Investigations

Wessex Water operates a stream support mechanism to augment river flows during periods of lower groundwater. These agreements are included in abstraction licences where investigations have shown that abstraction affects the flow in the river and the ecology reliant on it. Stream support involves pumping groundwater from boreholes into the stream to support flows however water directly abstracted from aquifers typically has low levels of dissolved oxygen which is essential to aquatic life. In AMP8 two investigations into the affect of stream support on dissolved oxygen levels will take place at Hullavington and Tetbury stream support sites, both in the upper reaches of the Bristol Avon operational catchment.

Our WRMP includes scenario testing of the possible licence reductions that may arise from these investigations.

Table 33 AMP8 water quality investigations linked to our water resource operations.

Primary WINEP driver code	WINEP ID	Action name	Number of WINEP actions	Completion date
WFD_INV	08WW100046a	Gauze Brook dissolved oxygen investigation	1	30/04/2027
WFD_INV	08WW100046b	Malmesbury Avon dissolved oxygen investigation and options appraisal	1	30/04/2027
		Total	2	

3.3. Water resources implementation WINEP actions

Water resources investigations are designed to identify and quantify the observed and potential impacts of Wessex Waters activities within the scope of existing licences and conditions. Where these are found to be unacceptable options to address these impacts or the likelihood of them occurring are considered. These options can range from improving the resilience of the habitat to changing the conditions within the abstraction licence. Once action is agreed necessary through the process of evidence-led investigation, options are assessed with the preferred option implemented. In AMP8 there are six water resources WINEP implementation actions under three drivers (Table 34).

Table 34 Summary AMP8 of water resources WINEP implementation drivers.

Primary WINEP driver code	Description	Number of WINEP implementation actions	Completion date
WFD_IMP_WRFlow	Action to improve ecological status (surface water)	3	31/03/2030
WFD_ND_WRFlow	Action to protect / ensure no deterioration in status (surface water)	2	31/03/2030
WFD_IMP_PHYSHAB	Actions to address barriers to passage of fish or impacted physical habitat in WFD failing waterbodies not designated artificial or heavily modified for water resources uses	1	31/03/2030
	Total	6	

Three WINEP actions under the WFD_IMP_WRFlow driver will implement recommendations made in previous investigations. The Sherston Avon flow adaptation action is a modification to the stream support arrangements on the Sherston Arm of the Bristol Avon. Currently, the stream support borehole operates at a fixed flow rate; switching it on results in a sudden and unnatural step change in river flow. This action will see the installation of a variable speed pump and associated controls to deliver a more gradual (and natural) flow regime.

The inclusion of Cannington Brook flow adaptations will allow modification of the flow and structures surrounding the North West Somerset reservoir. Heavily Modified Water Body (HMWB) investigations in AMP6 and Adaptive Management trials underway in AMP7 have assessed the hydrological impact of both the North West Somerset and Quantock reservoirs as well as a raw water transfer from the Currypool Stream on the Cannington Brook. The data appear to indicate that the current compensation arrangements do not support Good Ecological Potential. Moving the compensation flow discharge location from the foot of the North West Somerset reservoir dam upstream to the bypass channel would improve hydrological connectivity by providing continuous year-round flow in the Peart Water, the watercourse impounded by the North West Somerset dam. Under current arrangements this watercourse can dry during low flow periods. If confirmed by the conclusions of the existing trials a permanent modification at the inflow of the reservoir will be made and the corresponding changes will be reflected in a revised abstraction licence. The resulting flow improvements are linked to the AMP8 action to provide eel passage at the North West Somerset reservoir (see Section 3.3.2).

An allowance has been made to implement recommendations which will be made on conclusion of an ongoing AMP7 investigation into the combined impacts of abstraction from the four sources near Chippenham and local stream supports. This investigation looks at the impact of these assets on a number of local tributaries to the west and north of the Middle Bristol Avon between Chippenham and Trowbridge, and on the river Avon itself. Possible recommendations from this investigation may include but not be limited to stream support, habitat improvement works or abstraction licence modification.

Previous investigations into the impact of abstraction on the hydrological regime at site WxW_SS50 and site WxW_SS106 have identified the potential for abstraction at fully licensed rates to adversely affect the WFD status of the associated watercourses. Implementation actions have therefore been included for delivery within AMP8 to control this risk. In both cases modifications to the abstraction licences will be made to reduce the amount of water abstracted under particular conditions.

Table 35 AMP8 water resources WINEP implementation actions

Primary WINEP driver code	WINEP ID	Action name	Number of WINEP actions	Completion date
WFD_IMP_WRFlow	08WW100043a	Sherston Avon flow adaptations	1	31/03/2030
WFD_IMP_WRFlow	08WW100051a	Cannington Brook flow adaptations (site flow adaptations)	1	31/03/2030
WFD_IMP_WRFlow	08WW100094a	Middle Bristol Avon WFD ND implementation	1	31/03/2030
WFD_ND_WRFlow	08WW100086a	WxW_SS50 daily licence reduction	1	31/03/2030
WFD_ND_WRFlow	08WW100089a	WxW_SS106 licence reduction	1	31/03/2030
		Total	6	

3.4. Fisheries, biodiversity and geomorphology WINEP actions

The Environment Agency groups WINEP actions into three groups:

- Water resources actions.
- Fishery, biodiversity and geomorphology (FBG) actions.
- Water quality actions.

This section describes the fishery, (aquatic) biodiversity and geomorphology WINEP actions that we have committed to deliver in AMP8 and includes WINEP actions identified under the WINEP drivers listed in Table 36.

WINEP terrestrial biodiversity investigation and implementation WINEP actions are included in document WSX25 – Improving Biodiversity.

Table 36 Overview of aquatic FBG WINEP actions.

Primary WINEP driver code	Description	Number of WINEP actions	Completion date
WFD_INV_WRHMWB	Investigation to determine impact of abstractions and appraisal of options for an effective solution to achieve good ecological status (surface water)	1	31/12/2026

WFD_INV_PHYSHAB	Investigation to determine- impacts from water company owned/utilised physical modification on fish passage or physical habitat and- impact to WFD water body status/potential objectives – e.g. is the physical modification a reason for not achieving good status/potential?	1	30/04/2027
EE_INV	Investigation required to confirm eel entrainment/identify that a barrier to eel passage and to determine appropriate action	1	31/12/2026
NERC_INV	Investigations and/or options appraisal for changes to permits or licences, and/or other action that contributes towards biodiversity duties, requirements and priorities	1	30/04/2027
INNS_MON	Surveillance - Set up of surveillance programmes	2	30/04/2027
INNS_INV	Investigations - Includes pathway analysis, prevention of deterioration and actions to achieve conservation objectives	3	30/04/2027
WFD_IMP_WRHMWB	Action to improve ecological status (surface water)	1	31/03/2030
WFD_IMP_PHYSHAB	Actions to address barriers to passage of fish or impacted physical habitat in WFD failing waterbodies not designated artificial or heavily modified for water resources uses	1	31/03/2030
EE_IMP	Schemes to improve diversion structures to prevent the entrainment of eel (for example screening intakes) and to address barriers to the passage of eel (for example building and maintaining eel passes)	3	31/03/2030
INNS_ND	Delivery - Actions to prevent deterioration by reducing the risks of spread of INNS and reducing the impacts of INNS	1	31/03/2030
	Total	15	

The investigations and implementation measures broadly follow the process described for water resources investigations, Section 3, with investigations in one investment period informing the implementation measures delivered next.

Figure 21 shows how natural capital measures to be delivered in AMP8 have been identified through AMP6 and AMP7 investigations, and the investigations that will be delivered in AMP8. Note that some FBG WINEP actions arise from water resource investigations in the previous AMP; examples in AMP8 include the River Otter fish habitat investigation and the Knacker’s Hole fish passage implementation scheme, both of which were recommended actions from our AMP7 River Otter water resources investigation.

Figure 21 Fisheries, biodiversity and geomorphology investigations, monitoring and implementation actions in the WINEP

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3.4.1. AMP8 aquatic biodiversity investigations and implementation WINEP Actions

Invasive Non-Native Species (INNS) include any non-native animals or plants that have the ability to spread outside their native range causing damage to the environment, the economy, our health or the way we live. There are more than 130 INNS currently present in the UK’s freshwater network and this is increasing. The Natural Environment and Rural Communities Act 2006 (the NERC Act) places a duty on every public authority (including water companies) “to have regard, so far as is consistent with the proper exercise of its functions, to the purpose of conserving biodiversity.” A major theme that impacts on the resilience of biodiversity, habitats and species is the current and future threat from INNS.

In AMP6 we completed a risk assessment matrix to determine the presence and risk that our operations pose to the spread of INNS. The matrix identified that the highest risk sites were all surface water reservoirs and lakes where fishing and water sports take place, followed by raw water transfers (RWT`s) and large sewage treatment works. The investigation also identified that measures could be implemented to help control the spread of INNS and in AMP7, we implemented these measures.

Our AMP7 INNS projects comprised three components: Biosecurity Implementation, INNS Partnership Working and RWT Risk Assessments. The biosecurity component was informed by the risk assessment matrix developed in AMP6 and consisted of surveys to monitor our high-risk sites, such as reservoirs, lakes and RWT`s. Alongside this ongoing surveying, biosecurity measures were designed and installed based upon recreational activities taking place at different sites, such as boat wash down facilities, angling dip tanks, boot scrubs for walkers and new biosecurity awareness signage. An example of INNS awareness signage installed through this programme is included in Figure 22. In addition to this, a dedicated INNS webpage was added to the Wessex Water website to flag up events such as INNS week and other news, and two guidance documents were also produced, “Biosecurity Guidance for People Working Near Water” and “INNS Guidance when Storing and Transferring Sludge”.

The INNS Partnership Working component involved Wessex Water funding a biocontrol trial at Blashford Lakes, as well as contributing to the production of a Crayfish Conservation Manual. In addition, alongside other water companies we funded the Great British Non-Native Species Secretariat (GBNNSS) and the Animal and Plant Health Agency (APHA), who work to raise awareness and reduce the spread of INNS through borders and trade.

The matrix developed in AMP6 identified RWT`s to be a high risk for the spread of INNS. Transfers of water between catchments are particularly risky activities, providing a direct pathway between water bodies for the transfer of plants, invertebrates, and fish. The AMP7 WINEP identified eight RWT`s for which Wessex Water undertook a Risk Assessment to investigate the risks posed by these transfers and identified measures that could be implemented in future to mitigate the risk of spreading INNS through this mechanism.

Figure 22 Example of new INNS signage at Wessex Water sites, installed during AMP7

Aquatic biodiversity investigation WINEP actions

In AMP8 we have six INNS WINEP outputs to deliver, determined by the Environment Agency, which build on from our AMP6 and AMP7 INNS investigations. Five of these are investigations or monitoring programmes included under INNS_INV or INNS_MON drivers, summarised in Table 37 and described in the following section. The sixth WNIEP action is an implementation scheme described in the subsequent section.

Table 37 AMP8 aquatic biodiversity WINEP investigations and monitoring actions.

Primary WINEP driver code	WINEP Action ID	Action name	Number of WINEP actions	Completion date
INNS_INV	08WW100007a	National pilot and trials - INNS Raw Water Transfers	1	30/04/2027
INNS_INV	08WW100007b	INNS Rapid Response Plan	1	30/04/2027
INNS_INV	08WW100007c	INNS risks from fish movements investigation	1	30/04/2027
INNS_MON	08WW100006a	Designing national surveillance programme	1	30/04/2027
INNS_MON	08WW100067a	Invasive Non Native Fish Species Investigation	1	30/04/2027
		Total	5	

Also included in the AMP8 WINEP is an output to undertake national pilot(s) and trials for RWTs. This will involve collaborative trials of potential intervention measures identified in the AMP7 RWT Risk Assessments. Wessex Water will fund cross-company projects at a national level. The aim of this project is to understand the feasibility of INNS control measures for RWTs which, if successful, could inform options appraisals for possible future implementation.

A third WINEP output is the development of a INNS Rapid Response Plan, which would come into action if an INNS related incident occurred, such as an outbreak of a species not previously encountered on a Wessex Water site. The response plan will take the form of a decision tree, to inform actions taken under different circumstances and will include enhanced biosecurity options in addition to those implemented in AMP7 (e.g., boat wash downs), to further reduce forward transfer of INNS. In addition, it will cover different groups of INNS at both supply and waste sites and different action plan end points for each. Finally, response plans will include a review stage to identify likely sources and pathways of INNS to help reduce spread in future at other sites exposed to similar risks.

The AMP8 WINEP also includes an investigation into the INNS risk posed from fish movements between Wessex Water sites. This will entail producing a risk assessment to better understand the risks of spreading different INNS by removing and stocking different fish species and a pathway action plan to help mitigate this. The investigation will be split between Wessex Water managed fisheries e.g., Yeovil reservoir and fisheries managed by syndicates, such as North East Bath reservoir. The investigation will entail studying species, numbers and sources of fish stocked and removed from Wessex Water reservoirs. Furthermore, it will involve determining the methods used in transferring fish and means of ensuring reductions of risk of INNS transfer.

