Our final plan

Our Drainage and Wastewater Management Plan 2025-2050

The Plan

May 2023

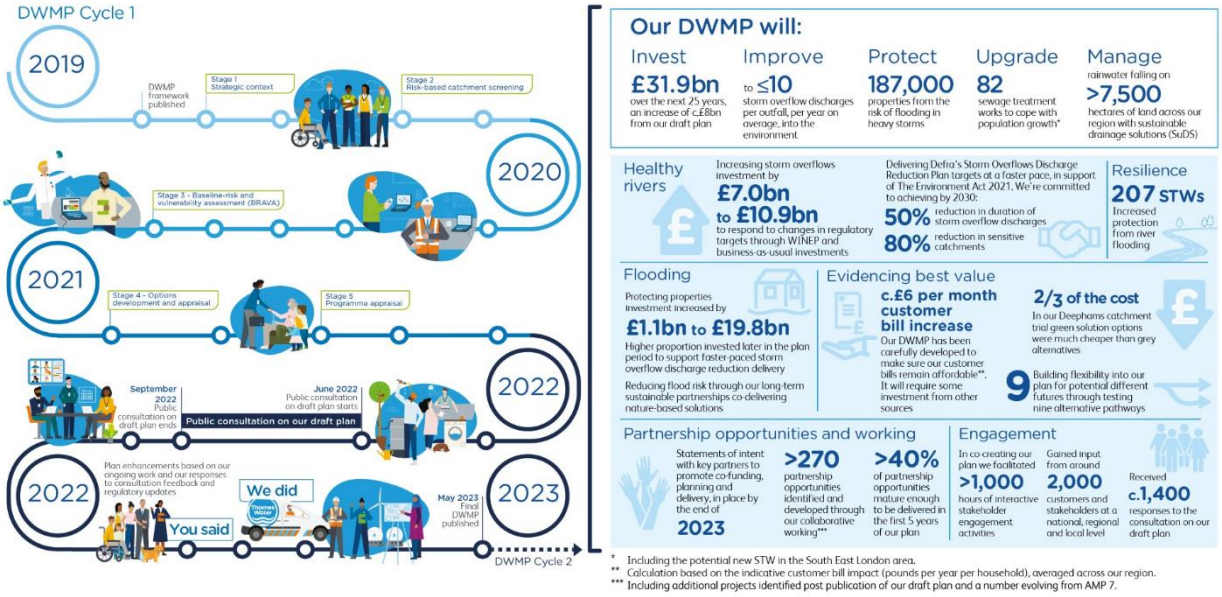
Contents

Figures

Tables

Preface

We're proud to present our first Drainage and Wastewater Management Plan (DWMP) and encouraged by the level of positive feedback we've received. Over the last four years, we've engaged and worked collaboratively with around 2,000 of our customers and stakeholders, to deepen our shared understanding and develop new ways to manage drainage and wastewater across our region. We illustrate our DWMP Cycle 1 and its headlines below.



We've progressed and enhanced our DWMP since we published it for public consultation in June 2022. We were pleased to receive lots of positive comments and support on the quality and ambition of our draft plan as well as useful ideas for making our final DWMP even stronger.

We've updated our draft plan based on our ongoing DWMP work, regulatory updates and our responses to the consultation feedback wherever possible*. Our updates include providing more detail where you felt it was needed and creating new appendices to answer technical queries. For more details on how we've progressed our final plan and responded to the consultation feedback, please see our Non-technical summary and You said, We did Technical appendix.

* Some public consultation feedback didn't require further action or wasn't relevant to the DWMP process. Other feedback was relevant to future DWMP planning cycles and will be used to inform this work.

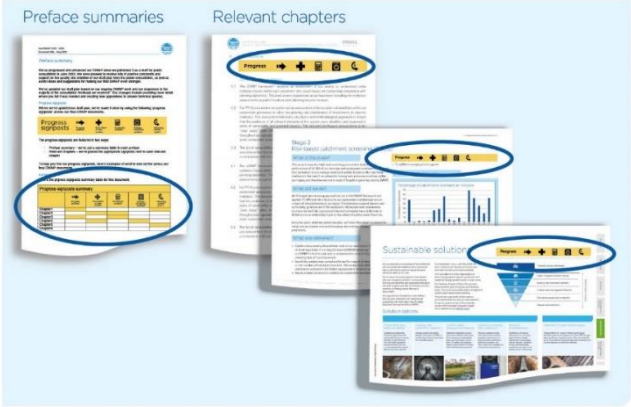
Progress signposts

We want to make it easy for you to see what's changed. You can spot all the places we've updated our draft plan with our 'progress signposts' which we've used across our final DWMP documents.

Here's where they'll be:

- Preface summaries – we've put a summary table in each document's preface (excluding Summary documents and CSPs)
- Relevant chapters – we've placed the appropriate signposts next to each relevant chapter (including Summary document and CSPs)

To help you find our progress signposts, here are examples of what to look out for:



Progress summary table

The progress signposts summary table for the chapters in this document is outlined below. We've used orange cells to indicate where our draft plan has been updated with progress.

Progress signposts summary: The Plan	Progress updated	More detail or new content	Number(s) updated	Delivery timeframe updated	Informing DWMP cycle 2
1 Introduction and background					
2 PART A: The impact of population growth and climate change					
3 PART B: What is the plan?					
4 PART C: The DWMP as an integral part of planning					
5 PART D: How we developed the Plan					
6 PART E: Next steps					

Key DWMP content

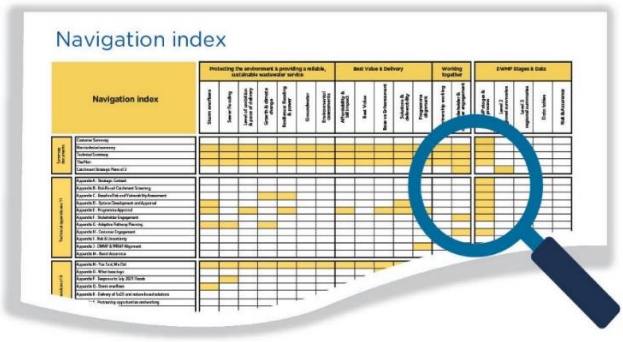
This document specifically includes the following key DWMP content:

- Protecting the environment and providing a reliable, sustainable wastewater service:
  - Storm overflows
  - Sewer flooding
  - Level of ambition & pace of delivery
  - Growth & climate change
  - Resilience: flooding & power
  - Groundwater
  - Environmental assessments

- Best Value and Delivery:
  - Affordability & bill impact
  - Best Value
  - Base vs Enhancement
  - Solutions & deliverability
  - Programme alignment
- Working together:
  - Partnership working
  - Stakeholder & customer engagement
- DWMP stages and data:
  - DWMP stages & process

Navigating our documents

To help you navigate around our final DWMP document suite and find where key DWMP content features, we've placed a Navigation index at the back of this document.



1 Introduction and Background

Progress

What is a Drainage and Wastewater Management Plan?

1.1 A Drainage and Wastewater Management Plan (DWMP) is a 'long-term strategic plan that will set out how wastewater systems, and the drainage networks that impact them, are to be extended, improved, and maintained to ensure they are robust and resilient to future pressures'[1]. The plan is over 25 years, 2025 to 2050. The DWMP will be renewed on a 5-year cycle with cycle 1 published in May 2023 (this release).

1.2 The DWMP follows a multi-step process that identifies the impact population growth and climate change will have on our systems and then develops a strategic-level investment plan for areas most affected. It provides a long term (25-year) view of investment to ensure that our systems remain resilient to future demands. It also informs medium term planning similar to the function of the Water Resources Management Plan (WRMP)[2] model.

1.3 The Thames Water vision for our DWMP is in Figure 1-1.

Figure 1-1: Our DWMP Vision

1.4 Our aim is **'To identify future catchment risks to our drainage and wastewater treatment systems and develop sustainable, efficient solutions to address them.'**

1.5 We released an unconstrained draft DWMP plan for public consultation over summer 2022. This plan was not restricted by financial or deliverability constraints. Consultation feedback has resulted in a change to a semi-constrained plan. The constraint is restricted to between 2025 and 2030 where we align the DWMP with the water industry Price Review process and the Water Industry National Environment Programme (WINEP).

1.6 A core principle of a successful DWMP is that it must be built through collaboration and working in partnership with other organisations and stakeholder groups. This is driven from

[1] https://www.water.org.uk/wp-content/uploads/2021/10/Working_Together_an_overview_of_Drainage_and_Wastewater_Management_Plans.pdf
[2] https://www.thameswater.co.uk/about-us/regulation/water-resources

the shared responsibilities for drainage and the expectation that pooled resources lead to improved efficiency and wider benefits.

1.7 DWMP is a major step-change in planning for the future, the last of which was arguably completed by Sir Joseph Bazalgette when he constructed the London sewer system in the 1800s. From this first iteration we believe the DWMP to be a game-changer in the water sector. It would not have been possible without regular, enthusiastic, creative, and challenging engagement from a wide range of regulators and stakeholders during the development process.

Our wastewater service region

1.8 We serve customers across London and the wider Thames Valley region. Figure 1-2 is a map showing the area we serve. Our wastewater service includes:

- Taking wastewater away from 15 million customers every day
- Maintaining and enhancing 68,000 miles (or 109,000 km) of sewer with 5,168 pumping stations and 1.77 million manholes
- Treating 4,600 million litres of wastewater at 354 treatment works that discharge treated effluent to local rivers

Figure 1-2: Our wastewater region

1.9 We have a great responsibility to provide wastewater services to so many customers and such an iconic capital city. We also value the environment, especially the rivers that pass through our area, and want to see them improve and thrive.

1.10 To continue providing this service and meet the demands of the future we need a DWMP that faces the challenges head on and improves our service to customers and the environment.

1.11 Key challenges in delivering this service are:

- **Population growth:** We expect the population in our region to grow by more than 2 million people by 2045. That is the same as the entire population of Birmingham and Leeds.
- **Climate change:** We already see impacts from climate change, and these are forecast to increase, with more extreme weather expected. This includes droughts, heatwaves and summer rainstorms becoming up to 20% more extreme[3].
- **Loss of green space:** We are continually losing green and permeable areas to housing, transport infrastructure, and many other uses This means that more rainwater cannot soak into the ground, and it runs into sewers and rivers more quickly, increasing the risk of flooding.
- **An environment in need:** Of the 501 waterbodies in the river Thames basin, 94% are at less than good ecological status[4]. 32% of the reasons for not achieving good status are down to water company activities, the remainder are principally attributed to activities such as urban and transport, and agricultural and rural land management.

Alignment to our corporate 2050 Vision

1.12 In March 2021 we launched our 8-year turnaround Plan. The Plan will:

- Fix the basics – ensure our core service works for customers and the environment
- Raise the bar – doing everything better
- Shape the future – set us up to provide our services reliably and efficiently into the future

1.13 The first two elements of this plan will drive continuous improvement as well as improve our understanding of asset performance and risk. They are focussed on the short and medium term.

1.14 In 'shaping the future' we want to be confident that we make the right decisions today to future-proof the wastewater service for generations to come. The DWMP, through its application of Adaptive Planning[5], is key to ensuring that decisions made now will leave a legacy that we can be proud of.

1.15 To make sound decisions today we need clarity in our long-term goal. We have therefore used our Vision 2050 to understand what the future may look like. Visions are by nature aspirational. This aligns well with our DWMP, which, following stakeholder feedback is constrained in the first five years and unconstrained thereafter. Overall, this is a semi-constrained plan.