The two WINEP outputs under an INNS_MON driver include an action to design a national surveillance programme and will be a collaborative cross-company project, coordinated nationally by the GBNNSS group. The aim is to develop a costed set of techniques and approaches for INNS surveillance of appropriate species at high-risk sites, using eDNA approaches where suitable.

Linked to the above investigation, a further WINEP output included under an INNS_MON driver concerns monitoring of INNS fish species and will involve setting up surveillance programs. This will be achieved using eDNA and traditional fish survey methods (such as netting) at Wessex Water owned lakes and reservoirs as well as a financial contribution by Wessex Water to a water company eDNA project.

Aquatic biodiversity implementation WINEP actions

The final INNS WINEP output is “partnership delivery of INNS control measures” and will involve delivering landscape scale INNS management as mitigation against risks such as RWTs and INNS at owned sites (Table 38). This will be achieved through continued funding for the national Check, Clean, Dry campaign run by APHA and GBNNSS and funding for INNS related research by the Centre for Agriculture and Bioscience International (CABI).

Table 38 AMP8 aquatic biodiversity WINEP implementation actions

Primary WINEP driver code	WINEP Action ID	Action name	Number of WINEP actions	Completion date
INNS_ND	08WW100068a	Partnership delivery of catchment INNS control measures	1	31/03/2030
		Total	1	

3.4.2. AMP8 fisheries investigations and implementation WINEP Actions

AMP8 fisheries investigation WINEP actions

Our AMP8 fisheries investigations are shown in Table 40.

The Eels (England and Wales) Regulations 2009 were introduced to meet the Eel Regulations (EC 1110/2007), with the aim of halting and reversing the decline in eel stocks. Priority actions are identified in Eel Management Plans prepared by the Environment Agency. Water companies are required to take those actions deemed necessary to deliver the Eel Management Plans, which include improvements to screening arrangements to protect eels from entrainment at our surface water abstractions and improvements to structures that impede the migratory passage of Eels.

In AMP6 we investigated ten of our sites for compliance with the regulations. The scope of the investigations included surveys to confirm the presence of eels and the risk that the assets posed to eel entrainment and passage (see Section 3.3.4 for further information). The investigation focused on sites identified by the Environment Agency but was not comprehensive. For AMP8 the EA has asked Wessex Water to consider other sites (typically small or disused sites) and Wessex Water owned in-river assets and the risk that they might pose to eel passage and entrainment. Natural England also asked us to assess the barriers that Wessex Water owned assets in-river assets might pose to migratory fish species; this will consider many of the same assets as the eel investigations. For efficiency we have included one WINEP investigation with primary and secondary drivers of EE_INV and SAFFA_INV, respectively. If necessary, these will include options appraisal and identify measures for implementation in AMP9.

Our AMP8 WINEP includes an action to investigate fish populations in the streams feeding The Tone Reservoir under a NERC_INV driver. This will involve walkover and electric fishing surveys to determine biodiversity, abundance and location of spawning reaches and nursery habitat in feeder streams, to help determine potential habitat/barrier improvements. The investigation will aim to confirm the level of entrainment or impediment to fish passage in the feeder streams to The Tone Reservoir and devise appropriate solutions to habitat and/or barrier improvements in waters that are becoming frequented by wild brown trout.

Our AMP7 WxW_SS106 investigation assessed the impact of our abstraction on the ecology of the Upper River Otter, including preliminary conclusions about the influence of the reservoir on the fish population. The Environment Agency requested that we look specifically at this issue through a further investigation in AMP8, which will assess the impact of changes in flow and water level on the extent and availability of fish habitat in the upper River Otter.

Table 39 AMP8 fisheries WINEP investigations and monitoring actions

Primary WINEP driver code	WINEP Action ID	Action name	Number of WINEP actions	Completion date
EE_INV	08WW100002a	In-channel assets eels and migratory fish species investigation	1	30/04/2027
NERC_INV	08WW100005a	Tone Reservoir Feeder Streams Fish Investigation and Options Appraisal	1	30/04/2027
WFD_INV_PHYSHAB	08WW100087a	Upper River Otter fish habitat investigation	1	30/04/2027
		Total	3	

AMP8 fisheries implementation WINEP actions

Our AMP8 fisheries WINEP implementation actions are shown in Table 40 and described below.

Table 40 AMP8 fisheries WINEP implementation actions

Primary WINEP driver code	WINEP Action ID	Action name	Number of WINEP actions	Completion date
EE_IMP	08WW100001a	North West Somerset reservoir eel passage improvements	1	31/03/2030
EE_IMP	08WW100060a	Currypool Weir eel passage improvements	1	31/03/2030
EE_IMP	08WW100061a	Bridgwater Reservoir eel passage improvements	1	31/03/2030
WFD_IMP_PHYSHAB	08WW100088a	Knacker's Hole gauging station fish passage improvement	1	31/03/2030
		Total	4	

In AMP6 we investigated ten of our sites for compliance with the regulations. The scope of the investigations included surveys to confirm the presence of eels and the risk that the assets posed to eel entrainment and passage. Where sites were found not to be compliant, measures to ensure compliance were identified and subject to a cost benefit assessment (defined by the EA).

Our AMP6 eel investigations followed the process prescribed by the Environment Agency and illustrated in Figure 23. All ten sites identified for possible screening improvement were reviewed for compliance with the regulations. For those sites found not to be compliant, screen improvements were costed subject to the Environment Agency's cost benefit assessment and prioritisation process. This reduced the size of the investment programme for PR19 to two intakes for Bridgwater and Yeovil reservoirs, respectively. The completed eel screen at one of the two sites is shown in Figure 24.

Under direction from the Environment Agency, no improvements for Eel passage were included in our AMP7 WINEP. Current guidance requires screening improvements to be implemented at intakes when other works are being implemented at a site; as no works are planned at Hele Bridge or Monkton Combe, we have not included any Eel screening improvements in our AMP8 programme. We have, however, included three eel passage improvements described below.

Figure 23 AMP6 eel screening investigations and AMP7 investment.

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Figure 24 Screen installed in AMP7 under EE_IMP driver near the intake from Bridgwater and Taunton Canal.

In AMP8 we are required to deliver eel passage improvements at Bridgwater and North West Somerset reservoirs, and at Currypool weir. The requirements at these sites were assessed in AMP6 and subject to cost benefit assessment, which identified the improvements shown in Table 41.

Table 41 AMP8 eel passage improvements included in the AMP8 WINEP

Site/asset	Upstream passage impro)vement required?	Downstream passage improvement required?	Description of improvement
Currypool Weir	Y	N	Two pumped up and over eel passes (main channel and diversion channel).
Ashford Reservoir	Y	N	Pumped up and over eel pass (reservoir intake sluice). Install eel tiles on spillway.
Durleigh Reservoir	Y	Y	Two pumped up and over eel passes (reservoir dam and v-notch gauging station). Install eel tiles on spillway. Install siphon for downstream passage.

The WFD_IMP_PHYSHAB action in Table 40 to improve fish movement at Knacker's Hole is a recommendation from an investigation into the impact of the operation of WxW_SS106, which was completed in March 2022. The investigation found that instream structures relating to the licensed operation of WxW_SS106 were restricting the available habitat for fish and specifically salmonids. The investigation identified that the gauging structure at Knacker's Hole (Figure 25) was not required; abstraction licence compliance could be ensured through monitoring at the Royston Bridge gauge approximately 1.25km upstream. Removal of the Knacker's Hole barrier would open up this section of river and tributaries to migratory fish.

Figure 25 Knacker's Hole gauging station, a barrier to fish passage.

3.4.3. AMP8 geomorphology investigations and implementation WINEP Actions

AMP8 geomorphology investigation WINEP actions

The AMP8 WINEP includes an investigation under a WFD_INV_WRHMWB driver to investigate the effect of Quantock Reservoir dam on sediment transport and geomorphological process in the downstream Peart Water. This follows similar investigations and adaptive management trials at Yeovil Reservoir in AMP6 (see below). If impacts are found an option appraisal will be undertaken, which may lead to an implementation scheme at PR29, such as sediment introduction, to replenish sediment eroded since Quantock Reservoir dam was constructed.

Table 42 AMP8 geomorphology WINEP investigations and monitoring actions.

Primary WINEP driver code	WINEP Action ID	Action name	Number of WINEP actions	Completion date
WFD_INV_WRHMWB	08WW100010a	Quantock Reservoir Sediment Investigation	1	31/12/2026
		Total	1	

AMP8 geomorphology implementation WINEP actions

In AMP6 we trialled adaptive management approaches to drive ecological improvement in the water body downstream of Yeovil reservoir under a wrWFDp1 driver (Action to achieve good ecological potential). Adaptive management is the process through which interventions are made and monitored to understand their success and where required, changes to approaches are made. This five-year trial focused on introducing sediment to replenish that eroded since the reservoir dam was constructed, providing habitat for invertebrates and driving ecological improvement (Figure 26). The trial successfully replenished sediment over a short reach of river but concluded too late to inform more extensive implementation in AMP7. The AMP8 WINEP includes an output to implement sediment replacement over a wider reach under a WFD_IMP_WRHMWB driver.

Table 43 AMP8 Geomorphology WINEP implementation actions.

Primary WINEP driver code	WINEP Action ID	Action name	Number of WINEP actions	Completion date
WFD_IMP_WRHMWB	08WW100011a	Yeovil Reservoir Sediment Introduction	1	31/03/2030
		Total	1	

Figure 26 Downstream Yeovil reservoir, showing sediment introduced in AMP6 trial, 2019.

3.5. Water resources investigations and implementation WINEP actions costs

Management control

All of the implementation schemes described above have resulted from previous investigations. These have been delivered in accordance with the Measures Specification Forms required at the start of AMP7 and agreed with the EA and NE. Delivery of these investigations and identification and recommendation of implementation actions has been undertaken in consultation with the EA and NE, to ensure that they are appropriate.

The completion dates for the water resources investigations have been determined by our environmental regulators and confirmed within the WINEP. These investigations will typically report in early AMP8 to enable the findings to inform further investment requirements in PR29 and inform the development of future WRMPs.

Best option for customers

We strongly believe that investment should be based on a robust evidence base, highlighting where our water supply operations are impacting the aquatic environment and so requiring improvement. Our water resources investigations enable Wessex Water, our regulators and stakeholders to have a better understanding of the water environment to understand the key factors causing decline and options for improvement.

As described above, these implementation actions have been developed as a result of investigations in previous AMPs. The options identified have been appraised to ensure that they are feasible and have been discussed with our regulators, and we are confident that these intervention actions are appropriate.

Robust and efficient costs

Section 2 of the main business plan narrative describes how we have ensured our proposals are efficient across all the price controls, as well as explaining how we estimate efficient costs for new projects.

The water resources, aquatic biodiversity, fisheries and geomorphology investigation costings have been developed through external benchmarking and previously competitively tendered work where we have demonstrated that our cost estimates are efficient and competitive compared with the marketplace. They have also been informed by costs incurred during the delivery of our AMP6 and AMP7 investigations in the following ways:

- Using actual costs from similar projects within AMP7, for example our AMP7 groundwater investigations in the Middle Bristol Avon, the Hampshire Avon and on the Cotswold Scarp slope, including externally contracted services for monitoring and modelling.
- Investigations have used a bottom up costing approach.
- External consultants where work has been competitively tendered during AMP7, for example the costs of drilling observation boreholes, undertaking river flow monitoring and the processing of ecological samples.

The costs for our water resource, aquatic biodiversity, fisheries and geomorphology implementation actions have been developed internally by our estimating team using costs provided by consultants and suppliers. Where previous investigation had included costed options appraisals, such as the eel passage improvements identified through our AMP6 Eels investigation (delivered by external consultants), estimates were reviewed, suppliers contacted and costs updated as appropriate.

As with some of our investigations, the costs of implementation actions have also been informed by costs incurred during the delivery of our AMP6 and AMP7 programmes. For example, in AMP7 we have delivered catchment INNS control measures and plan to continue similar level of investment in AMP8. Similarly, in AMP6 we trialled the introduction of sediment to the Sutton Bingham stream and the costs incurred have been used to inform our Yeovil Reservoir Sediment Introduction action.

The proposals in this section correspond to their appropriate line drivers in the PR24 data tables as summarised in Table 44 Note that there are two WINEP partnership projects that have some expenditure under the water resources price control. These are described and costs presented together with our other partnership projects in the document WSX16 - Waste water networks plus strategy and investment. Terrestrial biodiversity investigation and implementation actions with investment under the water resources price control are described in the document WSX25 - Improving biodiversity.

Table 44 Water resources investigations and implementation WINEP actions costs

Table	Lines	Line Description	Capex (£m)	Opex in 2025-2030 (£m)	Totex in 2025-2030 (£m)
CW3	CW3.7-CW3.9	Eels/fish passes; (WINEP/NEP) water capex, opex and totex	0.5	0.0	0.5
CW3	CW3.16-CW3.18	Water Framework Directive; (WINEP/NEP) water capex, opex and totex	3.5	0.0	3.5
CW3	CW3.10-CW3.12	Invasive Non Native Species; (WINEP/NEP) water capex, opex and totex	0.4	0.0	0.4
CW3	CW3.37-CW3.39	Investigations, total; (WINEP/NEP) water capex, opex and totex	18.5	0.0	18.5
CW3	CW3.4 – 3.6	Eels/fish entrainment screens; (WINEP/NEP) water capex, opex and totex	1.0	0.8	1.8
	Total		**23.9**	**0.8**	**24.7**

Costs are at 2022/23 price base, Post RPE/Frontier shift adjustment and excluding business rates

4. Asset Maintenance and Management

4.1. Principles of Approach

Our approach to long term planning and identifying investment needs is a combination of the following:

- priorities set out in Water – a new direction (our 25-year vision).
- strategies set out in our updated Water Resources Management Plan.
- strategies to achieve challenging Performance commitments.
- managing risks in our Drinking Water Safety Plans (DWSP) and improving resilience.
- horizon scanning of future obligations
- trends such as modelling long-term water quality
- our Asset Management Framework, based on best practice, including our ongoing programme of strategic and minor capital maintenance.

- review of people and systems.

As part of our internal governance process for the business plan, the outcomes from these methodologies have been tested through a series of internal risk and challenge meetings ahead of inclusion in our plan.

4.1.1. Risk management

The identification and management of risk is delivered through a tiered system of groups drawn from operational staff, management, Executive Directors, and the Board. The Board reviews and holds ultimate responsibility for the risk process, supported by the Audit and Risk Committee.

Asset and operational risks associated with our water supply operations are reviewed, assessed, and recorded continuously by staff as part of our Drinking Water Safety Plan (DWSP) programme, as a result of regular reviews and in response to changes. Risks are scored using an externally accredited process which assesses probability and impact on a five-by-five matrix. Risk mitigation plans are recorded and implemented where appropriate and pre and post mitigation scores are recorded.

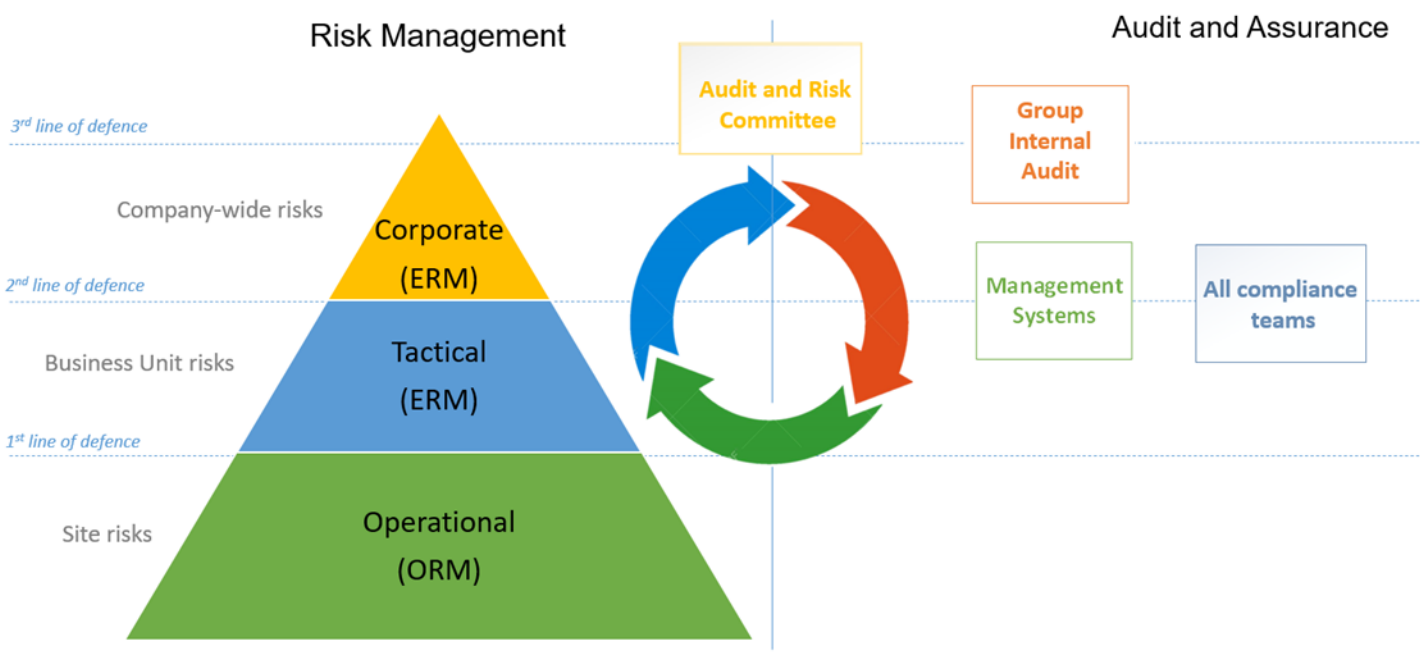
The risks identified provide a foundation for the risk hierarchy identifying more substantial tactical risks and a line of sight to the corporate risk register (to which our DWSP process feeds into). The corporate risk register is maintained by senior managers from across the business who are experts in their respective fields. Oversight of this process is by our Risk Management Group (RMG) that review all business risks, including emerging and strategic risks. Where a risk is deemed out of tolerance, RMG will consider additional measures to reduce it to an acceptable level or escalate the risk as appropriate to the Executive Leadership Team (ELT) or the Board.

RMG meets through the year and submits an update on the strategic and principal risks to the ELT and the Board twice a year. Any significant new risks are reported to the monthly ELT meetings.

ELT scrutinises and challenges the risks and request additional work where necessary to better classify the risk or explore alternative mitigation methods.

In 2023 we are introducing a new corporate risk system which will integrate all of our company risk records and assurance activities, as represented in the figure below.

Figure 27 New corporate risk system.



This new system would aim to:

- enable risks to be assessed consistently across the business with all relevant information in one place.
- provide improved oversight of the company's overall risk profile and insight into detailed risk information.
- produce a more succinct process for prioritising action plans for the mitigation and control of risks.
- allow us to make the better investment decisions by balancing risk, performance, and cost.
- streamline and simplify the audit process across the business and enable "Integrated Assurance" – using information about risks in the business to target our audit and assurance efforts and track trends.

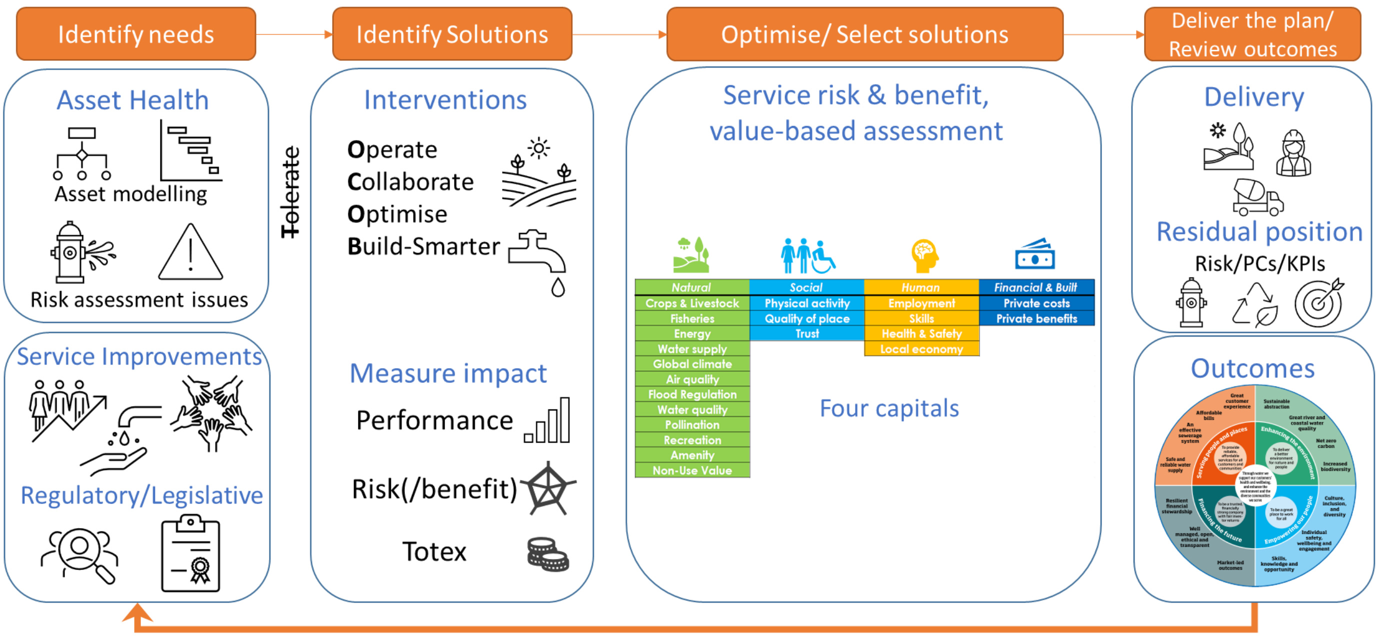
The audit module is already live and in use across the business. The risk module is expected to go live in Summer 2023. As part of this roll out, we have cleansed our existing risk data to maximise benefits of the new system.

If a more substantial solution to a risk is required, involving a capital project, this will be dealt with through our investment management process. Suitable options are considered prior to an agreed solution being confirmed. The capital scheme solution is then prioritised for funding based on the risk identified.

4.1.2. Investment management

Our new asset and investment management strategy is being implemented utilising the EDA (Enterprise Decision Analytics) decision support tool to enable optimal, data-driven decisions that balance complex factors for an optimal asset investment plan (Figure 28).

Figure 28 Asset and investment management overview.



This enables a consistent approach across the business for how we plan, manage and make-decisions on our investments, using service-and value-based decision making. It uses a forward-looking approach to project the change in risk, to inform when the risk should be mitigated, and uses a hierarchy of interventions to identify appropriate solutions. The risk reduction and benefits added of each solution is quantified and assigned value using the Service Measure Framework (SMF). The SMF monetises risk and benefits using four capitals, Natural, Social, Human and Financial/Built. When an optimisation is run in EDA, solutions are evaluated to determine the best-value options and associated optimal timing for implementation, that also effectively contribute to the programme-level risk reduction and performance targets required, within given financial constraints.

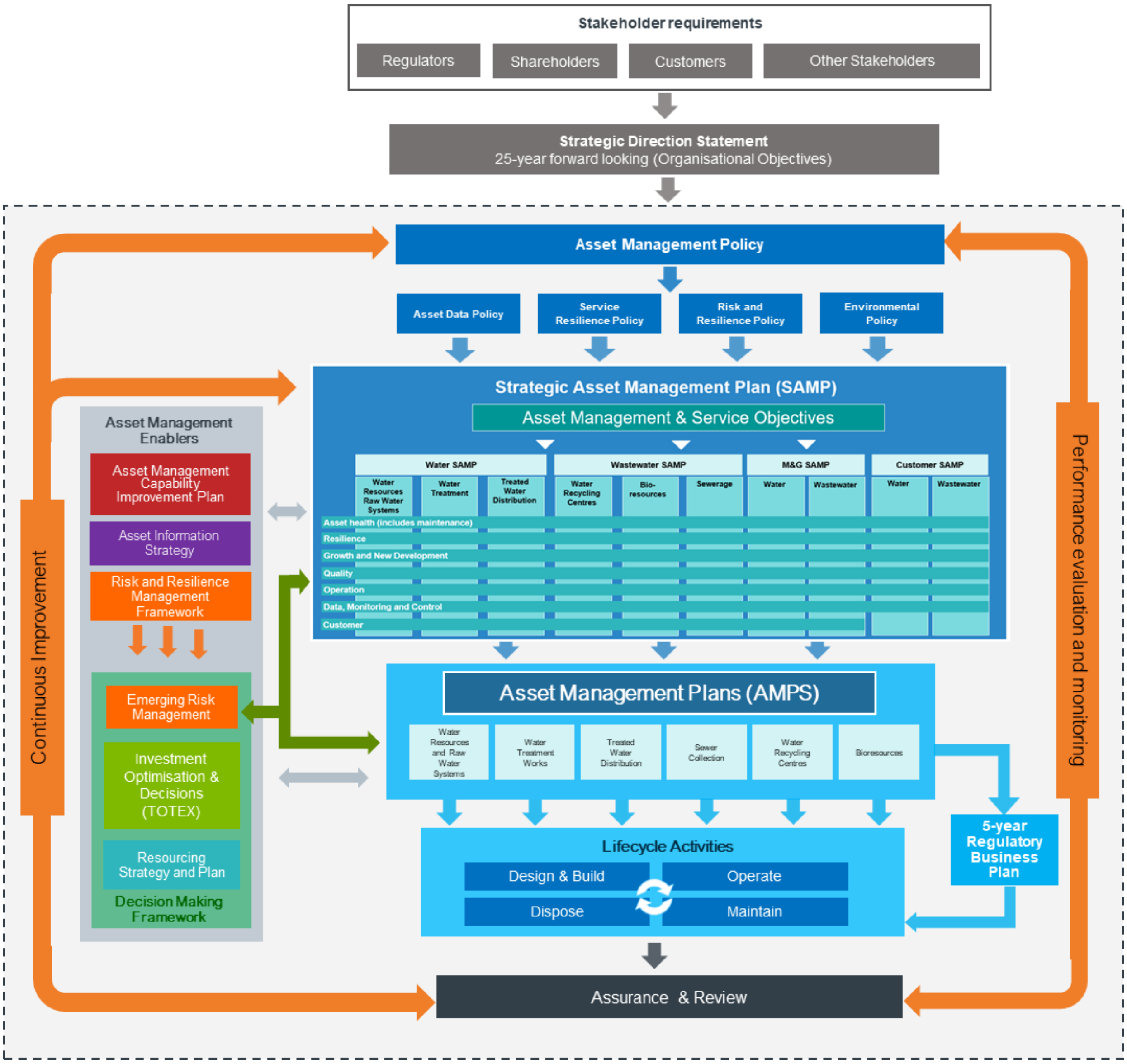
4.1.3. Asset management

Our asset management framework is used to direct, coordinate, and control our asset management activities.