[3] Betts, R.A. and Brown, K.(2021) Introduction. In: The Third UK ClimateChange Risk Assessment Technical Report [Betts, R.A.,Haward, A.B. and Pearson, K.V.(eds.)]. Prepared for the Climate Change Committee, London

[4] Thames Water - River Health Plan (2022): https://www.thameswater.co.uk/about-us/performance/river-health/investing-in-river-health

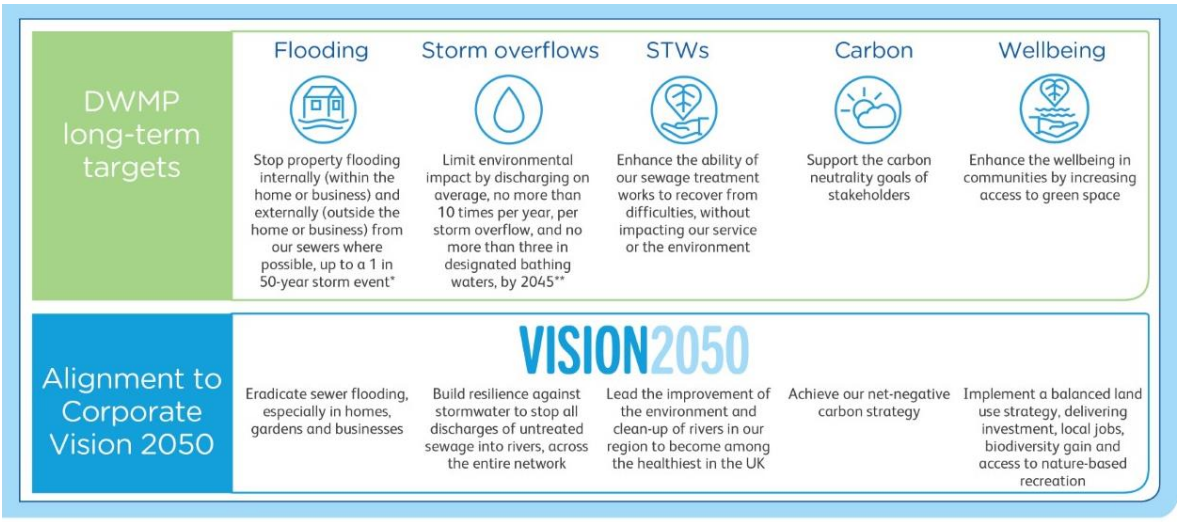
[5] Adaptive Planning explained in detail in our Technical Appendix on Adaptive Planning: https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-g-adaptive-pathway-planning.pdf

1.16 Vision 2050 has five key themes; they are outlined in Figure 1-3. Many of these key themes are similar to the DWMP guiding principles.

Figure 1-3: Key themes of our corporate 2050 vision

1.17 Our DWMP directly contributes to the 'Waste and Rivers' and 'Community' themes. Storm overflows and sewer flooding are comprehensively addressed in the DWMP and will form a cornerstone of improving river health. Due to an extensive sustainable drainage[6] component in our plan, communities will also benefit from new green spaces.

1.18 Figure 1-4 demonstrates the relationship between our DWMP planning objectives and Vision 2050.



* This is a measure of how well our drainage systems can cope in extremely wet weather. The risk of sewer flooding in a 1 in 50-year storm is defined as the likelihood that flooding will occur as a result of rainfall in a storm that has a 1 in 50 (or 2%) probability of happening in any given year.
** Our sewers are designed to overflow to the environment to prevent homes and businesses from flooding. However, storm discharges that happen too often, or for too long, can impact the environment.

Figure 1-4: Relationship between our corporate 2050 vision and our DWMP

[6] For more information on what sustainable drainage is, please refer to our Technical Appendix on delivery of sustainable drainage and nature-based solutions. https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-r-delivery-of-suds-and-nature-based-solutions.pdf

DWMP guiding principles

1.19 In February 2022 the UK and Welsh Governments and the environmental and economic regulators (Natural Resources Wales, Environment Agency and Ofwat) outlined their priorities and expectations for the DWMP in the form of Guiding Principles[7]. These are illustrated in Figure 1-5. The principles give us clarity on scope and a beneficial structure to help develop, deliver and judge the quality of our DWMP in this first cycle. This DWMP is non-statutory while future revisions will be statutory.

Figure 1-5: DWMP Guiding Principles (February 2022)

1.20 The key guiding principles require us to:

- Be comprehensive, evidence based and transparent in assessing, as far as possible, current capacity and actions needed in 5, 10 and minimum 25-year periods considering risks and issues such as climate change. Plans should also align, as far as possible, with other strategic and policy planning tools
- Strive to deliver resilient systems - that will meet operational and other pressures and minimise system failures
- Consider the impact of drainage systems on immediate and wider environmental outcomes including habitats and in developing options for mitigation to include consideration of environmental net gain and enhancement
- Be collaborative - recognising the importance of sectors working together to consider current and future risks and needs and to deliver effective solutions, setting out how they will do this, how they have engaged with and responded to stakeholders
- Show leadership - in considering the big picture for an organisation's operational capacity to develop and deliver the plan, and mindful of linkages with other strategic planning frameworks
- Improve customer outcomes and awareness and that solutions and actions provide both value for money and consider societal benefits

1.21 We have applied these Guiding Principles throughout the process of developing the DWMP. Part D (Section 5) of this document details how we have developed and produced the plan to meet these principles. Compliance of our DWMP with the guiding principles can be found in Technical Appendix M Board Assurance Statement[8] with further evidence tabulated in Annex A.

[7] https://www.gov.uk/government/publications/drainage-and-wastewater-management-plans-guiding-principles-for-the-water-industry/guiding-principles-for-drainage-and-wastewater-management-plans
[8] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-m-board- assurance - statement.pdf

1.22 The guiding principles further require us to use a best value framework. Such a framework allows us to build a plan that is best for customers and the environment. How we have done this can be found in 1.33 as well as our Technical Appendices on Options Development Appraisal[9] and Programme Appraisal[10].

The DWMP planning framework

1.23 DWMPs are region specific as they are developed by different companies. Regulators and national government require water companies to adopt a consistent approach when carrying out long term planning, especially to inform the National Infrastructure Assessment (delivered by the National Infrastructure Commission). The first assessment was published in July 2018[11] with a refresh expected in autumn 2023.

1.24 To ensure a consistent approach is taken across the UK, a framework was commissioned by Water UK[12] in collaboration with:

- Defra
- Welsh Government
- Ofwat
- Environment Agency
- Natural Resources Wales
- Consumer Council for Water
- Association of Directors of Environment, Economy, Planning and Transport (ADEPT)
- Blueprint for Water

1.25 The framework[13] was first published in September 2018 with revisions in May 2019, September 2019, and September 2021. It consists of a main document, five appendices and a stakeholder guide. This is a framework and not a methodology, which allows us flexibility in our approach and opportunity to innovate.

1.26 The framework consists of 5 main stages (see also Figure 1-6):

- Stage 1: Strategic Context
- Stage 2: Risk Based Catchment Screening
- Stage 3: Baseline risk and vulnerability assessment
- Stage 4: Options Development Appraisal
- Stage 5: Programme Appraisal

[9] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-d-options-development-and-appraisal.pdf
[10] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-e-programme-appraisal.pdf
[11] https://nic.org.uk/app/uploads/CCS001_CCS0618917350-001_NIC-NIA_Accessible-1.pdf
[12] Water UK is a membership body representing the Water Industry. https://www.water.org.uk/about-us/
[13] https://www.water.org.uk/policy-topics/managing-sewage-and-drainage/drainage-and-wastewater-management-plans/

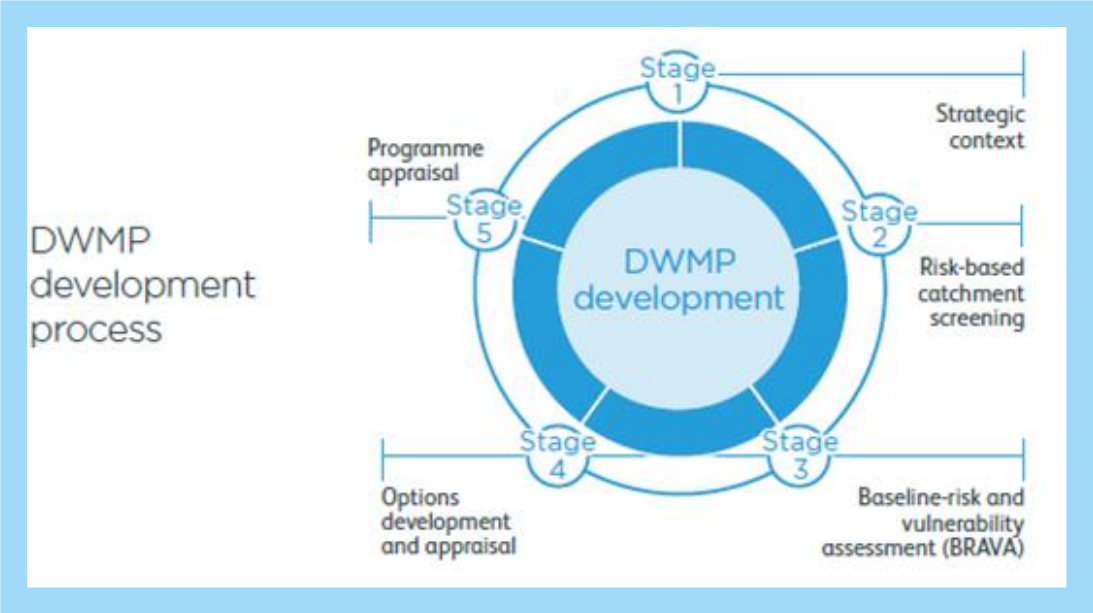


Figure 1-6: The five stages undertaken in a DWMP

1.27 Following completion of stage 5 we released our draft DWMP for public consultation. The comments received from regulators, stakeholders, and customers together with the new requirements on storm overflows were so extensive that we repeated parts of Stage 4 and fully repeated Stage 5 to yield the final DWMP presented in this document.

1.28 Figure demonstrates the calendar years and DWMP stages as we undertook them for cycle 1.

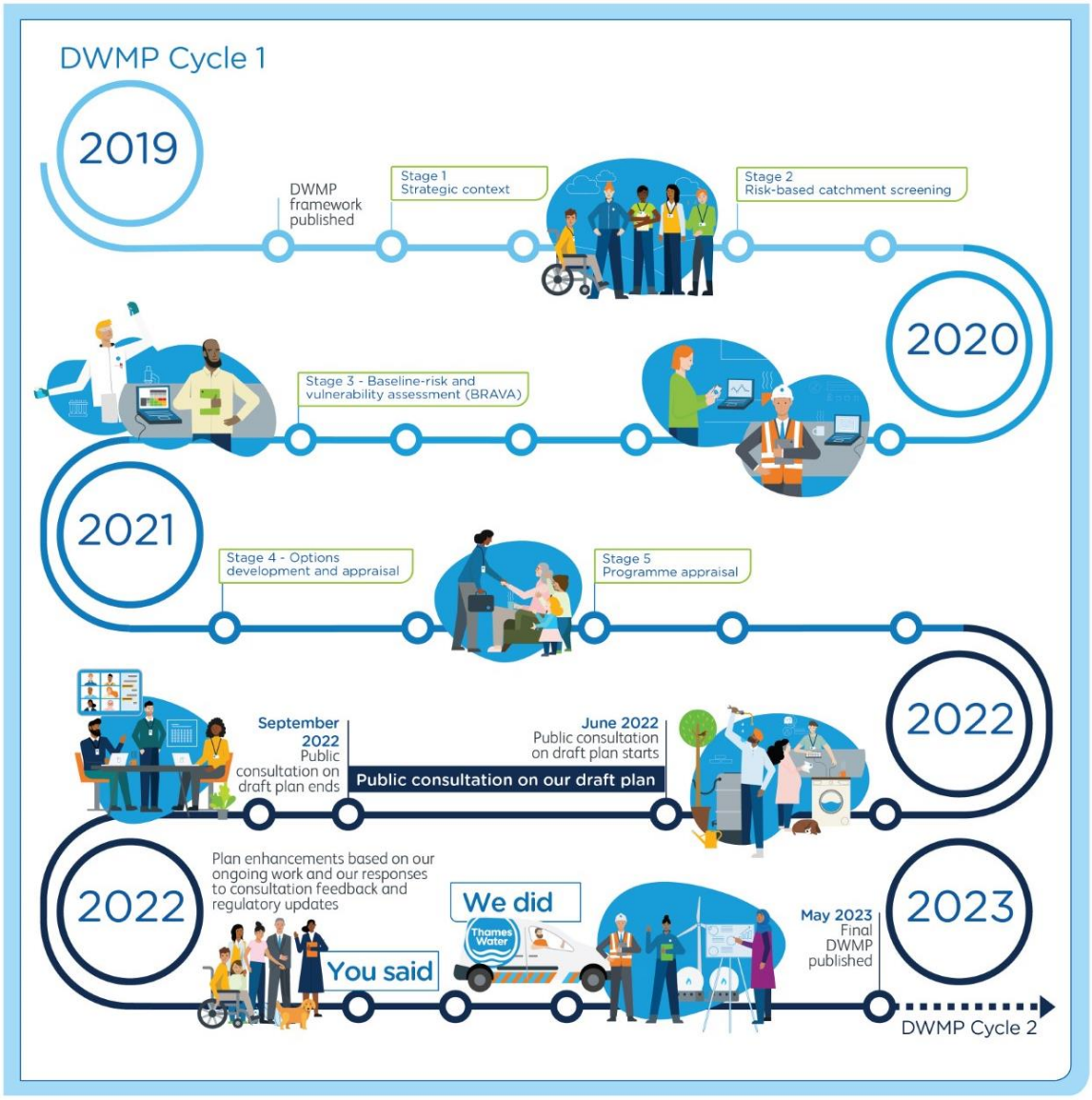


Figure 1-7: Timeline of the DWMP stages

Geographical Structure of the DWMP

1.29 We selected a four-tier geographical structure for our DWMP. These are shown in Figure 1-8. The levels are as follows:

- Level 1 is our company region. For the plan outputs we have also provided a split between Thames Valley and London
- Level 2 consists of thirteen Thames Regional Flooding and Coastal Committee (TRFCC) partnerships
- Level 3 is the 382 tactical planning catchments
- Level 4 called 'Risk Zones' was only used in London. This was due to the large catchments and a need for decision making to be more granular than at catchment level. Within London, the L3 is larger than the L2 due to the large catchments and political boundaries of the TRFCC partnerships.