In a Water Company, our assets are used to deliver service to our customers, so our asset management activities include all activities that allow us to:

- establish and deliver the objectives set out in our long-term strategic direction statement (including performance commitments).
- realise value from our assets for customers, communities, stakeholders, shareholders, and the environment.

Figure 29 Asset Management Framework.



Our asset management framework includes policies, strategies, plans, information management, decision-making processes and capital and operational delivery. It provides a number of important functions:

- it provides a clear line of sight so that everybody who works for or on behalf of Wessex Water understands how they contribute towards the delivery of our company objectives. The line of sight translates

organisational objectives from our strategic direction statement into asset management policy, strategy, and objectives, which cascade down into more detailed asset management plans and delivery activities.
- it ensures that our senior management decisions, strategies, and plans take into account the bottom-up, fact-based realities, i.e., asset capabilities, performance, opportunities and constraints through our risk management and resilience framework and our decision-making governance processes.
- it provides our delivery staff with direct visibility of the purpose of the work they undertake – so they understand why it is needed, not just when and how to do it. This helps with identification and prioritisation of risks as well as encouraging innovation through identifying better ways of achieving objectives.

Our framework allows us to monitor our performance against all objectives through a hierarchy of KPIs and align our decision making and risk management processes to the achievement of objectives at all levels of our organisation.

Our asset management framework applies to the following types of assets:

- Nature based assets e.g., reed beds, sustainable urban drainage.
- Physical assets used for the provision of services to our customers – water resources, treatment, distribution, bioresources and land.
- Equipment, inventory, and properties owned by Wessex Water.
- Data, information and operational technology and digital assets.
- Intangible assets – such as Wessex Water leases, brands, intellectual property rights, licences and software.
- Wessex Water employees and third-party providers.

4.1.4. Resilience

'Resilience is the ability to cope with, and recover from, disruption and anticipate trends and variability in order to maintain services for people and protect the natural environment now and in the future' (Resilience in the Round, Ofwat, 2017).

Resilience is at the heart of our business plan and is the fundamental driver behind how we deliver our 'safe and reliable water supply' strategic outcome. We recognise the responsibility we have in providing essential public services to customers and in managing the natural environment, both now and for future generations. Maintaining and strengthening our resilience is critical to ensuring we can continue to deliver reliable and trustworthy services to our customers. This is particularly true given the landscape of an increasingly frequent experience of more extreme shocks and stresses. To be truly resilient and fit for the future, we recognise we must take a long-term view in our plans and procedures, with an aim to anticipate likely changes and actively respond or adapt as they occur.

In recent years, Covid-19, the war in Ukraine and global economic challenges have highlighted the increasing frailty of our supply chain, including people resources, power, chemicals, materials, technology and information security such that we are having to be more self-reliant and provide increased resilience just to maintain existing service performance (i.e. more generators, increased cyber security, early procurement, additional on-site resilience at key locations).

We face many challenges which will potentially affect our resilience, now and in the future, and we must predict and prepare for these eventualities. We recognise these are sector or wider issues and we cannot address them all by ourselves, so we will also seek partnerships with others to address specific improvements.

Our Water Resources Management Plan is key to ensuring we maintain a resilient water supply system, particularly due to future predicted environmental and license restrictions, gradual population increase and availability of sources. Internally, our integrated Grid helps us to maximise use of our sources, while our work as part of the West Country Water Resources group is identifying potential new sources and exploring how associated cross-company schemes could be developed to ensure water supply resilience of the region as a whole.

4.2. Price control summary

4.2.1. Assets and assessment approach

We supply around 340 million litres per day of high quality drinking water to 1.3 million people and nearly 50,000 businesses across Bath and North East Somerset (BANES), Somerset, Dorset and Wiltshire. This water comes from a variety of sources and assets, with those in this water resources price control summarised below.

Table 45 Asset Group characteristics & approach

Functional Group	Asset Group	No.*	Characteristics	Assessment approach
Water Resources	Dams and impounding reservoirs	18	Small asset group by number, subject to detailed statutory inspection regime.	Deterioration modelling not appropriate. Bottom up assessment based on detailed inspection data.
	Raw water pumping stations	9	Small asset group by number, so individual assessment possible.	Deterioration modelling not appropriate. Bottom up assessment based on detailed asset and condition data.
	Raw water mains	113 (km)	Small asset group by length in comparison with distribution mains. Individual assessment possible.	Deterioration modelling not appropriate. Bottom up assessment based on individual asset performance data and risk assessments.
	Boreholes	171	Large and important asset group. Proactive risk-based specialist inspection regime in place.	Deterioration modelling not appropriate. Bottom up assessment based on detailed inspection data.
	Springs	8**		

* Number of sites for which we have a maintenance responsibility
** Number of WTW where we get at least some of the supply from springs, some of which are made up of several groups of springs

These asset groups represent our sources of raw water and thus they are critical to providing adequate supply capacity to meet our target headroom with respect to water resources planning. In addition:

- Stream support boreholes provide an essential function in meeting abstraction licence conditions.
- The dams associated with impounding reservoirs need to be maintained in an adequate condition such that there is no risk to the people living downstream of them.

Due to the hydrogeology of our supply area, and the lack of any large metropolitan areas, we have a large number of relatively small sources for our population served in comparison with other water companies.

These assets are only part of our water resources system, with the water catchments that we operate within and the communities that live and work in these catchments being vital to the overall sustainability of our water services and the wider water environment.

4.2.2. Objectives

The key objectives of our water resource asset base can be summarised as follows:

- Maintaining and enhancing drinking water quality
- Maintaining capacity to meet the demand for water
- Maintaining stable asset health
- Compliance with the Reservoirs Act 1975
- Delivery of all outputs agreed with our regulators.
- Minimising health and safety risks to the public, employees and contractors.

Our long-term strategy for maintenance and enhancement of these asset groups is to ensure that the assets perform reliably to the required standards throughout their life and operate in a way that provides cost effective, resilient service to our customers and the environment.

Our revised Water Resources Management Plan indicates that significant new water resource facilities will be needed in the future. We are working as part of West Country Water Resources Group, along with South West Water, and the EA, to support a coordinated approach to water resources planning in the South West of England that transcends water company boundaries. A number of Strategic Resource Options (SROs) are being considered.

All of the cost of the appraisal of these SROs in the AMP8 period is being allocated to the water resources price control under enhancement. Delivery of schemes will be post 2030 and therefore have no impact on maintenance needs for this price control in AMP8.

4.2.3. Performance to date

Our system is resilient, and the failure of any one raw water main or pumping station should not materially impact on the resilience of our supply to customers as we have redundancy built into our systems. Any failure should be repairable within a relatively short time period.

Recent investment in the Grid and projects to eliminate standalone sources has increased levels of resilience in the network and provides system wide mitigation of the consequences of individual source failure. Despite this investment, the water supply borehole and spring source assets are still critical to service and system resilience.

4.2.4. Proposed investment

Our proposed maintenance strategy for this price control can be summarised as:

- A continuation of our proactive inspection and maintenance regime for dams and impounding reservoirs with AMP8 expenditure in line with our current £0.5m/year
- A continuation of our reactive and proactive maintenance of raw water pumping stations
- A significant uplift in maintenance of our boreholes and springs

As shown below we are forecasting a significant uplift in expenditure for this price control from AMP7 to AMP8 based on the need to do more proactive maintenance on boreholes in particular.

Table 46 Capital Maintenance Investment Water Resources (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates.

Water Resources £m @ 2022-23	AMP3	AMP4	AMP5	AMP6	AMP7*	AMP8	AMP9
	3	9.3	10.8	6.2	12.0	20.7	32.5

4.3. Dams and impounding reservoirs

4.3.1. Historical analysis – assets, performance and expenditure

We own 16 Impounding reservoirs, 13 of which are governed by the Reservoirs Act 1975 with capacity greater than 25Ml. Government is consulting on reducing the volume threshold from 25ML to 10ML, and this could occur within the next 7 years, so we are effectively managing the 3 smaller reservoirs as if they fell under the act.

In addition, we have a maintenance responsibly for two other dams/reservoirs: ✂.

Asset condition and performance of our impounding reservoirs is governed by regular inspection and monitoring to comply with the Reservoirs Act 1975 ensuring that our dams and reservoirs are maintained.

The Reservoirs Act 1975 is the principal legislation aimed at ensuring the safety of people downstream of dams. Wessex Water is fully compliant with the Reservoirs Act 1975. We also apply the principles of the Reservoirs Act to our smaller non- statutory reservoirs. The act is enforced by the Environment Agency.

4.3.2. Maintenance planning objective

The main measure of serviceability performance is satisfactory compliance with the Reservoir Act 1975. Serviceability with respect to dams has been stable since AMP2. Our current risk position is to ensure full compliance with the Reservoirs Act and this position has not changed over time.

The consequences of not maintaining our dams and impounding reservoirs could be catastrophic failure with significant damage to property and potential loss of life, we are safeguarded from this by our compliance with the Reservoir Act. Minor noncompliance could also result in an increased risk of water quality failures and an increased risk of not being able to produce sufficient water to meet customers' demand.

Our Strategic Direction Statement includes an outcome related to resilience and highlights that we will continue to maintain our dams and reservoirs in the most effective way to ensure satisfactory performance to meet the long-term needs of all our customers. 7/18 Price Base)

The Flood and Water Management Act 2010 introduced a more risk-based approach to reservoir regulation. The main changes proposed were a reduction in the capacity at which a reservoir will be regulated from 25ML to 10ML and that only those reservoirs assessed as a higher risk are subject to regulation. There were also changes related to registration, inspection reports, flood plans and incident reporting.

Following consultation with the industry and stakeholders Defra have decided to implement the changes in two phases:

- Phase 1 will apply only to reservoirs that are currently regulated i.e., those with a capacity greater than 25ML. For these reservoirs the Environment Agency will determine whether a reservoir is high risk or not high risk, with the existing inspection regime only applicable to high risk reservoirs.
- Phase 2, for which the timetable is not yet decided, will include the lowering of the threshold to 10ML, dealing with cascades of reservoirs and clarification of the abandonment process.

In practice the changes will make very little difference to our approach because we already apply the principles of the Reservoirs Act to our smaller non-statutory reservoirs. The changes, when implemented by Defra, will be undertaken through this base maintenance programme.

Performance Commitments

Performance commitments associated with the maintenance and management of our dams and impounding reservoirs are summarised below.

Risk of severe restrictions in a drought – Resilient Services

This is a common performance commitment designed to measure the company's resilience to extreme drought events. We forecast that 0% of our population will experience severe supply restrictions in a 1-in-200-year drought and our proactive management of these assets minimise any potential risks to this PC.

Compliance Risk Index (CRI) – Excellent Drinking Water Quality

This is a common performance commitment stipulated by Ofwat and is the headline drinking water quality measure. Our proactive catchment management approach is integral to our excellent performance for this metric.

Unplanned Outage – Resilient Services

This is a common performance commitment which aims to show the extent to which unplanned events lead to a reduction in the maximum sustainable production capacity including the length of time and impact of those events.

It is defined as the total unplanned outage as a proportion of total production capacity (%); where unplanned outage is a temporary loss of maximum production capacity or reduction in capacity.

4.3.3. Historical capital maintenance expenditure

Table 47 Impounding reservoirs and dams expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates

£m	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Impounding reservoirs and dams	1.11	5.43	5.65	2.32	4.27	3.76

* Forecast

Large one-off schemes occurred in both AMP4 and AMP5 and we are not expecting any similar one-off schemes for AMP8.

4.3.4. Historical performance

The performance of our reservoirs and dams is generally excellent.

There is an increasing emphasis on emergency planning in relation to reservoirs. Aspects of the emergency plans will become statutory requirements under The Flood and Water Management Act 2010. On-site plans, detailing the action to be taken at the reservoirs in the event of a problem, have been prepared for all our reservoirs based on a template issued some years ago. Inundation maps have been prepared by the Environment Agency and issued to undertakers for emergency planning purposes.

4.3.5. Capital maintenance forecasting

The level of maintenance is governed by the outputs of regular inspection and monitoring to comply with the Reservoirs Act 1975.

We maintain a 10 year look ahead for all our dams and impounding reservoirs and based on all planned inspections and foreseeable needs we anticipate expenditure in AMP8 to be similar to the £0.5m/year in AMP7.

Although some of our dams are over 100 years old with corresponding rates of deterioration and the risk regime imposed by the Reservoirs Act continues to tighten, our assessment is that an increase in expenditure is not required.

Capital costs have been estimated by reference to similar projects or through discussions with the Inspecting Engineers and Supervising Engineers. There will not be any on-going operating costs associated with these schemes.

The schemes are justified on the basis that the company is required to comply with the Reservoirs Act. There is no overlap with the enhancement programme. Due to the level of scrutiny of Inspecting Engineers we are confident that the interventions will deliver the stated benefits.

We consider that our planned investment for Dams and Impounding Reservoirs maintains an acceptable and stable level of risk.

4.3.6. Conclusions

Asset condition and performance is governed by regular inspection and monitoring of our impounding reservoirs to comply with the Reservoirs Act 1975. Our proposed level of expenditure for AMP8 is based on a bottom-up approach, is in-line with AMP7, and maintains an acceptable and stable level of risk.

4.4. Raw water pumping stations

4.4.1. Asset inventory

Raw water pumping stations are defined as stations that pump water directly from rivers, canals and impounding reservoirs. This asset group excludes all raw water or partially treated water pumping stations which take water from wells, boreholes and springs and excludes all pumping stations located within or very close to Water Treatment Works (WTWs).

We own 8 sites defined as raw water pumping stations, of which only 5 are currently in use. There is a large range of capacities from <5Ml/d up to 50Ml/d.

✂

In general, the impact of asset failure is limited as there is resilience within the supply network and most of the raw water pumping stations deliver to impounding reservoirs that provide many months of storage.

4.4.2. Maintenance planning objective

There are no applicable serviceability indicators connected with capital maintenance expenditure for this asset group, so investment in maintaining asset resilience and stable risk will be managed through our Drinking Water Safety Plan risk management system.

The condition and performance of individual assets in this group has a marginal impact on performance commitments given the level of redundancy in these systems.

Performance Commitments

The performance commitment associated with the maintenance and management of our raw water pumping stations is summarised below.

Unplanned Outage – Resilient Services

This is a common performance commitment which aims to show the extent to which unplanned events lead to a reduction in the maximum sustainable production capacity including the length of time and impact of those events.

It is defined as the total unplanned outage as a proportion of total production capacity (%); where unplanned outage is a temporary loss of maximum production capacity or reduction in capacity.

4.4.3. Historical capital maintenance expenditure

As shown below our historic capital maintenance expenditure on this small group of assets is relatively stable.

Table 48 Raw Water Pumping Stations expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates.

£m	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Raw Water Pumping Stations	0.2	1.1	1.7	0.1	0.2	0.7

4.4.4. Historical performance

The sites are generally considered to be in a fair to good condition and the current level of risk is stable.

The failure of any one pumping station should not materially affect the resilience of our supply to customers as we have adequate redundancy built into our systems and any failure should be repairable within a relatively short time period.

The status of our raw water pumping stations is summarised in the following table.

Table 49 Status of raw water pumping stations.

✂

4.4.5. Capital maintenance forecasting

Our assessment has focused on meeting our planning objectives by maintaining a suitable balance of risk and service through our DWSP (Drinking Water Safety Plan) system.

✂, we anticipate AMP8 costs will be in line with historical average expenditure to address reactive repairs, asset improvements, H&S and asset replacement as needs arise over future years due to asset deterioration.

We consider that our planned investment for Raw Water Pumping Stations maintains an acceptable and stable level of risk.

4.4.6. Conclusions

The proposed AMP8 plan has been developed based on individual site assessments in conjunction with a review of historical expenditure. The AMP8 proposal is in line with the long-term average, excluding any payments to South West Water for the refurbishment of the River Exe raw water pumping station.

4.5. Raw water mains & conveyors

4.5.1. Asset inventory

We have just over 113 km of raw water mains allocated to the water resources price control, most of which is made up of a small number of major systems, with most of the remaining length being smaller diameter spring collection mains. All our raw water mains and conveyors in the Wessex Water area are pipes, we do not have any tunnels or brick conduits or similar.

4.5.2. Maintenance planning objective

None of the water supply performance commitments provide a good metric on which to focus our capital maintenance assessment of raw water mains. Our assessment is therefore focused on meeting our planning objectives by maintaining a suitable balance of risk to service through our DWSP system.

4.5.3. Historical capital maintenance expenditure

Table 50 Raw Water Mains & Conveyors historical expenditure (22-23 price base), Post RPE/Frontier shift adjustment and excluding business rates.

£m (22/23 Price Base)	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Raw Water Mains & Conveyors	0.03	0.15	0.54	0.04	0.05	0.16

* *Forecast*

This summary of historical capital expenditure shows very little expenditure on raw water mains. This is because in most cases major historical capital expenditure on the raw water mains was part of a bigger scheme related to the associated WTW. Reactive maintenance has been limited to several localised repairs.

4.5.4. Historical performance

We do not have a large asset stock in this category and the probability of failure can be estimated from historical failure/repair records.

In general, the consequence of failure is limited as we have redundancy within our supply systems and given the characteristics of our pipes there is no reason why a pipe failure cannot be repaired within 18 hours.

4.5.5. Capital maintenance forecasting

We undertake individual asset condition and criticality assessments for each of the major systems to identify any potential investment needs and record the likelihood and consequence of failure data within our DWSP system.

We consider that our planned investment for Raw Water Mains maintains an acceptable, stable level of risk.

4.5.6. Conclusions

Our proposed investment strategy for PR24 is a continuation of our existing proactive and reactive strategy with a similar level of investment to the current AMP.

4.6. Boreholes and springs

4.6.1. Asset inventory

Around 75% of the water we supply comes from groundwater sources, mostly from boreholes with less than 5% from springs.

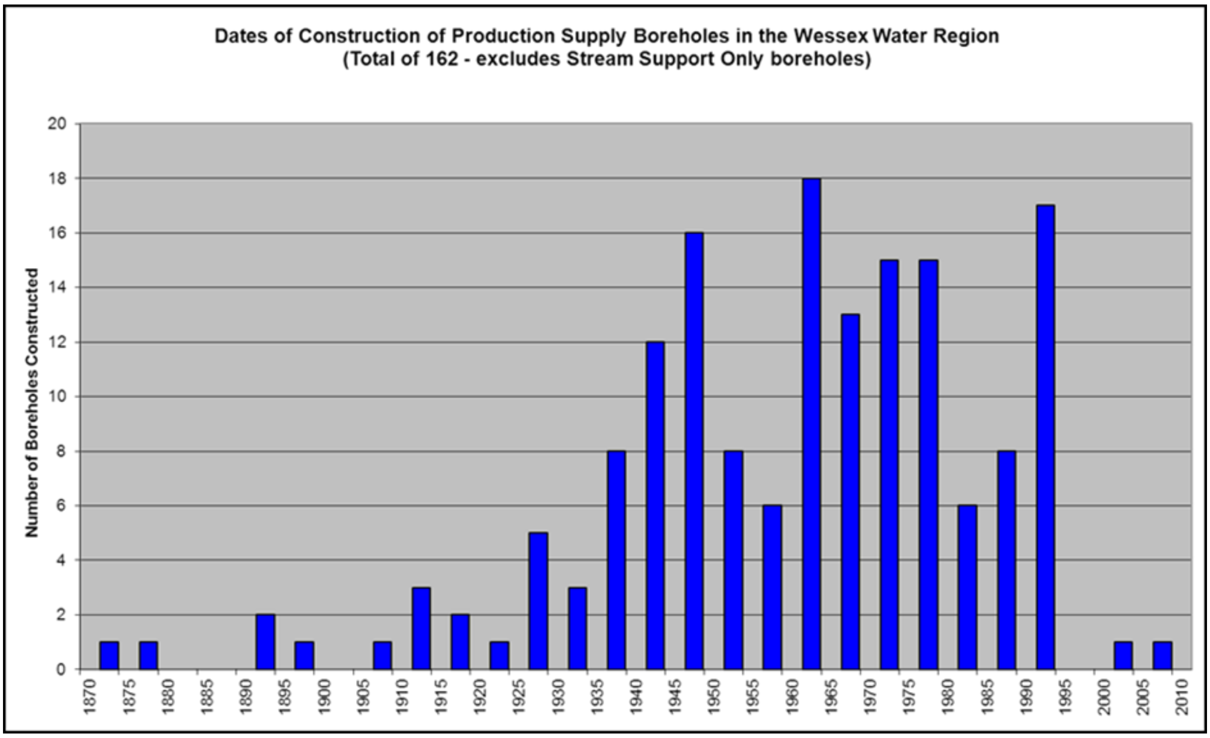
There are 171 boreholes currently in supply that can be categorised by the geology of the aquifer, chalk or upper greensand and/other. Chalk boreholes are the simplest and normally comprise an unlined hole with 15-20m of permanent mild steel casing grouted into place at the top of the borehole to prevent surface water ingress. Upper greensand/other require additional screens and gravel pack within the hole to keep the borehole open and prevent the ingress of fines/iron deposits.

The borehole assets can be further sub-divided by their function. This could be for public water supply only, stream support only, supply and stream support (from separate pumps in the same borehole).

Many Wessex Water boreholes are between 50 and 100 years old (see Figure 30) and still operating efficiently and catastrophic borehole collapse is uncommon; two occurrences in 22 years.

More common is the reduction in efficiency of boreholes by clogging of screens and gravel packs, most commonly by iron. This occurs in boreholes in the Upper Greensand, Yeovil Sands or other granular aquifers across the region.

Figure 30 Borehole age profile.



The number of operational spring sources has been reduced significantly since privatisation, with only 8 WTW still supplied at least in part from springs. Many of our spring fed sources are supplied by multiple groups of springs. Springs are always located in areas that tend to be geologically unstable (at the groundwater – surface water interface) and as a result there is constant movement and erosion of the ground, it is therefore recognised that maintenance of springs is an ongoing activity.

4.6.2. Maintenance planning objective

Maintenance objectives are to maintain overall capacity and quality of the sources to avoid the risk of multiple and simultaneous failures. Stream support boreholes are also critical assets in that they are required to operate reliably on demand for extended periods to prevent loss of aquatic life and avoid the risk of environmental prosecution.

It is vital that the boreholes and springs consistently deliver the appropriate quantity and quality of water to ensure that the supply network and treatment processes are optimised. The following describes the key objectives of borehole and spring maintenance activities:

- boreholes remain open to accept an appropriate size of submersible pump to provide the required yield
- provide their design yield with no deterioration in efficiency or performance (i.e., that pumped water levels do not increase over time for equivalent yield).
- provide groundwater of the highest possible quality with no deterioration

Utilisation of springs is generally maximised within the water resources strategy as spring sources have a low unit cost.

Concerns about water quality, such as cryptosporidium and turbidity, can also limit the utilisation of spring sources.

Performance Commitments

The performance commitments associated with the maintenance and management of our boreholes and springs are summarised below.

Risk of severe restrictions in a drought – Resilient Services

This is a common performance commitment designed to measure the company's resilience to extreme drought events. We will be forecasting that 0% of our population will experience severe supply restrictions in a 1-in-200-year drought.

Compliance Risk Index (CRI) – Excellent Drinking Water Quality

This is a common performance commitment stipulated by Ofwat and is the headline drinking water quality measure. It is a relatively new measure introduced by the DWI in 2016.

Unplanned Outage – Resilient Services

This is a common performance commitment which aims to show the extent to which unplanned events lead to a reduction in the maximum sustainable production capacity including the length of time and impact of those events.

It is defined as the total unplanned outage as a proportion of total production capacity (%); where unplanned outage is a temporary loss of maximum production capacity or reduction in capacity.

4.6.3. Historical capital expenditure

Table 51 Historic Capital maintenance – Boreholes and springs.

£m	AMP3	AMP4	AMP5	AMP6	AMP7*	Average
Boreholes & Springs	1.8	3.7	4.7	3.7	7.5	4.3

* Forecast

Service and asset performance is monitored by a programme of proactive inspection of the boreholes. The regime includes:

- Direct monitoring of the borehole condition comprising visual inspection by CCTV and geophysical logging
- Indirect monitoring such as measuring of pumped water levels or pump tests to assess the performance of the borehole
- Water quality monitoring, as increases in turbidity could be due to degeneration of the lining or structural issues within the borehole.