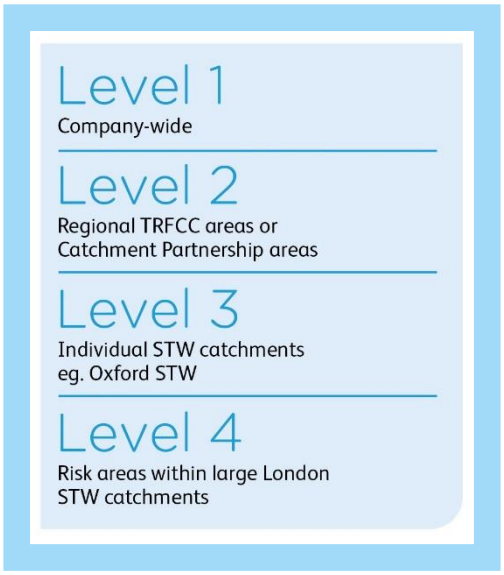


Figure 1-8: The different geographical levels in our DWMP

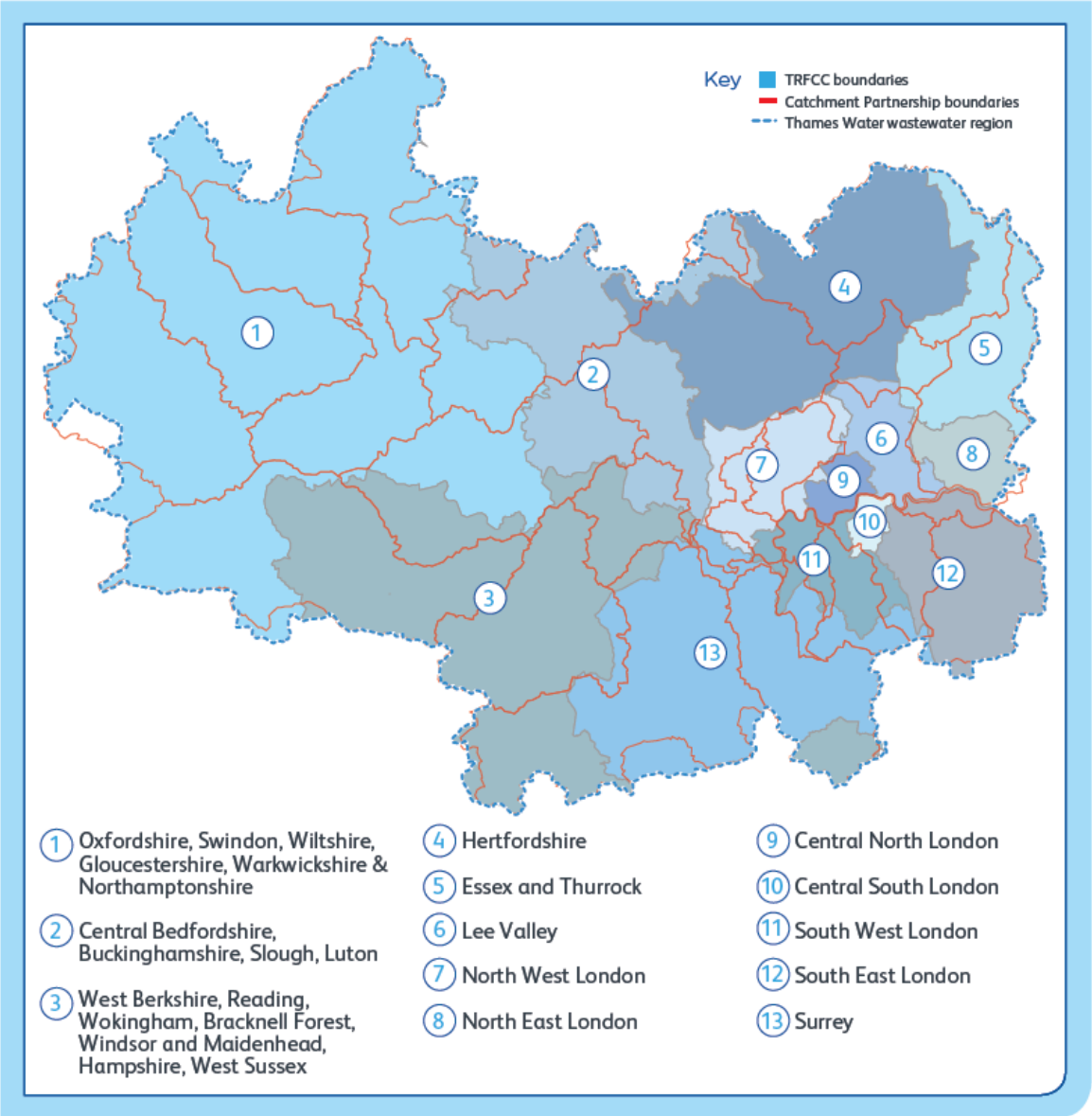


Figure 1-9: Level 2 groupings - TRFCC sub-regional boards and Catchment Partnerships

1.30 Regional stakeholder engagement was predominantly at Level 2, and we used well-established partnership forums and close working relationships to kick-start DWMP engagement. We incorporated the 27 river catchment partnerships.

1.31 Figure 1-9 is a map of our region showing the Level 2 TRFCC partnership areas as well as the river catchment partnership boundaries.

1.32 Our reporting for London differs due to the large geographic extent of the catchment. We produced our output at TRFCC partnership level for the Thames Valley (i.e., Level 2) and at catchment level (i.e., Level 3) for London.

Our best value framework

1.33 We used a best value framework in developing our DWMP using the Water Resources Management Plan (WRMP) definition of best value as one that 'considers factors alongside economic cost and seeks to achieve an outcome that increases the overall benefit to customers, the wider environment and society[14]'.

1.34 Figure 1-10 defines the eight main stages in our best value framework.

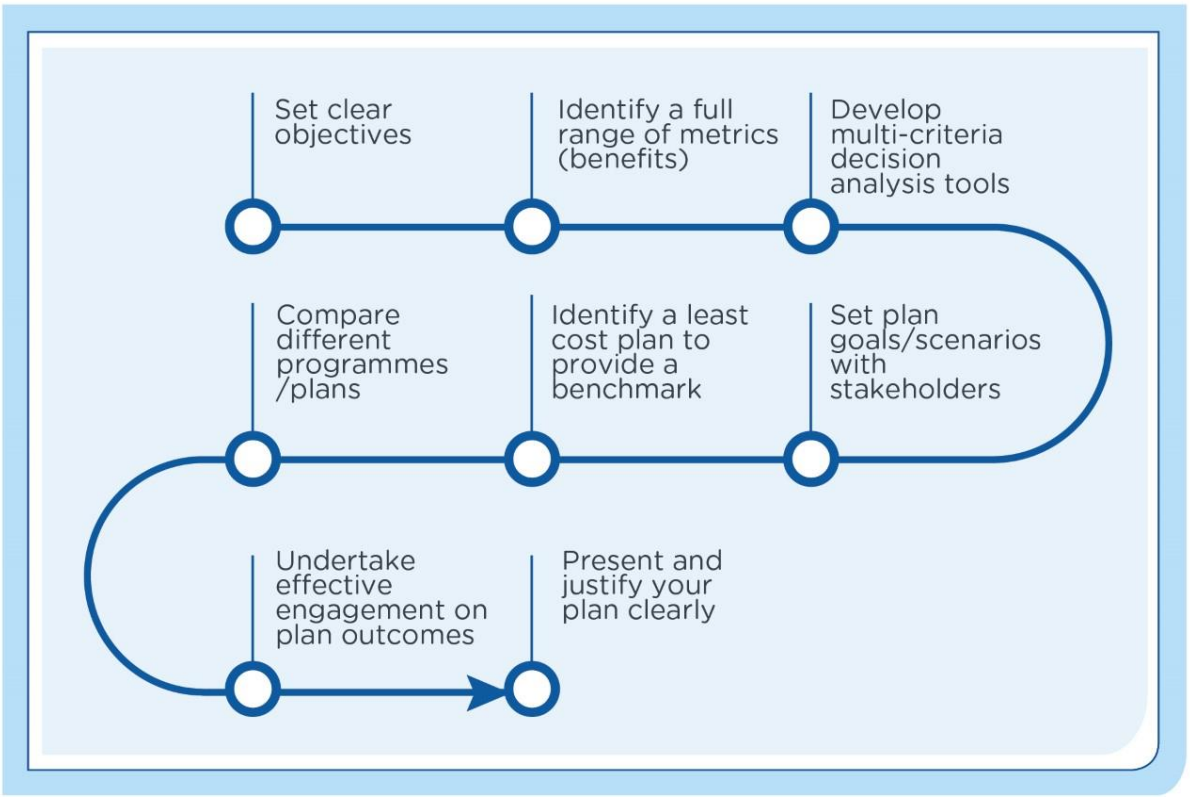


Figure 1-10: Stages in a Best Value Framework

1.35 For more detail on how we developed our best value approach, as well as the 16 value criteria and how they were applied, please refer to the Technical Appendix on Options Development and Appraisal[15].

Relationship to other plans

1.36 The Guiding Principles require us to take account of a range of other planning and strategic policy documents and plans (see Figure 1-11).

1.37 Strategic and regional plans include:

- The National Flood and Coastal Erosion Risk Management Strategy (FCERM) for England[16]

[14] https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline#section-9--aspects-to-consider-in-compiling-a-best-value-plan
[15] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-d-options-development-and-appraisal.pdf
[16] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/920944/023_15482_Environment_agency_digitalAW_Strategy.pdf

- River Basin Management Plans (RBMP's): Thames River Basin[17]
- Flood Risk Management Plans (FRMP's): Thames River Basin[18]
- The Defra Storm Overflow Discharge Reduction Plan[19]
- The NIC report on Reducing the risk of surface water flooding[20]
- The Water Industry National Environment Programme[21]
- The Water Resource Management Plan (multiple water companies due to our wastewater operational boundary).

1.38 Some of the local plans include:

- Local Development Plans.
- Local Flood Risk Management Strategies.

1.39 We used Local Development Plans growth forecasts in the Baseline Risk and Vulnerability Assessment (BRAVA) stage of the DWMP framework to predict the change in population growth. More detail on how this was done is in the Technical Appendix for BRAVA and Problem Characterisation[22].