The specialist nature of borehole work, the limited number of experienced contractors and the large physical dimensions (diameter and depth) of public water supply boreholes (as opposed to small private boreholes) mean that any works carried out are expensive.

In 2006 a major programme of springs refurbishment was undertaken. Since then, further refurbishment schemes have been driven by cyclical inspection and maintenance.

4.6.4. Historical performance

The borehole assets within Wessex Water are robust and continue to provide excellent service. However, regular inspection is required and increasingly so as the boreholes age.

There are concerns over those boreholes which, for example, penetrate both the Chalk and the Upper Greensand. Historically, the construction method was to leave the Chalk (upper) section unlined and add a "drop set" screen into the Upper Greensand section.

Inspection shows that loose blocks of Chalk and even relatively small flints, can fall out of the unlined section and wedge the pump into the "drop set" or damage the screen below.

Regular borehole inspection with a view to the possible addition of casing through the chalk section will be carried out for early identification of weakness in the unlined sections of the boreholes.

4.6.5. Capital maintenance forecasting

The proposed AMP8 plan of is much higher than the long-term average and aims to further improve the understanding of the condition and performance of the assets to better inform decisions on the level of proactive maintenance interventions required to meet the maintenance objectives.

In addition, top-down budget allocations derived from historical costs and lifecycle modelling assumptions, have been forecast for inclusion in our AMP8 plans.

Proposed activities include cyclical maintenance and cleaning activities at spring sources and greensand boreholes, borehole pump replacements, casing and head plate relining/replacement and an allocation for major refurbishment or rehabilitation of boreholes and spring sources as informed by the inspection programme.

Detailed bottom-up annual programmes of work will be developed for the above activities in each year of the AMP based on the findings of an annual condition inspection programme and through ongoing monitoring of source yield and water quality.

We consider that our planned investment for Boreholes & Springs maintains an acceptable, stable level of risk.

4.6.6. Need for Investment

Wessex Water relies on groundwater for 75% of its public drinking water supply. This equates to an average daily quantity of water into supply of 255Ml/d (75% of total 340 Ml/d and 127,840 Ml/yr).

The majority of the groundwater is supplied from three major aquifers in the Wessex Water region; the Chalk, Upper Greensand and Great Oolite. Significant volumes but from fewer sources, are also obtained from the Jurassic Limestone, the Inferior Oolite and Yeovil Sands

This groundwater is abstracted from its host aquifers through boreholes, wells and springs. These structures are carefully designed to facilitate the abstraction of good quality groundwater, in significant quantities, at acceptable flow rates, over many decades of lifespan. Their specific design depends on the aquifer type and local characteristics of the aquifer.

Each groundwater source carries an abstraction licence, granted by the Environment Agency, which dictates how much water can be withdrawn from the aquifer daily and annually (and in some cases hourly). These licences may also carry conditions that relate to the impact of abstraction on the environment. For example, pumping rates and volumes may be conditional on river flows, particularly during low river flow periods.

Some boreholes provide stream support water to rivers (in addition to the 340Mld for drinking water supply), but this is to compensate for abstraction from supply boreholes that are known to impact surface water flows.

Due to environmental pressure, it is now very difficult to secure a new groundwater abstraction licence. It is considered unlikely that any further exploitation of groundwater for public water supply will be allowed in the Wessex Water region in the foreseeable future.

The result is that our 'licensed' groundwater resource is incredibly valuable. It is estimated that the cost of securing 1Ml/d of 'new' groundwater is £2million, including the environmental investigations required to secure a licence.

The constructed assets through which our licensed resource is secured (boreholes, wells and spring chambers) are essential 'frontline' assets which require ongoing monitoring and maintenance. Their condition and performance, in all seasons, is critical to Wessex Water's ability to supply our customers with wholesome drinking water.

Wessex Water's current assessment of the deployable output (DO) of its groundwater sources is 299 Ml/d (ann av.) and 337 Ml/d.[21]This compares with the licensed quantities from the same sources, of 394 Ml/d (ann av.) and 536 Ml/d (daily). There is, at least a theoretical 'gap' of 95 M/d (as ann. av) or 199 Ml/d (daily) between what we are allowed to abstract at present, and what we can abstract. The objective of this strategy is to ensure that that gap is properly understood, and where possible minimised by maximising DO at all our groundwater sources. This is critical in the context of Wessex Water losing licensed resource by 2035 to Habitat Regulation and Environmental Destination drivers.

[21] Source: wrmp24_licenceChangeScenarios file (from Chris Hutton) Copied from master file as 'values only' on 19/05/23.

The benefits of this work to the company include the minimisation of uncertainty around deployable output calculations, potential savings in capex due to reduced need for new resource development, opex savings in terms of reduced power gained through improved efficiency of borehole asset operation.

The cost of development and construction of the Bristol reservoir, a strategic surface water resource option that would deliver 20Ml/d as an annual average, has been recently estimated at £500million. Though this cost would be shared with Southwest Water, at £25million / megalitre, it illustrates the scale of expenditure that can be expected to replace existing groundwater resources where abstraction has been shown to be environmentally unsustainable.

A high level review of the 2022 licence usage information suggests modest improvements to outputs from our existing groundwater assets could produce anywhere from 5 to 15Ml/d of additional deployable output. Further investigative work is needed to quantify this figure and then take focused action to realise it. It is feasible that this additional DO could be achieved for the tenth of the capital cost of new schemes such as the Bristol reservoir.

The groundwater work is divided thematically into seven areas; Quantification, Monitoring, Protection, Operation, Maintenance, Development and Communications (Figure 31). These themes represent a flow from understanding how much groundwater we have available against how much we need, continuously measuring it, protecting it (quantity and quality), using it responsibly, keeping it available at minimal cost, increasing its supply when and where necessary and communicating its status (internally and externally).

Figure 31 Seven key strategic themes for Groundwater.

- **Quantification**

How much groundwater available for abstraction in all seasons. Includes understanding quality, quantity, licence, infrastructure and other hydrogeological limitations or constraints

- **Monitoring**

Effective, consistent, and reliable monitoring of the performance, quality and condition of our groundwater assets and their catchment areas. Critical to strategy.

- **Protection**

Activity, informed by monitoring, that protects quality and quantity of groundwater resources, including catchment management and source rehabilitation.

- **Operation**

Understanding how to operate groundwater sources (down to individual borehole and spring set scale) to optimise resources in all seasons while minimising cost and environmental impact.

- **Maintenance**

Risk based 25 year programme (including borehole replacement)

- **Development**

Identification, design and appraisal of new resources to meet current and future need

- **Comms**

Development of PR related material to 'surface' the issue of groundwater within WW and stakeholders

4.6.7. Quantification

Understanding how much groundwater is available for abstraction, both now and in the future, across the Wessex Water region is critical to annual supply operational management, and to strategic supply and operational planning, essentially for WRMP deployable output forecasting to better model yield under dry and annual average conditions.

Assessing our present and future supply / demand balance is the responsibility of the Water Resources team. Their decisions are strongly influenced by the Environmental Investigations team who develop hydrological / hydrogeological models and carry out environmental investigations to assess the impact of our abstractions on environmental receptors. They liaise with the Environment Agency (EA) in reviewing our abstraction licences under various regulatory drivers. The general picture here is of downward pressure on groundwater abstraction licences, with current estimates of deployable output reductions under central scenarios 53.69 Ml/d (Dry Year Annual Average) and 70.91 Ml/d (Dry Year Critical Peak) by 2035 and 60.13 Ml/d (DYAA) and 76.84 Ml/d (DYCP) by 2050. This quantification work is generally funded through the WINEP.

Providing accurate data to these assessments involves the collation and analysis of historic 'quantity' and 'quality' data on groundwater sources and individual boreholes (reports, pumping tests etc). Where available this provides baseline data on the performance of our sources. Current source performance and assessment of DO requires the collection and analysis of present 'operational' data in terms of borehole and source outputs, water levels and water quality. The aim here is to identify how or why current DO is constrained. This work, often either not done, or carried out by consultants in the past, will be the focus of the newly formed Raw Water Performance (RWP) team.

Understanding of future changes in climate (recharge), land use and abstraction licences for example, at both catchment and global level, is critical to the development of robust groundwater asset strategy. The nitrate modelling (Nmod20) falls into this theme as it seeks to understand limitations on yield due to nitrate trends. Teams across Wessex Water will be engaged in this process with significant contributions coming from Water Resources, Operations and RWP teams.

4.6.8. Monitoring

Accurate and continuous regional and catchment scale hydrometric data is required to feed into the quantification process. Important in this regard too, is operational water quantity and quality data that identifies any constraints to DO.

The operational water quantity and quality data (raw and treated, down to borehole and spring set scale) contributes significantly to many of the other themes such as protection, operation and maintenance. At source and borehole level, the data required includes operational borehole and source output data (including regular borehole yield and drawdown testing), operational groundwater level data, borehole condition monitoring (including regular downhole CCTV and geophysics) and ongoing water quality data. It is critical that data acquisition, analysis, reporting and storage is maintained at high levels of accuracy.

Assessment of pump performance is also critical, and effective monitoring here will inform the pump maintenance and management programme.

4.6.9. Protection

Use of the monitoring data allows definition of source protection issues. This is particularly important in the development and maintenance of catchment and source Drinking Water Safety Planning (DWSP) areas. Accurate risk scoring procedures based on the monitoring will identify and prioritise risks to water quality and quantity. Effective mitigation options can then be planned, whether through asset or nature-based intervention.

The catchment management work for nitrate, pesticides and nutrients described above fall into this theme. The aim here is move to much more predictive understanding of water quality threats.

The physical condition of our assets (boreholes, wells and springs) plays a significant role in protecting raw drinking water quality. Well maintained assets will minimise the pathways and therefore the likelihood of contamination of groundwater from the surface. It is important that these assets are protected based on a sound understanding of their condition and associate risks.

4.6.10. Operation

The way in which we operate our sources down to the individual assets (boreholes) through which we draw raw groundwater for drinking is important to understand. We have shown that abstraction rates and volumes can induce or avoid water quality issues. This is true of nitrate, pesticides and turbidity.

Detailed hydrogeological investigation of water quality issues and events will help in informing the business as to the optimum ways of operating each of our groundwater drinking water sources to reduce the risk of adverse water quality.

4.6.11. Maintenance

A robust and well-planned groundwater asset maintenance programme is critical to maximising and sustaining source deployable outputs up to licensed quantities.

This programme will be guided by the monitoring work. Depending on the aquifer type and the nature of the issue, maintenance will include cleaning (airlifting, scrubbing and chemical cleaning) and relining inside the existing casing. Complete replacement (new boreholes on existing sites with simultaneous backfilling of existing boreholes) will be required at a number of sites where the structure of the borehole is contributing to yield and quality reductions and is beyond reasonable repair. This is important as 60% of our supply boreholes that are in service are older than 50 years, and 30% are older than 70 years. Age is only one metric of condition, and it is important to understand the rates of deterioration including yield, efficiency and quality associated with each of these assets

It should also be noted that that all of our boreholes are lined with bitumen coated mild steel casings. This is no longer an automatically approved material for drinking water assets, with stainless steel becoming the favoured material for lining boreholes. While there is no indication that DWI will apply this retrospectively, over time there will be a requirement to replace these assets with stainless steel lined boreholes.

4.6.12. Development

Wessex Water is predicted to lose approximately 54 Ml/d of licensed deployable output from groundwater by 2035 in response to various environmental drivers (Habitats Directive, Water Framework Directive and Environmental Destination). The majority of these losses will be from 10 – 11 groundwater sources. The options for backfilling the deficit include the development of some groundwater options. While the investigations for these options will be funded from a separate area, it is important to identify this element of the groundwater asset strategy here for context. It also underlines the need to ensure that the deployable outputs of all our remaining groundwater assets are maximised.

4.6.13. Communications

There remains concern that at many levels groundwater is a misunderstood resource. This has led to the contamination of groundwater from both permitted and non-permitted sources (out of sight, out of mind, but also out of view in regulatory terms). It has to its over exploitation in some areas, leading to significant environmental damage, while in other areas it is beginning to be recognised that it has perhaps been under-exploited, leading to significant loss of DO where the evidence of impact does not support that outcome.

It is necessary therefore to develop effective communications to educate customers, operators, potential polluters, regulators, and policy makers on the true status of groundwater in terms of quality, quantity, environmental significance, and development potential across our region.

4.6.14. Costs

The costs presented in this section of the business plan relate to all of the themes set out above with the majority of costs around monitoring and maintenance of our groundwater water assets. The selected cost profile is set out in Table 53 below.

This represents a significant uplift on previous spend due to the recognition in AMP7 that many of our boreholes need ‘deeper’ interventions than simply scrubbing and airlifting to overcome long standing issues that affect deployable output and borehole structural competence. This is critical given the levels of deployable output that we stand to lose in forthcoming years due to environmental pressures.