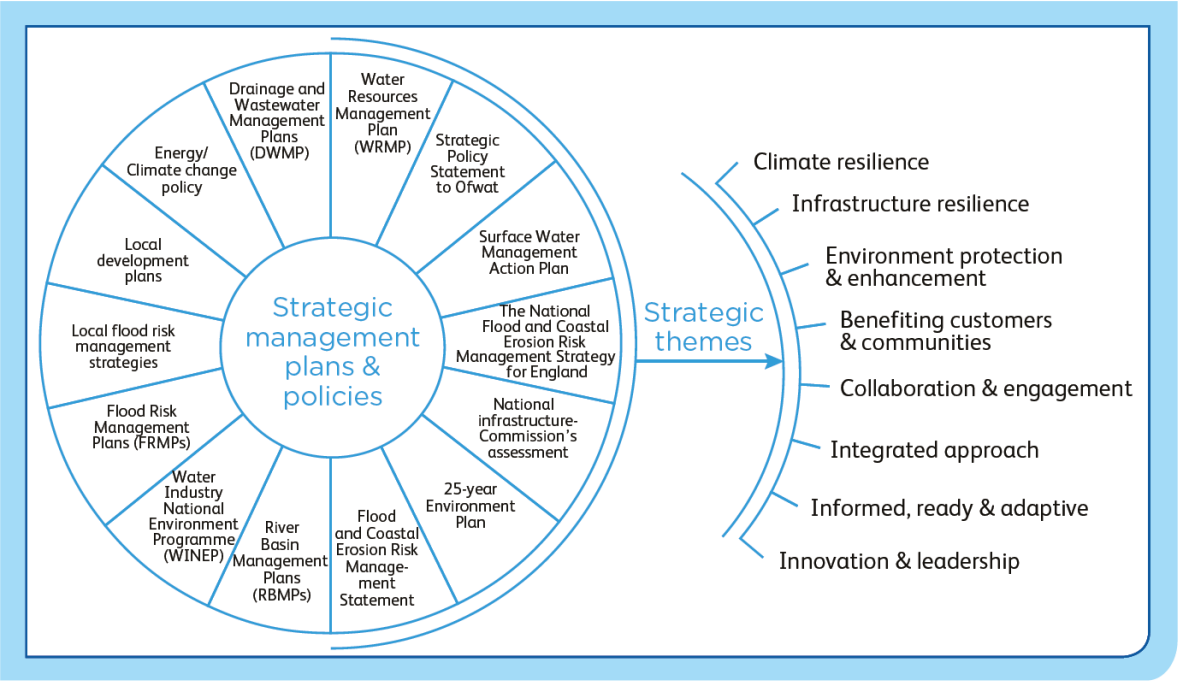


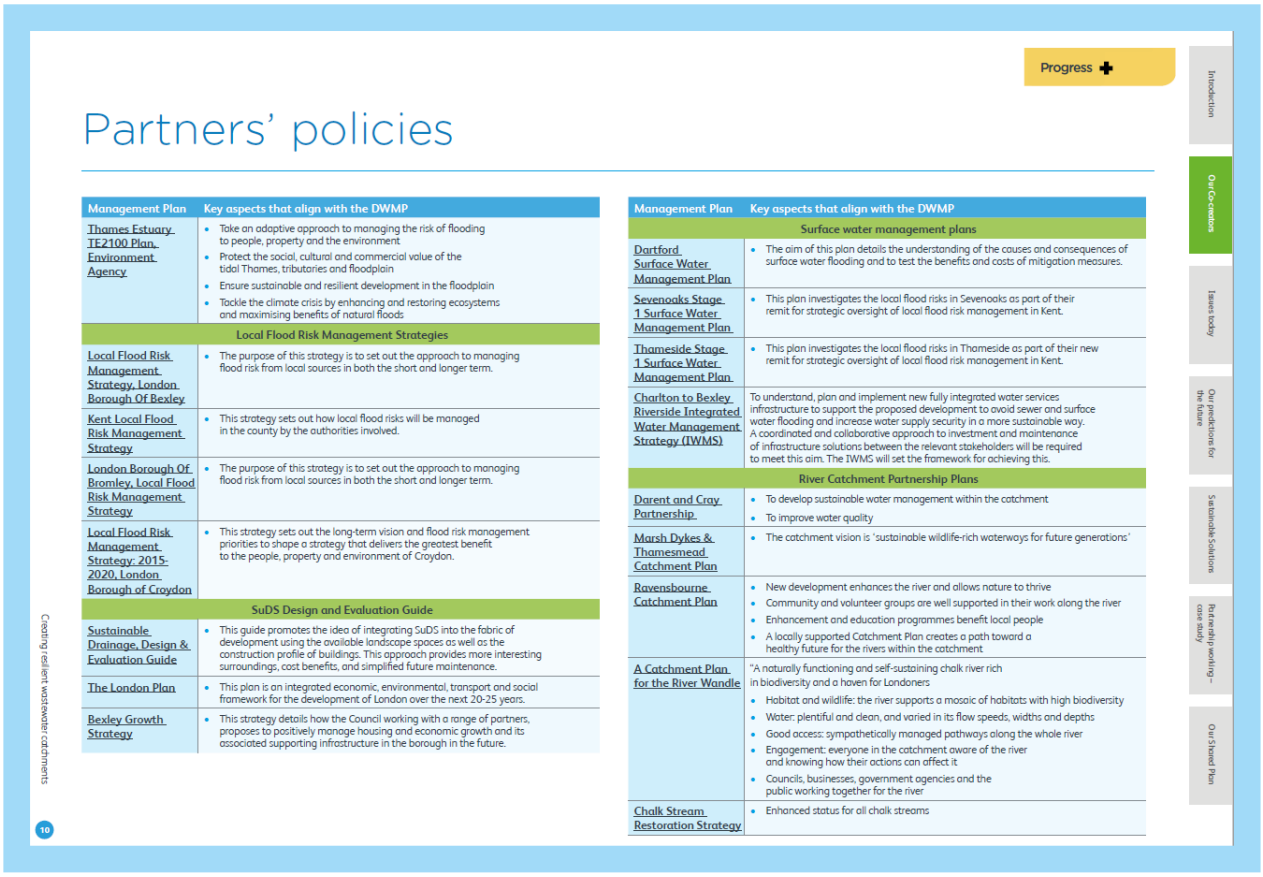
Figure 1-11: DWMP links to other strategic management plans and policies

1.40 In addition, we have interrogated local plans and policies applicable to the DWMP and summarised them in the sub-regional outputs of the DWMP called Catchment Strategy Plans (CSPs). The CSP's each hold a page called 'Partner Policies' of which an example can be found in Figure 1-12 for the Long Reach catchment in southeast London. These

[17] https://www.gov.uk/guidance/thames-river-basin-district-river-basin-management-plan-updated-2022
[18] https://www.gov.uk/government/publications/thames-river-basin-district-flood-risk-management-plan
[19] https://www.gov.uk/government/publications/storm-overflows-discharge-reduction-plan
[20] https://nic.org.uk/studies-reports/reducing-the-risks-of-surface-water-flooding/surface-water-flooding-final-report/
[21] Under development.
[22] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-c-baseline-risk-and-vulnerability-assessment-and-problem-characterisation.pdf

pages list the plans/policies, provide a hyperlink to the documentation and a short summary of how that plan/document aligns with the DWMP.

1.41 Many of the local flood risk locations as well as relevant local authority policies and plans were identified and discussed along with areas of known flood and environmental risk during local stakeholder engagement sessions. Further details can be found in our Technical Appendix on Stakeholder Engagement[23].



Progress +

Partners' policies

Management Plan	Key aspects that align with the DWMP
Thames Estuary TE2100 Plan, Environment Agency	• Take an adaptive approach to managing the risk of flooding to people, property and the environment • Protect the social, cultural and commercial value of the tidal Thames, tributaries and floodplain • Ensure sustainable and resilient development in the floodplain • Tackle the climate crisis by enhancing and restoring ecosystems and maximising benefits of natural floods
Local Flood Risk Management Strategies	
Local Flood Risk Management Strategy, London Borough Of Bexley	• The purpose of this strategy is to set out the approach to managing flood risk from local sources in both the short and longer term.
Kent Local Flood Risk Management Strategy	• This strategy sets out how local flood risks will be managed in the county by the authorities involved.
London Borough Of Bromley, Local Flood Risk Management Strategy	• The purpose of this strategy is to set out the approach to managing flood risk from local sources in both the short and longer term.
Local Flood Risk Management Strategy: 2015-2020, London Borough of Croydon	• This strategy sets out the long-term vision and flood risk management priorities to shape a strategy that delivers the greatest benefit to the people, property and environment of Croydon.
SuDS Design and Evaluation Guide	
Sustainable Drainage, Design & Evaluation Guide	• This guide promotes the idea of integrating SuDS into the fabric of development using the available landscape spaces as well as the construction profile of buildings. This approach provides more interesting surroundings, cost benefits, and simplified future maintenance.
The London Plan	• This plan is an integrated economic, environmental, transport and social framework for the development of London over the next 20-25 years.
Bexley Growth Strategy	• This strategy details how the Council working with a range of partners, proposes to positively manage housing and economic growth and its associated supporting infrastructure in the borough in the future.

Management Plan	Key aspects that align with the DWMP
Surface water management plans	
Dartford Surface Water Management Plan	• The aim of this plan details the understanding of the causes and consequences of surface water flooding and to test the benefits and costs of mitigation measures.
Sevenoaks Stage 1 Surface Water Management Plan	• This plan investigates the local flood risks in Sevenoaks as part of their remit for strategic oversight of local flood risk management in Kent.
Thameside Stage 1 Surface Water Management Plan	• This plan investigates the local flood risks in Thameside as part of their new remit for strategic oversight of local flood risk management in Kent.
Charlton to Bexley Riverside Integrated Water Management Strategy (IWMS)	To understand, plan and implement new fully integrated water services infrastructure to support the proposed development to avoid sewer and surface water flooding and increase water supply security in a more sustainable way. A coordinated and collaborative approach to investment and maintenance of infrastructure solutions between the relevant stakeholders will be required to meet this aim. The IWMS will set the framework for achieving this.
River Catchment Partnership Plans	
Darent and Cray Partnership	• To develop sustainable water management within the catchment • To improve water quality
Marsh Dykes & Thamesmead Catchment Plan	• The catchment vision is 'sustainable wildlife-rich waterways for future generations'
Ravensbourne Catchment Plan	• New development enhances the river and allows nature to thrive • Community and volunteer groups are well supported in their work along the river • Enhancement and education programmes benefit local people • A locally supported Catchment Plan creates a path toward a healthy future for the rivers within the catchment
A Catchment Plan for the River Wandle	"A naturally functioning and self-sustaining chalk river rich in biodiversity and a haven for Londoners • Habitat and wildlife: the river supports a mosaic of habitats with high biodiversity • Water: plentiful and clean, and varied in its flow speeds, widths and depths • Good access: sympathetically managed pathways along the whole river • Engagement: everyone in the catchment aware of the river and knowing how their actions can affect it • Councils, businesses, government agencies and the public working together for the river
Chalk Stream Restoration Strategy	• Enhanced status for all chalk streams

Introduction
Our Co-creation
Issues today
Our predictions for the future
Sustainable Solutions
Partnership working – case study
Our Shared Plan

Creating resilient wastewater catchments

10

Figure 1-12: Sample Partners' policies for the Long Reach STW Catchment

1.42 We also need to align our water and waste long term planning and we report the interaction between the DWMP and WRMP in a dedicated Technical Appendix[24].

1.43 Feedback during our stakeholder engagement consultation focused on ensuring that our final DWMP aligns with business planning activities currently underway for 2025 to 2030. This business planning is also known as the Price Review (PR) and as it will be agreed in 2024, it's commonly referred to as 'PR24'. All water and wastewater utility companies will submit their proposed plans to Ofwat in autumn 2023. Aligning PR24 with our DWMP is demonstrated in the Technical Appendix on Assurance[25].

[23] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-f-stakeholder-engagement.pdf
[24] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-j-dwmp-and-wrmp-alignment.pdf
[25] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-m-board-assurance-statement.pdf

Working together

1.44 The industry-wide, 'Working together' guide[26] describes DWMP's as '…much more than just a water company plan…It's an opportunity to plan together, to generate efficiencies and maximise outcomes arising from co-creation and delivery of solutions…'

1.45 By collaborating with our stakeholders, we have identified opportunities to co-create and co-deliver improvements to the environment and reduce flood risk. Many location-specific nuances have also been shared and identified at a very early stage. Figure 1-13 is a graphical representation of what can be achieved by working together.

1.46 Working together is inevitable when considering drainage. Responsibilities are shared across many organisations due to the interconnection of the drainage assets. With different forms of local government that have varying responsibilities, without a spirit of collaboration it will be challenging and often cost prohibitive to resolve issues.

1.47 We appointed a dedicated DWMP stakeholder engagement team and part funded the Thames Flood Advisors[27] (TFA's) who have closer engagement with the Lead Local Flooding Authorities (LLFA's). We did this to prioritise stakeholder engagement throughout the DWMP development.