It is also clear that in order to fully understand the constraints on DO at particular sites, more in depth monitoring and surveillance tools and techniques are required. As our borehole stock increases in age, there is a need to review the need to replace boreholes that are at the end of their design life and where rehabilitation will no longer be effective in yield and/or quality recovery.

Table 52 AMP8 Groundwater Costs.

	2025/26	2026/27	2027/28	2028/29	2029/30	Total
Groundwater (boreholes & springs) Costs (£m)	1.39	1.39	1.39	1.39	1.39	6.95

4.6.15. Conclusions

Our AMP8 plan is for a significant increase in expenditure in this area as we have an ageing borehole asset stock with low levels of expenditure here in the past.

Our operational monitoring of borehole and spring performance needs to be upgraded so that we can understand the behaviour of our assets under a range of hydrogeological conditions (low and high groundwater levels). For this reason, additional borehole monitoring and testing is required (step testing, yield versus quality performance).

Given the condition of many of our supply boreholes there will be a need to invest in 'deeper' levels of rehabilitation (as opposed to simple scrubbing and airlifting) and will also require the replacement of a number of boreholes that have reached the point where effective rehabilitation is no longer an acceptable option.

We are due to lose significant quantities of licensed deployable output over the next 10 – 30 years

The value of existing licensed water is growing significantly due to the emerging costs of delivery of new resources (£25million/Ml for Bristol reservoir SRO) and through the review of the 2022 drought. During this period, Wessex Water was able to maintain drinking water supply due to its groundwater assets and resources. Our surface water resource reached near historic low level (31% September 2022).

Investment in maximising our existing licensed deployable output is necessary and cost effective given the cost of new resource development. In addition, groundwater on average is four times cheaper than surface water.

4.7. Catchment delivery for drinking water compliance

4.7.1. Catchment delivery for drinking water compliance

Table 53 Summary of catchment delivery.

Summary of Catchment delivery for drinking water compliance	
Brief description	Active catchment management at groundwater and surface reservoir sources to deal with nitrates, pesticides and nutrients, which pose a threat to drinking water compliance. Customer campaigns around domestic oil storage and septic tanks and risk assessments for PFAS compounds are also included in this portfolio.
Business plan table lines	
AMP8 TOTEX value	£12.98 million
Need for investment	Some of these investments are a statutory obligation included in the WINEP for which the EA have confirmed the need. Customer research shows that environmental improvements are a priority for customers. The Wessex Water Partnership have been consulted about the investment programme. Other schemes (continuation schemes) are required to maintain the improvements already achieved through catchment approaches
Management control	The need for the programme is driven by factors outside management control i.e., through the WINEP, and through the activity of 3rd parties within our drinking water catchments. All reasonable steps have been taken to control the cost: · we have investigated impacts to ensure that there is a sound scientific basis for a mitigation measure · we have had extensive discussions with the Environment Agency over need and timing.

Best option for customers	A range of options has been evaluated to maintain drinking water compliance, including: · catchment management · blending flows from other water treatment works (WTWs) with lower nitrate concentrations · asset solutions at WTWs. Our proposed solutions are the best value for customers.
Robust and efficient costs	Section 8 of the main business plan narrative describes how we have ensured our proposals are efficient across all the price controls, as well as explaining how we estimate efficient costs for new projects. Supporting document 8.11 provides more detail. Through external benchmarking we have demonstrated that our cost estimates are efficient and competitive compared with the marketplace.
Customer protection	Customers will be protected if the investment is cancelled, delayed or reduced in scope through the following performance commitment and its ODI: · E7: Working with catchment partners to improve natural capital.

4.7.2. Need for investment

Raw water quality deterioration is a considerable risk to our operational resilience, from both a quality and quantity perspective.

In supply forecasting there is a tendency to make implicit assumptions that the assets that generate water into our distribution network are fully resilient and never fail, or that the design parameters and tolerances they operate to never need to change. If subsequently, due to raw water deterioration, the source water quality were to fall outside of the original design parameters then this would mean the water could no longer be treated to the required standards and therefore the source could not be used.

Raw water quality is likely to experience further deterioration as a result of climate change and more frequent extreme weather events. The specific parameters that might be affected are difficult to predict but agro-chemicals (pesticides and nutrients) and turbidity would be obvious ones.

Our recently established Raw Water Performance Team brings together agricultural advisers working on catchment management in our drinking water source catchments (groundwater and surface water sources), the Catchment Drinking Water Safety Planning (DWSP) team and Hydrogeology team to assess and manage catchment and source risks to raw water quality. This team monitors catchment activity and spring and borehole performance and condition, as well as water quality issues in our surface reservoirs, and when necessary, will intervene to remove or reduce risk issues. The catchment advisers engage with farmers and landowners, providing advice and training and where appropriate financial support, as well as the Environment Agency, to ensure at least compliance with agricultural regulations and beyond if possible. The hydrogeologists monitor the quality and deployable output of our source assets (borehole, wells and springs) to diagnose water quality and quantity issues and recommend, design and supervise effective remedial action.

Our operational scientists continually review raw water data and trends to identify any changes and respond accordingly, to protect treated water quality. Our Catchment team activities are key in the protection of raw water quality, and they continue to engage with stakeholders to educate and improve practices.

Agriculturally derived nitrate and pesticides represent a real threat to drinking water quality compliance in the Wessex Water region. The drinking water compliance levels for nitrates and pesticides are 11.3mgN/l and 0.1µg/l respectively. Our preferred method of dealing with nitrates and pesticides is through catchment management, reducing the problems at their source by engaging with catchment farmers.

The objective of the Raw Water Protection Team is to maximise the licensed, deployable output of all of our sources (groundwater and surface water), or at least to minimise the uncertainty around deployable output calculations. This is because many of our abstraction licences are under investigation from Habitats Directive and Environmental Destination drivers and we are likely to lose significant licensed deployable output as early as 2035.

Table 54 Catchment Management AMP8 Costs.

	2025/26	2026/27	2027/28	2028/29	2029/30	Total
WINEP (£m)	2.165	2.165	2.165	2.165	2.165	10.825
Non-WINEP (£m)	0.432	0.432	0.432	0.432	0.432	2.160
Total (£m)	**2.597**	**2.597**	**2.597**	**2.597**	**2.597**	**12.985**

4.7.3. Catchment Management

Catchment management has been a key feature of our raw water quality management since the early 2000s. From tackling pesticides and nitrate in groundwater to dealing with metaldehyde and other pesticides in our surface water sources, the success of our experienced, in-house catchment management team has largely avoided the need for additional treatment. The work involves engaging proactively with catchment farmers, providing advice and education on the potential impacts of agriculture on ground and surface water quality. Where appropriate, financial support is offered to help farmers implement mitigation measures or make changes to their farm business that will minimise the risk of their activity on raw water quality. At present we are working actively at 19 groundwater sources for nitrate, three groundwater sites for pesticides and five surface reservoirs to tackle pesticides, nutrients and sediment.

We will continue to work closely with the Environment Agency to ensure that farmers understand their responsibilities within our source protection zones. The Environment Agency are also custodians of Safeguard Zones (SGZs) that have been designated around our drinking water sources (originally under EU Water Framework Directive now translated to Water Framework Regulations in UK law). The EA are committed to increasing their resources to allow them to regulate agriculture effectively in these zones. Wessex Water will continue to assist farmers to fulfil their obligations as we work towards minimising our own environmental footprint.

Catchment management proposals for PR24 include the continuation of work at the 19 existing sources for nitrates. 11 of these sources have been identified by modelling and trend analysis as higher risk nitrate sources. An 'enhanced' catchment approach described above, with additional support from the EA, is proposed.

Table 55 Enhanced Catchment Management WINEP Investigations.

Primary WINEP driver code	WINEP Action ID	Action name	Number of WINEP actions	Completion date
DrWPA-Inv	08WW100052a	WxW_SS9 SGZ enhanced CM	1	31/03/2030
DrWPA-Inv	08WW100074a	WxW_SS33 SGZ enhanced CM	1	31/03/2030
DrWPA-Inv	08WW100075a	WxW_SS46 SGZ enhanced CM	1	31/03/2030
DrWPA-Inv	08WW100076a	WxW_SS49 SGZ enhanced CM	1	31/03/2030
DrWPA-Inv	08WW100077a	WxW_SS57 SGZ enhanced CM	1	31/03/2030
DrWPA-Inv	08WW100078a	WxW_SS61 SGZ enhanced CM	1	31/03/2030
DrWPA-Inv	08WW100079a	WxW_SS93 SGZ enhanced CM	1	31/03/2030
DrWPA-Inv	08WW100080a	WxW_SS132 SGZ enhanced CM	1	31/03/2030
DrWPA-Inv	08WW100081a	WxW_SS126 SGZ enhanced CM	1	31/03/2030
DrWPA-Inv	08WW100082a	WxW_SS125 SGZ enhanced CM	1	31/03/2030

Catchment work in all of our surface reservoir catchments is proposed for PR24, this will continue to focus on pesticides, sediment and nutrients. The objective is to develop our ability to predict type and timing of potential pollutions (particularly from agri-chemicals) more effectively.

Customer campaigns for domestic oil storage and septic tanks within our sources source protection zones (SPZ) are proposed. Leakage of oil from these private systems has the potential to shut down a source and cause significant cost and hardship to the householder.

Table 56 Customer Campaign for Domestic Oil WINEP implementation.

Primary WINEP driver code	WINEP Action ID	Action name	Number of WINEP actions	Completion date
DrWPA-Imp	08WW100057a	Domestic Oil Storage Customer Campaign – North West Somerset / Quantock reservoirs	1	31/03/2030
DrWPA-Imp	08WW100057b	Domestic Oil Storage Customer Campaign - Bridgwater reservoir	1	31/03/2030
DrWPA-Imp	08WW100057c	Domestic Oil Storage Customer Campaign – Exebridge reservoir	1	31/03/2030

4.7.4. Pesticides

Pesticides are usually an issue in surface water sources, but we also see them in groundwater sources with strong surface to groundwater connectivity. The types of pesticides that are seen in raw water depend on the cropping types within the catchment, and the chemical stability of the pesticide in water.

We know that we can control pesticides through active catchment engagement, as demonstrated in these examples:

- Metaldehyde, banned in 2020, was very stable in water and very difficult to remove through standard treatment. It was detected at significant levels in some of our reservoirs. The solution was to educate the catchment farmers and offer them a subsidy to switch from metaldehyde to an alternative slug pellet. This action helped us to remove metaldehyde from our vulnerable catchments long before it was banned.
- In one groundwater catchment we have worked with the farmers to develop a list of low dosage, low mobility pesticides to which they are restricted.
- In another case, with the cooperation of the Environment Agency we have persuaded farmers not to use bentazone, a long-lasting pesticide whose appearance in groundwater at our source led to the removal of a borehole from supply. Figure 32 highlights the impact of a bentazone application two years prior to its appearance at Upton Scudamore groundwater source, and the movement of the peak through the aquifer rising and then reducing as further application of bentazone were prevented by our catchment approach.

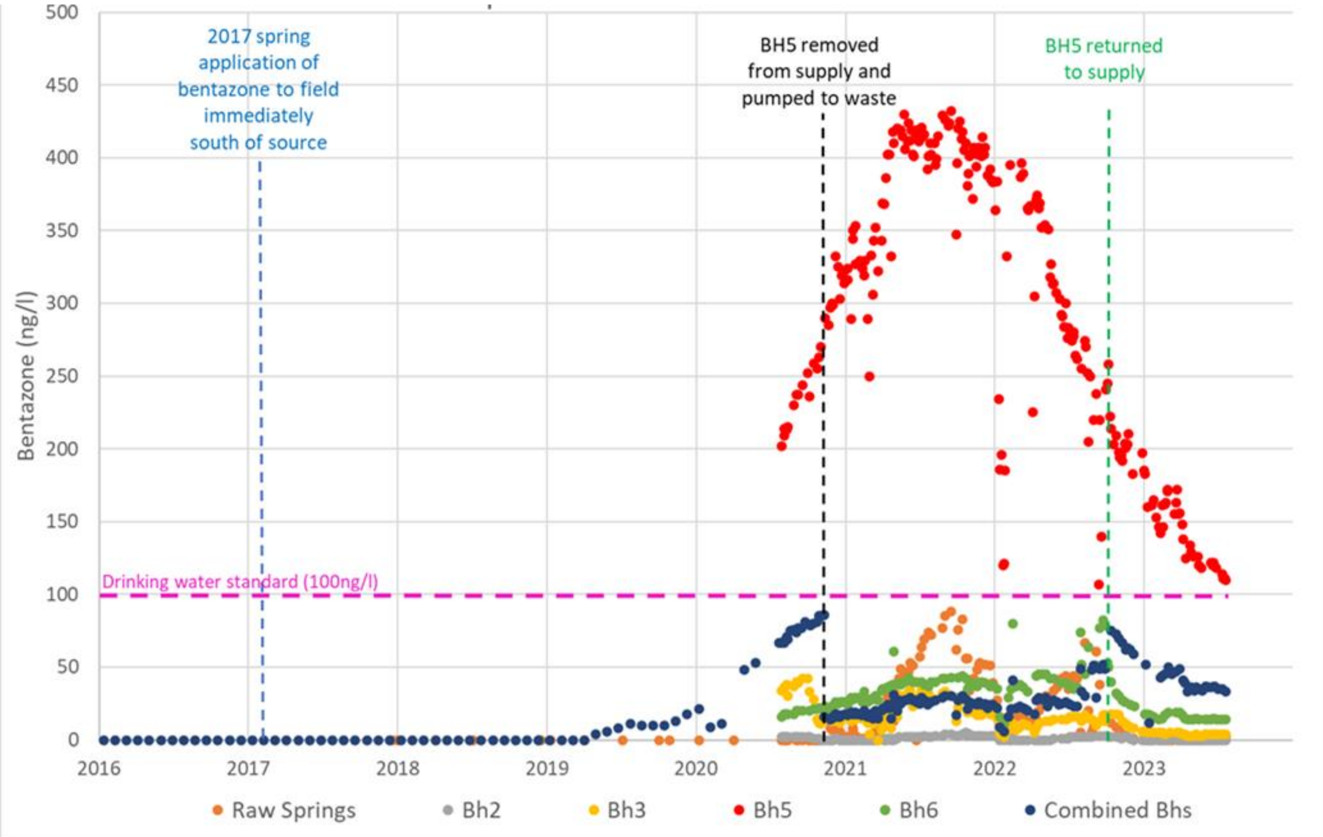
Our pesticide specialist will continue to work closely with farmers, academics and agri-chemical companies to understand pesticide usage trends to better predict when problems may occur on a catchment by catchment basis. This work has avoided the need for any additional treatment to remove pesticides in recent years and we anticipate that this will continue going forwards. Under PR24 our focus is to develop our ability to predict, rather than react to, potential pesticide issues along with developing trends in land use and cropping across our region.