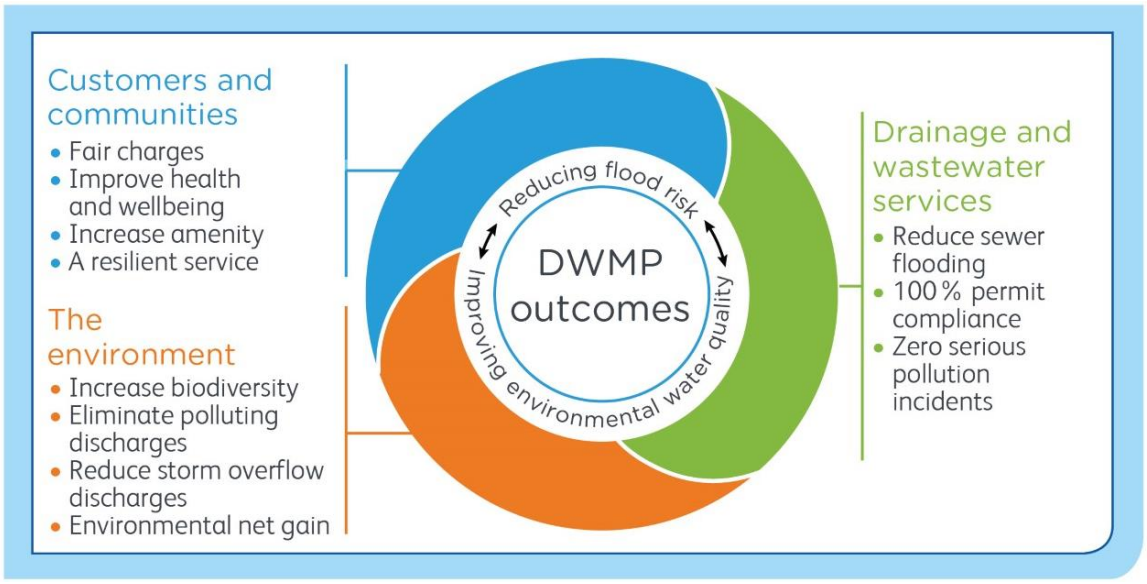


Figure 1-13: What we can achieve by working together

1.48 We are deeply indebted to our stakeholders who have engaged with us on this first DWMP. We held:

- More than 100 regional workshops
- In excess of 70 public consultation responses from more than 50 organisations
- More than 1,500 domestic customers and 450 business customers engaged

[26] https://www.water.org.uk/wp-content/uploads/2021/10/Working_Together_an_overview_of_Drainage_and_Wastewater_Management_Plans.pdf

[27] The Thames Flood Advisors (TFA's) are funded by the Thames Regional Flood and Coastal Committee (TRFCC) who were established under the Flood and Water Management Act 2010. They assist Lead Local Flooding Authorities in developing and delivering a programme of surface water flood risk improvements.

1.49 After a dedicated engagement period we took time to reflect upon how our plan (and in some cases processes) needed to change to accommodate the stakeholder feedback. This approach was carried through the DWMP all the way to the public consultation.

1.50 Due to the Covid-19 pandemic we encountered both challenge and an opportunity. The challenge was an inability to meet face to face and hold deep and rich engagement with stakeholders. The opportunity was that due to online engagement we could engage with a wider stakeholder group and more often. We complemented our engagement with newsletters and webinars to allow stakeholders close engagement with the DWMP process as it was developed.

1.51 In addition, we dedicated resources to digital platforms. Our GIS[28]-based DWMP Practitioners' Portal was launched in 2020 and updated as more information became available. The portal holds both DWMP data and relevant national publicly available datasets. We are now enhancing the portal to share more Thames Water data that we believe will make it easier for stakeholders to engage with us in future.

Incorporating customer views

1.52 Customers are a very important group of stakeholders. We needed to allow their views to influence the plan we have produced. We undertook two dedicated customer focus engagement activities.

1.53 We carried out qualitative and quantitative customer research that supported our Strategic Context as well as Optioneering and Programme Appraisal stages. We then undertook further research in parallel to the public consultation. The research findings have been incorporated in our Statement of Response[29].

1.54 Figure 1-14 demonstrates some of the ways we have engaged with customers, stakeholders and regulators.

[28] Geographical Information System (GIS)
[29] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-n-you-said-we-did.pdf

Figure 1-14: Examples of the diverse range of stakeholder engagement activities

1.55 Figure 1-15 outlines the four key customer engagement areas. We asked them about:

- Service expectations for the next 25 years
- Which of our planning objectives are most important to them
- Their thoughts on different solution types to address the challenges we face
- Their view on the draft plans specifically relating to costs and benefits.

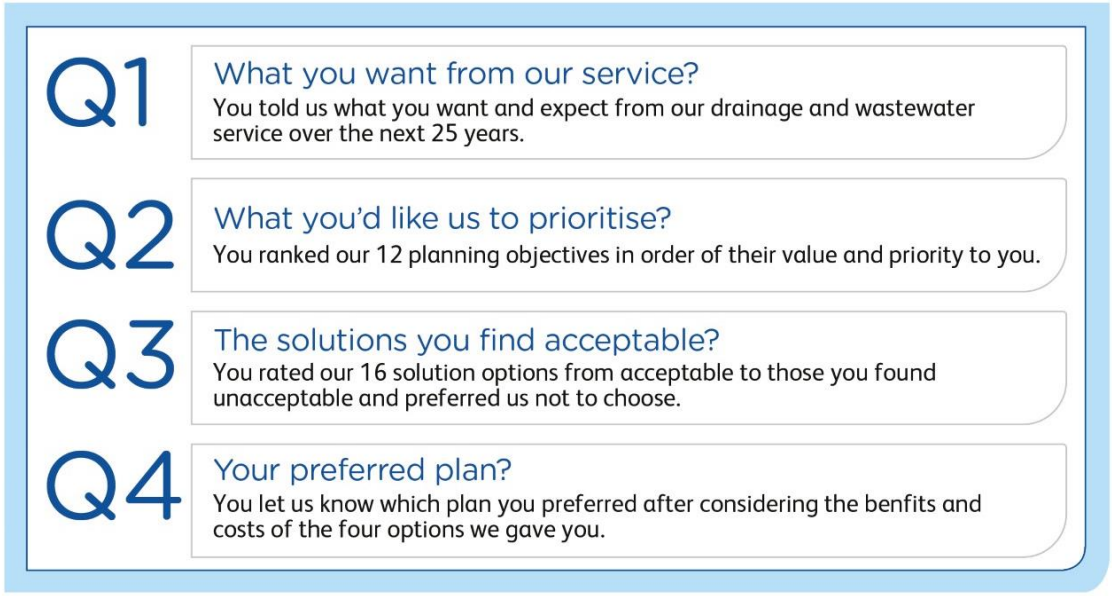


Figure 1-15: Key areas for our customer engagement

1.56 The key priorities for our customers are:

- A desire for our future plans to be affordable for our entire customer base
- Ensuring that our plans are adequate for the future and do not leave a burden on future generations
- Make sure that we protect the environment

Feedback and response to the public consultation

1.57 Our customers, stakeholder and regulators had a large amount of very detailed and specific comments on our draft plan. We received 1,400 individual comments from over 200 organisations. An overview is shown in Figure 1-16. Key elements that we focussed on were:

- Storm overflows
- Sewer flooding
- Proposing and justifying nature-based solutions and sustainable urban drainage
- Considering performance commitments beyond the industry standard
- Being ambitious with our targets
- Improving data on surface water assets
- Extending partnership working and partnership opportunities

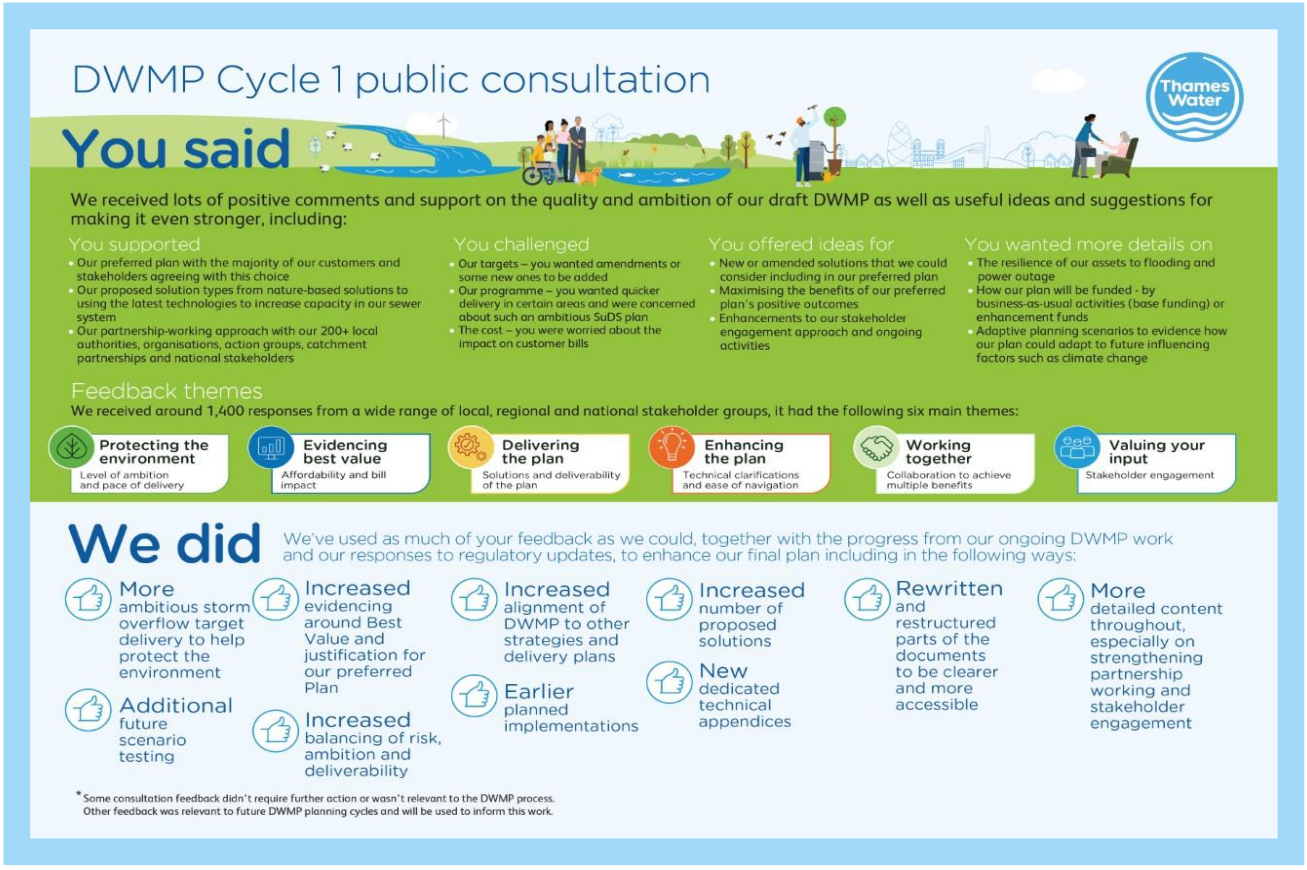


Figure 1-16: Extract from "You said we did"[30] summarising the findings of the stakeholder engagement

[30] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-n-you-said-we-did.pdf

1.58 You can find more details on our customer engagement in our Technical Appendix on Customer Engagement[31] and Consultation Response – You Said We Did[32].

Regulator requirements from the public consultation

1.59 Our regulators set out a series of expectations to all water companies after the public consultation. These expectations were released in an open letter[33] and were driven by their findings from reviewing all companies' DWMPs. The key requirements were:

- Incorporation of the Defra Storm Overflow Discharge Reduction Plan[34]
- Enhancement of the content demonstrating the need to invest, the costs and associated benefits the plan will deliver
- Explanation of the contribution of base expenditure to issues investigated in the DWMP as well as how we propose to use more sustainable drainage and nature-based solutions
- Improved maturity on partnership working when compared to the draft DWMP

1.60 In response to these and other stakeholder queries we have made significant amendments to our DWMP. Further details on feedback from stakeholders as well as our response can be found in our 'Statement of Response' that we have called 'You Said, We Did'[35].

1.61 Our plan for storm overflows has been updated to ensure compliance with the Storm Overflow Discharge Reduction Plan and aligned to the WINEP programme as submitted to the EA in January 2023. This has increased cost and changed some of our solutions. For more detail, please refer to the Technical Appendix on Storm Overflows[36].

1.62 More specifically to these issues we have written bespoke Technical Appendices for Storm Overflows[37], Base Expenditure[38] and Partnership Working[39]. These appendices address the stakeholder issues as well as meeting the regulators' requirements.

Document suite navigation

1.63 Our DWMP contains documents giving details of our plan and the process we undertook to develop it. There is The Plan document (this one) with three associated summaries; a series of technical appendices; standard tables of data outlining various elements of the plan, thirteen sub-regional plans (CSP's) and three digital tools.

---

[31] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-h-customer-engagement.pdf
[32] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-n-you-said-we-did.pdf
[33] https://www.ofwat.gov.uk/publication/letter-to-water-companies-ofwats-industry-overview-of-draft-drainage-and-wastewater-management-plans-2022/
[34] https://www.gov.uk/government/publications/storm-overflows-discharge-reduction-plan
[35] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-n-you-said-we-did.pdf
[36] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-q-storm-overflows.pdf
[37] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-q-storm-overflows.pdf
[38] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-o-what-base-buys.pdf
[39] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-s-partnership-working-and-opportunities.pdf

1.64 The Plan documents are:

- The plan document (this document)
- A customer summary
- A non-technical summary
- A technical summary

1.65 The Technical Appendices cover a wide range of topics. Documents in *italics* are new documents that were not produced as part of the draft DWMP.

- Strategic context
- Risk based catchment screening
- BRAVA and problem characterisation
- Options development appraisal
- Stakeholder engagement
- Adaptive planning
- Customer engagement
- Risk and uncertainty
- DWMP and WRMP alignment
- Strategic environmental assessment
- Habitats regulation assessment
- *Assurance*
- *Statement of response to public consultation – You said we did*
- *What base buys*
- *Response to the July 2021 flooding in London*
- *Storm overflows*
- *Delivery of SuDS and nature-based solutions*
- *Partnership opportunities*
- *Groundwater quality*
- *Resilience*

1.66 We have prepared standard data tables[40] and a commentary file[41] that contains the data Ofwat will use to compare the different companies against each other.

1.67 The regional plans are represented in a suite of thirteen Catchment Strategy plans.

1.68 Our digital products includes:

- Our main DWMP page on our website that hosts all the DWMP content
- A customer friendly GIS portal where headline data can be viewed on interactive maps
- A practitioners' portal where stakeholders have access to more detailed DWMP data as well as other Thames Water and publicly accessible data layers

[40] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/data-tables.xlsx
[41] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/data-tables-commentary.pdf

1.69 The documentation suite for the draft DWMP was substantial. Due to the wide-ranging and detailed responses from customers, stakeholders and regulators, we have extended the suite specifically addressing key issues raised in dedicated technical appendices.

1.70 To help navigate updates to draft documentation we have included a preface section. This explains the signpost imagery we have used to show change. It also contains a navigation index to point readers to where in the documentation suite certain topics are addressed. Figure 1-17 is an example of how the navigation is.

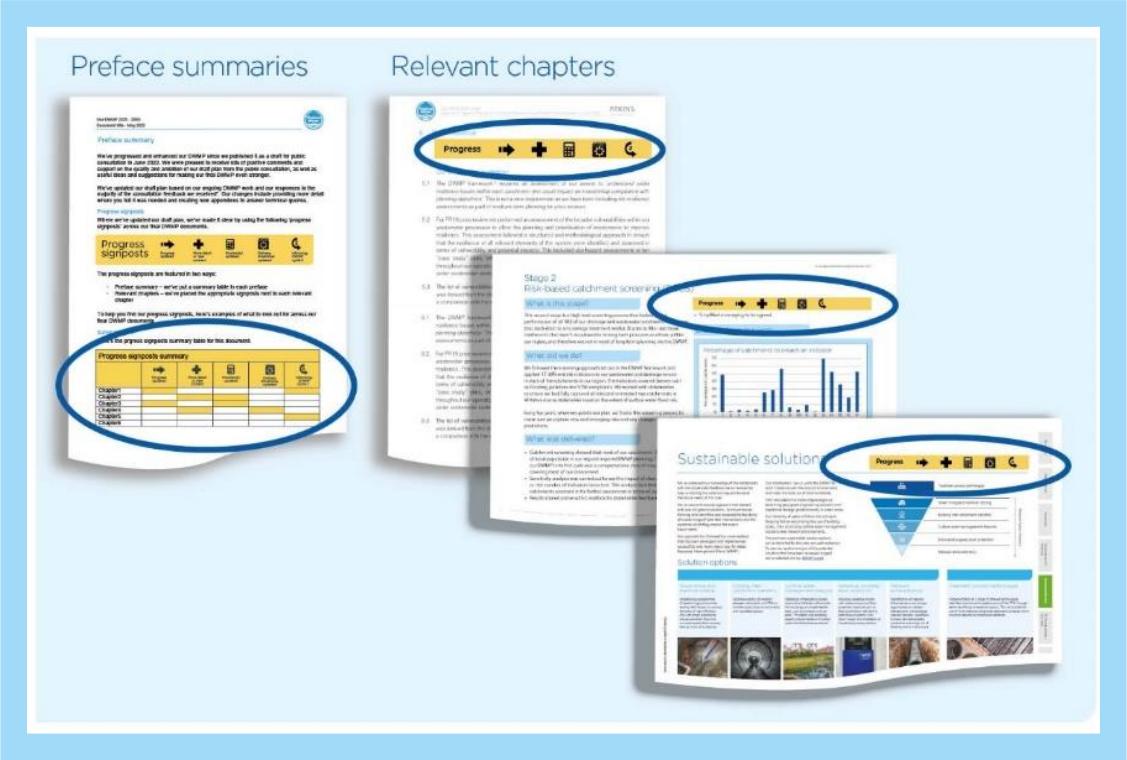


Figure 1-17: Examples of signposting in the DWMP documentation suite

Board assurance

1.71 The Thames Water Utilities Board has responsibility for setting our strategy and assuring that all plans developed deliver that strategy. We have therefore obtained approval from our Board for this final DWMP.

1.72 Our regulators have defined a set of five criteria[42] that they expect all water company boards to assure for the DWMP. There were four of these at the draft stage and a fifth one has been added for the final DWMP. They are:

- The guiding principles and the DWMP technical framework have been followed and applied
- The planning objectives are being met (both common and bespoke)
- There are clear links and processes in place to ensure that the appropriate DWMP interventions, including partnership and co-funded schemes, will be put forward for investment in the PR24 business plan

[42] Letter to CEOs from Defra, Ofwat, EA on Expectations for assurance of cycle 1 draft and final drainage and wastewater management plans (DWMPs).

- Measures are in place to achieve objectives set in the Government's Storm Overflows Discharge Reduction Plan (new criteria)
- It is a best value plan for customers and the environment, for managing and developing drainage and wastewater services, and is based on robust evidence and costing processes

1.73 Our plan has been externally assured against the DWMP set criteria to support the Board Assurance process. The audit of the DWMP was demonstrated by compliance with 13 tests developed by the auditors independent of us.

1.74 The delivery of DWMP was also incentivised by a dedicated performance commitment set at the last price review (PR19). This has separate external assurance as part of annual return reporting.

1.75 More details on assurance can be found in our Technical Appendix on Assurance[43].

[43] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-m-board-assurance-statement.pdf

2 PART A: THE IMPACT OF POPULATION GROWTH AND CLIMATE CHANGE

Progress 

2.1 The focus of our DWMP is to understand and respond to future risks to our wastewater services. Part of having a resilient and sustainable service is having a plan that acknowledges the challenges due to capacity-related issues, including forecast population growth and climate change.

2.2 In stage 3 of developing our plan (BRAVA), we used computer modelling for sewer hydraulics and sewage treatment works processes to analyse the future impact of population growth and climate change from 2020 through to 2050. We predicted performance against:

- Properties at risk of internal sewer flooding for a 1:30 year rainfall return period[44]
- Properties at risk of external sewer flooding for a 1:30 year rainfall return period
- Properties at risk of internal and external sewer flooding for a 1:50 year rainfall return period
- Risk of final effluent permit limits for our treatment works
- Average annual number of discharges from storm overflows

2.3 In our central London Beckton and Crossness catchments we started from a 2025 baseline due to the construction of the Thames Tideway Tunnel, which will significantly increase our sewerage capacity in the capital.

2.4 To understand activities undertaken during our BRAVA modelling, please refer to the Technical Appendix on BRAVA and Problem Characterisation[45].

The case for change

2.5 Population growth is forecast to increase by 2.56 million homes between 2025 and 2050. That is greater than the population of Birmingham and Leeds moving into our region.

2.6 The impact of climate change was set at 20% increase in volume of annual rainfall. This approach was consistently used across the industry for cycle 1 of the DWMP.

2.7 In 2020, all companies collaborated to produce a 'National Picture' of how wastewater services could change due to population growth and climate change using the DWMP planning objectives. This was reported nationally at Level 2 using a simple scoring system.

2.8 Table 2-1 provides more detail of the planning objectives assessed and our 2020 baseline and 2050 forecast position against each of these.

[44] Refer to the **Glossary** for definitions of the rainfall.
[45] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-c-baseline-risk-and-vulnerability-assessment-and-problem-characterisation.pdf

2.9 Our analysis indicates that between 2025 and 2050:

- There will be a 54% increase from 90,310 properties to 138,821 properties at risk of internal sewer flooding for a 1:30 year rainfall return period
- There will be a 31% increase from 315,598 properties to 414,331 properties at risk of sewer flooding for a 1:50 year rainfall return period
- There will be an 83% increase from 53 sites at risk of not meeting final effluent permits to 94

2.10 The implications of these changes are staggering. If we do nothing the risk of sewer flooding into homes and businesses may increase by 4,000 properties every year. Significant increased volumes will mean that our treatment works will struggle to treat all the flow. This will result in a deterioration in river water quality.

2.11 Figure 2-1 describes our 2022 performance, our DWMP vision and aims, our 2050 service targets and what we predict the future will look like without implementing the DWMP.

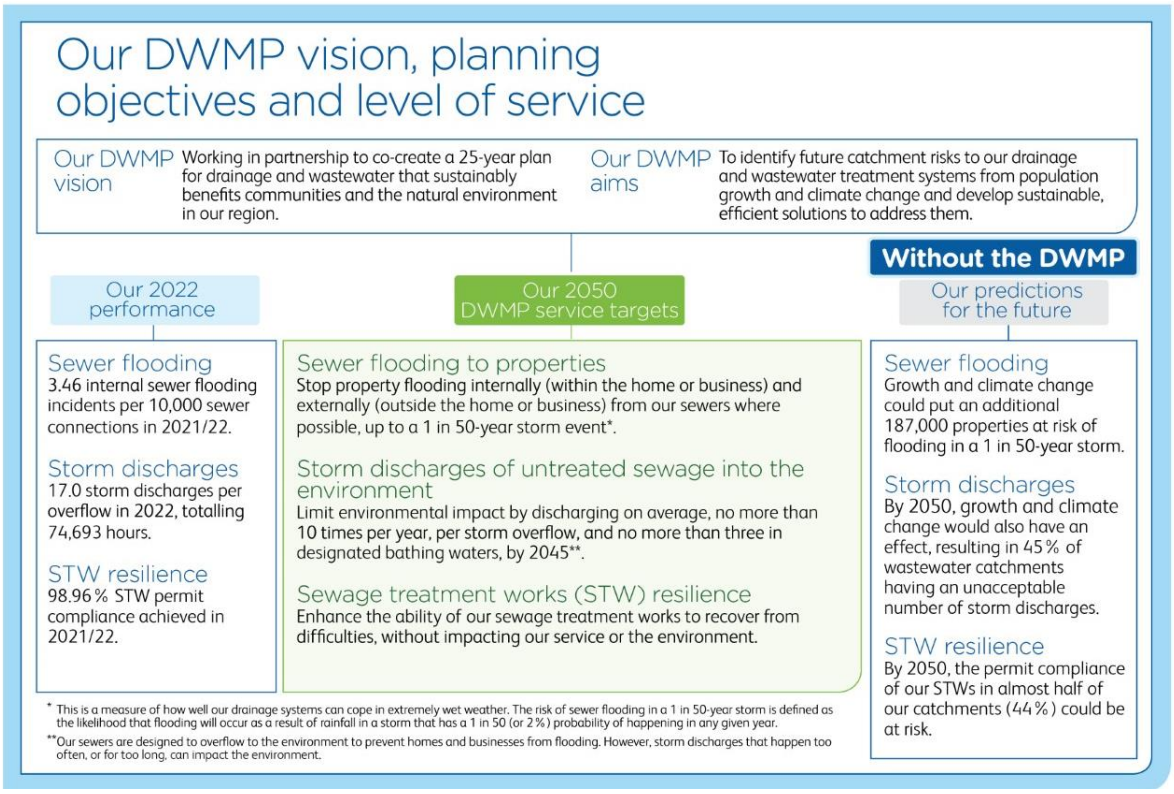


Figure 2-1: DWMP objectives and predictions of the future without a DWMP.