Our pesticide work will continue in our three most vulnerable catchments (North West Somerset, Bridgwater and Exebridge) and the River Tone catchment. In addition, ongoing catchment work in the groundwater catchment of WxW_SS61 source, a particularly vulnerable groundwater catchment, will seek to provide greater resource resilience through better control of pesticide use and management in the catchment. A source in Chippenham is another groundwater source that has been recently impacted by pesticides. Catchment and hydrogeological data analysis has helped to identify a management approach including level and flow triggers. More work is required to determine source and pathway elements to this issue.

Other parameters, which have proved problematic at a number of sites, such as bentazone, carbetamide and propyzamide, will be carefully monitored both in terms of their catchment use and their occurrence in raw water quality samples. Greater involvement by the Environment Agency as they recruit more agricultural advisers will help in this process. Bespoke action will be taken by both Wessex Water and the EA in response to any issues arising.

All of our surface water reservoirs have Granular Activated Carbon (GAC) treatment on site, and this provides a robust line of defence should pesticides from the catchment contaminate the reservoir. Many of those pesticides which are more difficult to remove through GAC are facing regulatory restriction or even removal from use, but while the risk remains, we will continue our catchment management and monitoring approach to help mitigate these risks.

Figure 32 Bentazone contamination at WxW_SS141 groundwater source.



4.7.5. Nitrates

Nitrate concentrations in groundwater from historical and recent agricultural activity continue to present a significant water quality risk.

Catchment management forms a fundamental part of our source to tap approach to managing nitrates in water supplies. Much progress has been made by the catchment delivery team since work started at four sources in 2005 and the team has been successful in managing nitrate risks in many sources. Where catchment management alone has not resulted in significant enough reduction in nitrate concentrations, we have instigated source substitution and/or blending solutions, with treatment solutions only considered as a last resort.

Detailed nitrate trend modelling across Wessex Water's sources, previously undertaken in 2013, was reviewed in 2020/21. Some issues were identified that meant that some sources were not modelled as accurately as others. As a result, the model was updated to ensure that all the models were as robust as possible. The revised 2020/21 modelling suggested that at some sources where the trend was previously shown to be stabilising, nitrate concentrations were still rising, or only just peaking. As a result of these findings, we are committing to reviewing and undertaking nitrate modelling for all sources on a biannual basis, to better inform the future risk profile and predict the potential future interventions that may be required to mitigate the risk.

The latest modelling data has led us to propose the installation of ion exchange treatment at one strategic site, as all other avenues have been exhausted and the revised modelling data suggests concentrations may not have peaked and will subsequently not start reducing for a significant period. A summary of the nitrate modelling approach is provided in section 9.1 of Appendix B of our PR24 drinking water quality submission to the Drinking Water Inspectorate (March 2023).

Enhanced catchment management is being proposed at eleven high risk sources for 2025-2030 to attempt to influence the nitrate trends. Whilst this might not be enough to remove the need for treatment, the aim of it is to minimise the level of treatment required. The continuation of catchment management, similar to previous engagement levels, is proposed at a further seven groundwater catchments to maintain the downward pressure on the nitrate trends at these sources. These approaches are summarised in Figure 33 below.

Figure 33 Proposed AMP8 nitrate catchment management strategy summary.

The ongoing modelling work, which will see the nitrate model reviewed and updated every 2 years, and observed sample data will be used to inform the need for enhanced catchment management or for capital schemes such as blending or nitrate removal at other high-risk sources. Our current DWSP nitrate risk matrix incorporates likelihood of breaches further ahead than our standard 10-year matrix.

The impacts of climate change on agricultural practice and recharge patterns will be carefully monitored. Cropping patterns may change as a result of wetter winters and drier summers, and the potential changes to groundwater recharge patterns may affect the timing of nitrate peaks.

Our farmer engagement approaches build on relationships that we have established with catchment farmers during the past 20 years. This varies between one-to-one engagement of farmers by our catchment advisers to farmer meetings and on-line connection through our website. As part of this engagement, we have trialled several payment mechanisms including one-to-one negotiation, online auctions and online schemes which set out our offer of financial support for specific measures and invite farmers to apply online. These approaches will continue and develop in the light of new legislation and regulatory pressure on farmers. These may result in catchment farmers being obligated to change their behaviour to meet environmental targets which may in turn limit or enhance our requirement and/or ability to fund nitrate loss reduction measures.

We will continue to work closely with the Environment Agency to ensure that farmers understand their responsibilities within our source protection zones. The Environment Agency are also custodians of Safeguard Zones (SGZs) that have been designated around our drinking water sources (originally under EU Water Framework Directive now translated to Water Framework Regulations in UK law). The EA are committed to increasing their resources to allow them to regulate agriculture effectively in these zones. Wessex Water will continue to assist farmers to fulfil their obligations as we work towards minimising our own environmental footprint.

A review of the SGZs, and the Action Plans associated with them is required. Some of the existing SGZ's designated for nitrate have shown reducing nitrate trends to the extent that they may be candidates for de-designation (e.g. Hooke Springs). Other SGZs need to have parameters such as metaldehyde (now banned) removed from their designation. These amendments will require close liaison with the EA as custodians.

Two 'types' of catchment management are described above. 'Continuation' catchment management proposals for PR24 include those sites where nitrate has been a significant issue in the past, but the trend has stabilised or is reducing. Here we propose to continue catchment management at the same level or reduced, to maintain the benefits already achieved and to make sure the trends don't bounce back over the next 7 years. 'Enhanced' catchment management is proposed for sites where, despite existing catchment interventions, the nitrate trends and/or peaks remain stubbornly high. Here we have set out a revised approach that draws the Environment Agency in proactive regulation. The EA will write to all catchment farmers in the Safeguard zone, outlining their responsibilities and requiring them to quantify their average whole farm annual nitrate leaching levels using an approved tool (the EA's Nitrate Leching Tool is favoured). This will allow each farmer to understand where their leaching levels are against the catchment target loss (kgN/ha). If they are above this level, they will be obliged to produce a plan that will bring them down to the target within a realistic time frame. Wessex Water will work with the farmers and landowners to assist with completing the assessment tool, advice and finance where appropriate. This finance may include contributions to farm infrastructure improvements where other options are not available.

This 'enhanced' approach is being trialled at these catchments for the remaining two years or AMP7, and is proposed to continue into AMP8, running in parallel to additional treatment at the WTC.

4.7.6. PFAS

In March 2022, a DWI information letter (*IL 03/2022*) to the water companies set out our responsibilities in the risk assessment of so called PFAS compounds. This was followed by a second letter (*IL 02/2023*) in March 2023 which aimed to clarify the previous one. The risk assessment requirements for PFAS are wide ranging as the DWI requires the hydrogeological/hydrological risk assessment of all groundwater and surface water sources under the full range of water level conditions. The guidance requires water company strategies on PFAS to cover as a minimum, operational monitoring (that will extend upstream into the catchment), enhanced investigatory monitoring (risk based and under varying hydrological conditions), catchment characteristics/identification of PFAS sources, stakeholder engagement, operational measures (to be optimised as more data becomes available), research and development and regulatory mechanisms.

Our compliance team has developed a PFAS Drinking Water Safety Plan (DWSP) methodology (as per IL 03/2022) and an AMP8 PFAS strategy (as per IL 02/2023) which sets out our approach to quantifying and monitoring the risks. During 2022, we instructed a consultant, Arcadis to carry out an exemplar risk assessment on our groundwater source at WxW_SS31, where elevated PFAS had been detected. This risk assessment forms the basis of the catchment risk assessment work. This is explained in detail in Wessex Water's Drinking Water Safety Plan Methodology, Part F. DWSP001 Drinking Water Safety Plan Methodology.pdf

Our business plan includes enhancement costs for PFAS to include additional catchment surveys to investigate sources and pathways for PFAS compounds (especially in Tier 2 sources), risk assessments, as per DWSP process, of source, treatment, distribution and customer elements, significant additional water quality sampling for up to 47 PFAS compounds (including catchment investigatory sampling), verification of treatment options/processes, research and development and stakeholder engagement as per DWI guidance as shown below.

Table 57 PFAS investigation and risk assessment costs.

	2025/26	2026/27	2027/28	2028/29	2029/30	Total
PFAS investigation and risk assessment enhancement costs (£m)	0.2	0.2	0.2	0.2	0.2	1.0

4.7.7. Conclusions

Catchment management forms a significant part of Wessex Water's ambition to use nature-based solutions wherever they are appropriate to tackle water quality issues. Since 2005 when catchment management first started no additional nitrate or pesticide treatment has been required at any site. The approach to date has been based on effective engagement between experienced in-house agricultural experts (advisers) and catchment farmers and landowners. This engagement has been based on trust as Wessex Water has no regulatory power to impose conditions on catchment activity.

The work in nitrate sites has been largely effective but it is now clear that there are some sources where despite many years of catchment engagement, it has not been enough to reverse the rising nitrate trend. At these sites an 'enhanced' approach is proposed and is being trialled in AMP7 ✂. This approach, that will include the Environment Agency (EA) much more closely than in the past and allow Wessex Water to fund point sources (farm infrastructure) to a greater degree than in the past, means that costs of catchment management at these high-risk sites will increase considerably. Other factors that will affect cost include competition for nutrient credits from other buyers and farmers insistence that land-use restrictions imposed upon them will affect the capital value of their land.

Climate change is affecting the types of crops and the timing of sowing, harvesting and agri-chemical applications. As result, there is a need to much more flexible in terms of the scope, range and timing of offers that are made to farmers. There is a pressing need to move to a more predictive, proactive approach to pesticide management for example, with new chemistry being used and applied at more challenging times of year (e.g., Propyzamide on Oil Seed Rape, applied on cold, wet soils which are high risk periods for run off).

Other issues such as domestic oil storage need to be addressed as, though the likelihoods of spills are relatively low the consequences are high, both to the households in which the leak occurs, and to raw water quality. Customer campaigns on this issue and that of private septic tanks within source protection zones are felt to be a responsible and sustainable approach.

PFAS compounds have surfaces as a relatively new risk. The costs of sampling are high and onus on the water companies to understand and demonstrate risk is high. There are some indications that the drinking water compliance standards may reduce (in line with EU countries), making it more of an issue. The DWI is tying the risk assessment very closely to the catchment risk and this, as a result, becomes more critical.

Despite the clear need to invest at high risk sites, catchment approaches remain Wessex Water's preferred approach to tackling water quality issues.

5. Investment Summary

5.1. Overview

We are proposing a significant uplift in both enhancement and maintenance expenditure in AMP8 as summarised below and detailed in the preceding sections. This increase in expenditure primarily relates to WINEP and Water Resources Management Plan drivers. Expenditure in AMP9 is uncertain related to uncertainty in our adaptive plan for water resources and depends on outcomes of the WINEP investigations in particular as to the scale of need required, and therefore additional investment required to meet 2035 need.

Table 58 High level expenditure summary.

Water Resources price control	AMP7	AMP8
Enhancement (£m)	17.9	112.0
Base maintenance (£m)	12.0	20.7
Total (£m)	29.9	132.7