BRAVA details

2.12 Table 2-1 provides more information at a company and regional level of the impact predicted by BRAVA on some of our key planning objectives.

Planning Objective	Unit	Region	Threshold Description	Value
Properties at risk of internal sewer flooding for a 1:30 year rainfall return period	Number of properties	London	2025 value	87,119
			2050 value	133,852
			Increase	46,733
			% Change	**54**
		Thames Valley	2025 value	3,091
			2050 value	4,969
			Increase	1,878
			% Change	**61**
		Thames Water	2025 value	90,210
			2050 value	138,821
			Increase	48,611
			% Change	**54**
Properties at risk of internal and external sewer flooding for a 1:50 year rainfall return period[46]	Number of properties	London	2025 value	300,771
			2050 value	391,468
			Increase	90,697
			% Change	**30**
		Thames Valley	2025 value	14,827
			2050 value	22,863
			Increase	8,036
			% Change	**54**
		Thames Water	2025 value	315,598
			2050 value	414,331
			Increase	98,733
			% Change	**31**
Risk of treatment works operating at or above their permit levels (including dry weather flow)[#]	Number of sites	London	2025 value	0
			2050 value	8
			Increase	8
			% Change	**N/A***
		Thames Valley	2025 value	45
			2050 value	86
			Increase	41
			% Change	**91**
		Thames Water	2025 value	53
			2050 value	94
			Increase	44
			% Change	**77**

[#] This is a risk of non-compliance and dependant on multiple factors
***** A percentage increase cannot be calculated if the stating position is 0.

Table 2-1: Detailed BRAVA results

[46] This planning objective is not included in the national results as it is a bespoke objective for us.

2.13 A summary of the increased risks between London and Thames Valley are highlighted below:

- For properties at risk of internal sewer flooding in a 1:30 year rainfall return period, the increase in risk over time is even across London and the Thames Valley with a 54% and 61% increase respectively
- For properties that will be at risk of external sewer flooding in a 1:50 year rainfall return period, the increase in risk is higher for Thames Valley than in London with 54% and 30% increases respectively
- In both cases the number of properties in London is very large dur to the population density

Uncertainty

2.14 Population growth is inherently difficult to forecast due to the uncertainty created by the many economic and political influences both locally and internationally that affect planning authorities realising the level of growth they plan for. Climate change is also uncertain with national updates based on the latest emission scenarios produced periodically. We have used adaptive planning approaches to assess the impact of changing forecasts on our plan. This is aligned to national guidance from Ofwat's Long Term Delivery Strategy which for wastewater focuses on common reference scenarios for demand (population growth), climate change and technology. This work is summarised in Part B, and more details are given in the Technical Appendix on Adaptive Pathway Planning[47].

[47] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-g-adaptive-pathway-planning.pdf

3 PART B: WHAT IS THE PLAN?

3.1 This section gives an overview of the final preferred plan that was developed by applying the DWMP industry framework. The preferred plan has been derived as a result of extensive stakeholder engagement and the application of a best value assessment. This means it represents the optimum balance of costs to meet a broad range of benefits required to address the multiple DWMP planning objectives. Our bespoke DWMP optimiser is set to select the least cost solutions to achieve this balance and we give further details of the protocol used in Part D of this document. In this section we focus primarily on what this plan is and the outcomes, how it integrates with other plans and can be adapted if drivers change. We have written this in accordance with Appendix F of the framework document[48].

3.2 Our plan is summarised at different geographical hierarchies and across the range of outcomes. In this section we provide a region wide view as well as detailing our proposals for London and Thames Valley and Home Counties separately, reflecting the different needs of the sub-regions. We also summarise the plan at outcome level describing plans to address the main performance areas on sewer flooding, storm overflows, treatment works compliance and fluvial resilience separately.

3.3 Costs reported within this document, technical appendices, data tables and on our customer and practitioner portals are in a 2020/21 price base. This is a requirement set by Ofwat in the PR24 final methodology[49]. It differs from the price base (of 2021/22) used in our draft DWMP and the price base set for PR24 (2022/23) recognising that DWMP is developed in advance of price review business plan submissions.

3.4 This section focuses on the additional activities required to meet new targets or enhance resilience, not the day-to-day activities that drive good performance. Part C outlines how DWMP proposals are part of a hierarchy of options together with maintenance activities to deliver the service our customers require, outlining how maintenance can support hydraulic deficits due to growth and climate change.

3.5 Following on from the public consultation we have substantially amended the draft plan. The headline messages for the final plan (called our preferred plan) can be found in Figure 3-1 and include:

- £31.9bn of capital investment (an increase of £8bn from our draft plan)
- Storm overflows not discharging above an average of 10 rainfall events per overflow per year
- Protect more than 187,000 properties from a risk of sewer flooding
- Ensure our sewage treatments account for growth with 82 upgraded

[48] A Framework for the production of Drainage and Wastewater Management Plans: Appendix F – Example contents of a Drainage and Wastewater Management Plans, September 2019: Water_UK_DWMP_Framework_Appendices_September-2019-F.pdf
[49] Ofwat PR24 Final Methodology Appendix 9: https://www.ofwat.gov.uk/wp-content/uploads/2022/12/PR24_final_methodology_Appendix_9_Setting_Expenditure_Allowances.pdf

- Adopt a 'SuDs first' approach impacting on 6,914 hectares of land in London

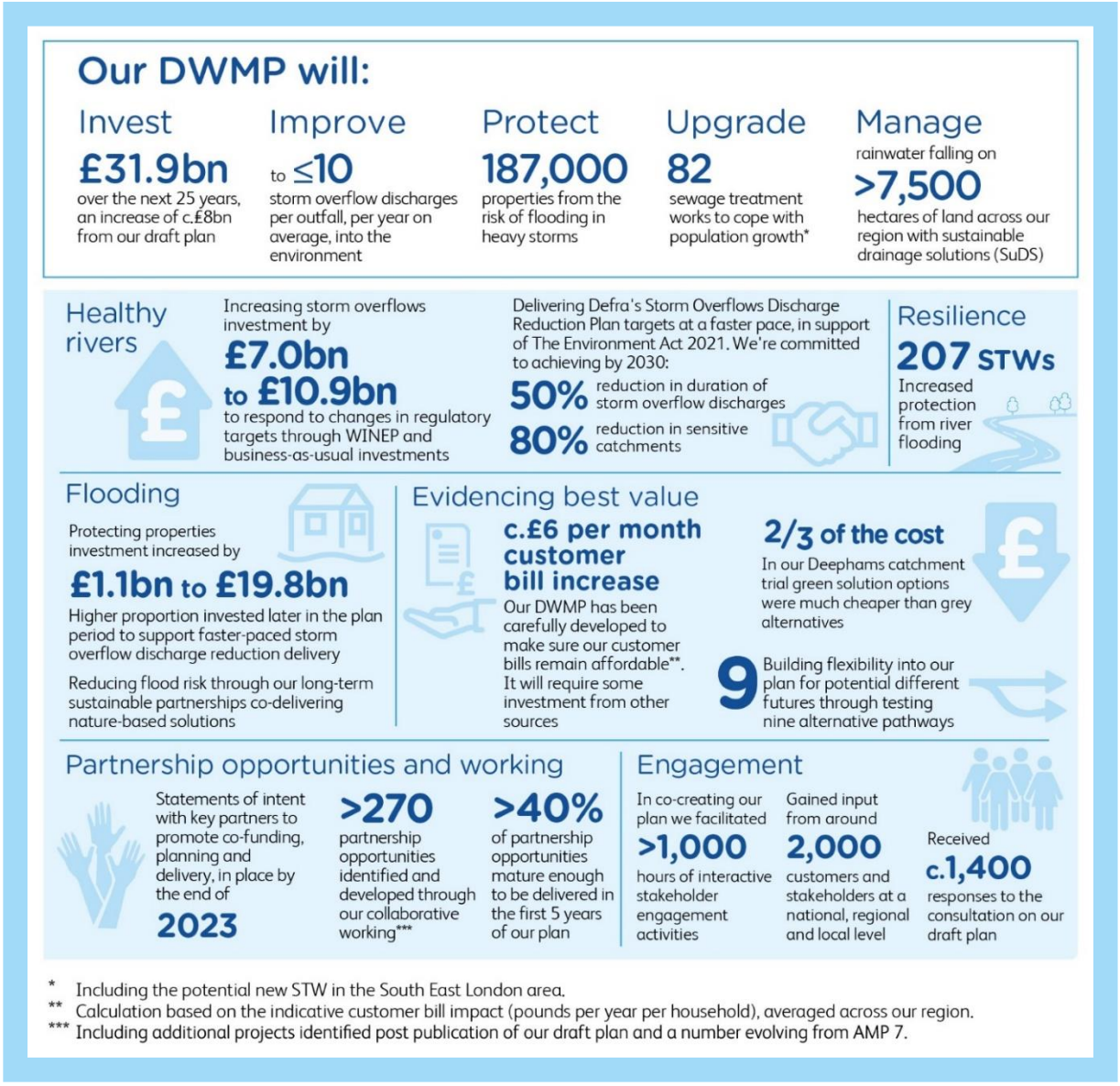


Figure 3-1: Headlines of our preferred plan

Delivering the core metrics

3.6 Our core metrics are based on storm overflows, flooding, and capacity at our wastewater treatment works. We have retained our ambitious targets from our draft to the final plan, however the scope and profiling of the plan has changed, particularly for storm overflows to meet new requirements. We will continue to ensure our programmes comply with environmental regulation through the Water Industry National Environment Programme (WINEP), whilst also including hydraulic flood risk reduction.

3.7 Our targets are outlined in Table 3-1 for London and Thames Valley. They were developed in conjunction with our stakeholders and tested during our extensive stakeholder engagement consultation. Our best value framework accounts for the wider benefits of delivering these core metrics. For example, flooding alleviation solutions evaluated against factors such as efficiency in solving the problem whilst supporting amenity, biodiversity and carbon targets.

Metric	Unit	Target for London	Target for Thames Valley
Storm overflow	Annual average number of spills	No more than 10*	No more than 10*
Sewer Flooding Resilience Risk (1:50)	Percentage of properties not at risk	95%	100%
Treatment Works Compliance	Percentage of works that are compliance	100%	100%

Table 3-1: Core metric targets for London and Thames Valley

3.8 The plan has been developed to mitigate the forecast impacts of climate change and population growth up to 2050. The annual volume of rainfall over the next 25 years, from 2025, is due to increase by 20% (based on today's figures). Population growth is expected to increase between 15-18% in our customers over the same period.

3.9 Over the past 25 years we have delivered more than £12bn of investment in improving our wastewater network. This includes quality upgrades at our treatment works and significant quality improvements to the Thames Estuary at treatment works and storm overflows by construction of the Lee and Thames Tideway Tunnels. Our DWMP proposes to more than double this spend rate over the next 25 years, driven by ambitious goals on flooding and the environment.

3.10 The solutions we use in DWMP are different to the past. Previously our investment has focused primarily on addressing shortfalls in our existing infrastructure and was heavily reliant on grey engineering solutions. Our DWMP proposes innovative green engineering solutions to provide the best outcomes for our communities. The technical solutions we are proposing aim to reduce flow of rain and groundwater into our sewers. Also, by tackling unwanted contributions into our network and attenuating flow we can more sustainably manage the impact to our customers and the environment.

3.11 Our approach to delivery has also shifted, to work in partnership with our stakeholders collaborating on projects and delivering green engineering solutions where possible. Our SuDS programme will extend from 20 ha. in AMP6 (2015-2020) to 180 ha. in AMP8 (2025-2030) and eventually to 3,748 ha. in AMP12 (2045-2050). We recognise this level of delivery is beyond our experience. At public consultation, our stakeholders welcomed such an ambitious target. We do not have all the answers on how to deliver the ambition, but we have included a new technical appendix on mainstreaming SuDS delivery[50] which includes a proposal of activities based on stakeholder discussions following our draft publication.

3.12 The final DWMP activity highlights are listed below, with a breakdown of those activities in 5-year intervals in Table 3-2: This investment represents best value for customers and the environment and achieves agreed targets by delivering;

- 1,853 km sewer relining
- 7,598 Ha of impermeable area managed through SuDS

* storm overflow discharges per outfall, per year on average, into the environment

[50] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-r-delivery-of-suds-and-nature-based-solutions.pdf

- 82 sewage treatment works upgraded to accommodate for growth
- 207 sewage treatment works made resilient towards fluvial flooding
- 187,019 properties protected from sewer flooding in 1:50-year storm
- Working with partners to progress the 271 partnership opportunities identified pre screening

fDWMP	Unit	2025 - 2030	2030 - 2035	2035 – 2040	2040 - 2045	2045 - 2050	Total
Capex	£m	1,494	3,215	6,096	9,062	12,075	31,943
SuDS	ha.	180	68	971	2,631	3,748	7,598
Sewer relining	Km	278	271	816	166	321	1,853
Treatment Works upgraded	No.	30	48	4	0	0	82
Treatment Works resilient to fluvial flooding	No.	0	80	60	67	0	207
Properties protected in a 1:50	No. of properties	2,472	16,502	15,737	26,180	126,128	187,019
Storm overflows reduced	No. of discharges prevented*	10,657	1,098	322	423	520	13,020
Carbon	Net carbon per AMP tCO_2	111,588	668,735	816,760	1,111,461	1,211,962	3,920,507
* This is based on a modelled forecast of the number of sewage discharges that would occur without investment							

Table 3-2: The quantum of investment required to meet our core metrics.

3.13 The planning objectives specified in the Stage 1 Strategic Context[51] are reproduced in Figure 3-2. Our preferred plan has been designed to meet all these objectives which remain unchanged between draft and final[52].

Figure 3-2: DWMP Planning objectives

[51] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/strategic-context-document.pdf

[52] During the consultation stage, some stakeholders fed back their concerns about the meaning of including a 'where possible' statement against the flooding target. We retain the same wording, recognising that in rare occasions, costs are prohibitive and mitigation is sought instead

3.14 We recognise that delivering a £31.9bn investment programme in 5 AMPs is unaffordable and undeliverable using current ways of working. At draft we developed an unconstrained plan that aligned to our Vision 2050. At final we have constrained the near term to align with our PR24 submission. We have not constrained the DWMP from 2030 onwards. Our view, supported by our executive and board is that long term planning needs to set the direction, pace and be ambitious to drive change. Subsequent DWMP cycles will have to work hard to continue to track a path towards our 2050 goals whilst making the near and medium term more achievable.

3.15 This is a strategic and not a delivery plan. It evidences the strategic need for investment, not how it should be delivered. This makes DWMP different to other plans such as Long-Term Delivery Strategies and medium-term planning in price reviews. These plans take the context of DWMP and translate into deliverable, affordable plans with a more granular view of the projects to be delivered.

3.16 Total capex for our draft DWMP was £22.4bn[53]. Between draft and final this has increased to £31.9bn, mostly driven by new requirements for storm overflows. Prioritising delivery of the new storm overflow discharge reduction obligations upfront has had a significant impact on our sewer flood risk management plan. This is shown in Figure 3-3 and Figure 3-4. In the final DWMP, overall PR24 deliverability constraints due to potential WINEP investment in the near term (AMP8) has resulted in a reduction in the delivery capacity to address flood risk.

3.17 In summary the main drivers of the profiles shown in Figure 3-3 are:

- growth upgrades at our treatment works prioritised for the first 15 years to meet the expected demand.
- the regulatory dates in the Storm Overflow Discharge Reduction plan
- deliverability concerns on meeting the storm overflow programme restricting sewer flooding investment in the near term and then driving significant investment in the medium to long term to meet targets by 2050

[53] Due to the change in cost base, this value is does not match that reported in our draft plan. It has been adjusted to be in the same cost base as the final plan.

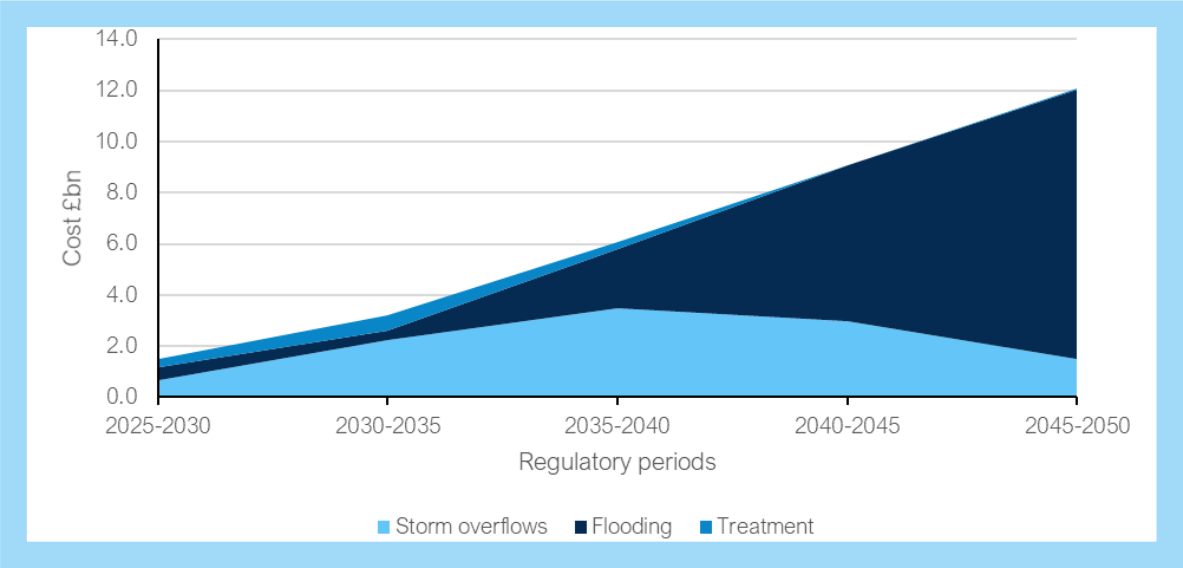


Figure 3-3: Planned investment for storm overflows, flooding and treatment works upgrades for the final DWMP (preferred plan)

3.18 This graph needs to be contrasted to the draft DWMP planned investment that is found in Figure 3-4.

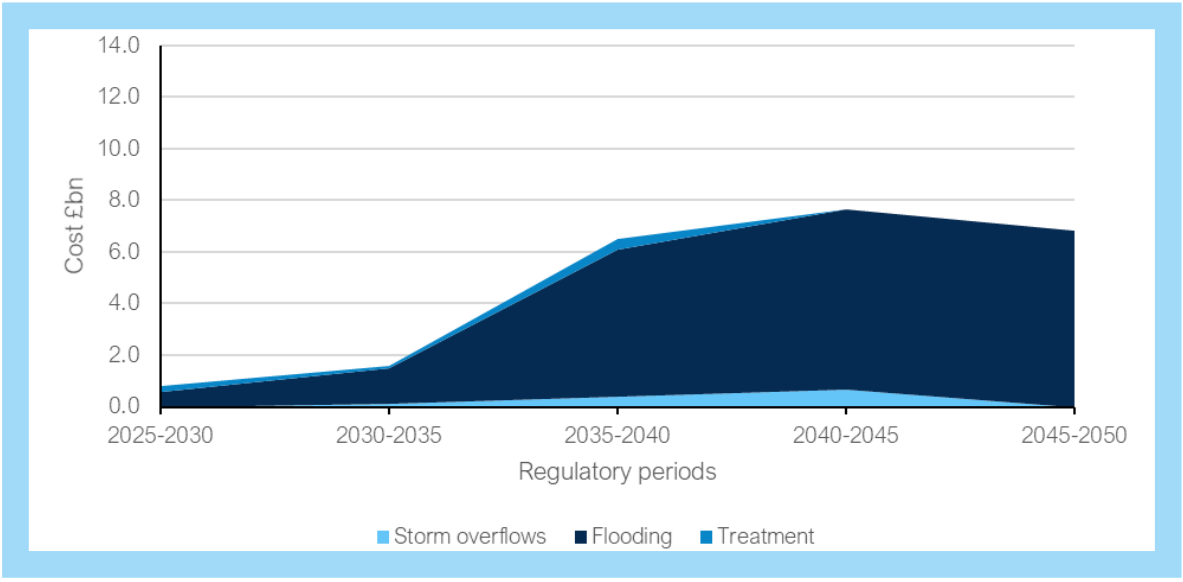


Figure 3-4: Planned investment for storm overflows, flooding and treatment works upgrades for the draft DWMP

3.19 Figure 3-5 is a radar plot of the best value assessment applied to different plans. Simplistically the plan with the largest area under the radar plot best balances cost and wider benefits. The preferred plan best represents that balance. To understand more of the alternative plan options please refer to our Technical Appendix on Programme Appraisal[54].

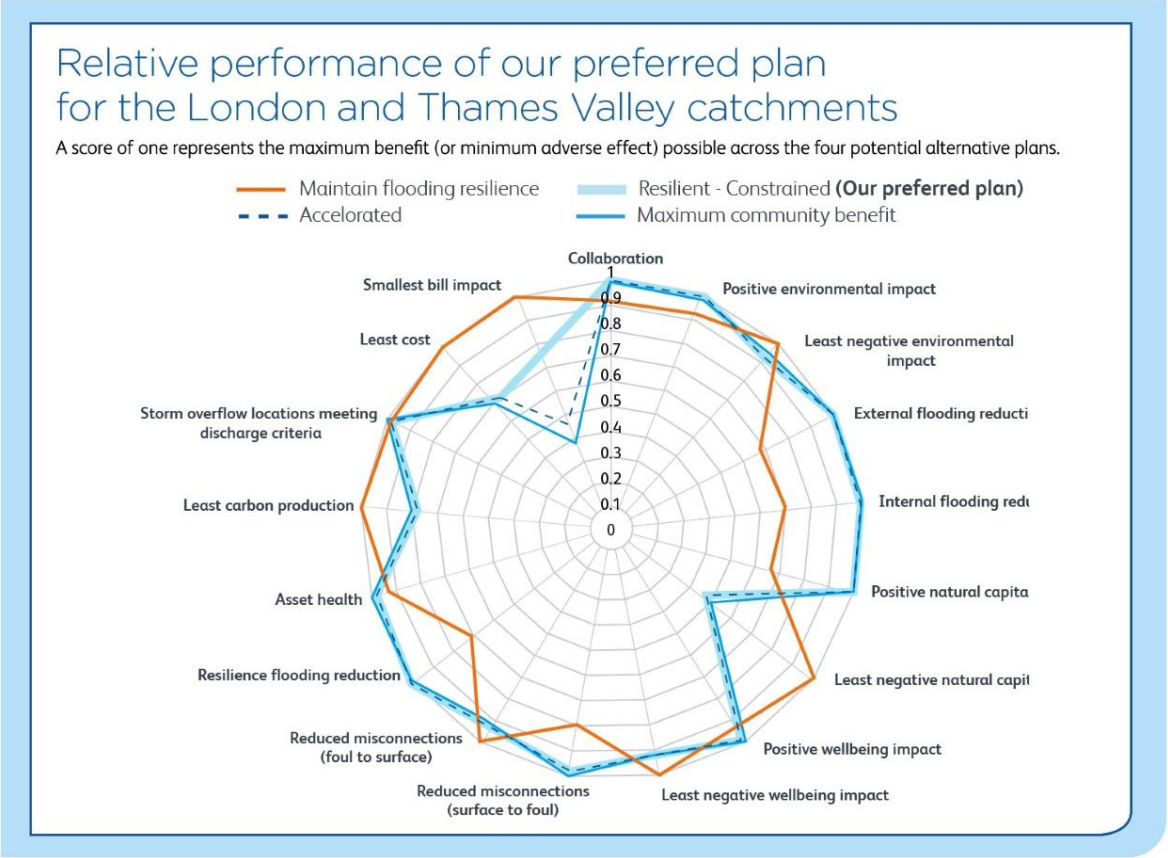


Figure 3-5: Radar plot demonstrating best value of the plans considered in the final DWMP Note: 'Maintain flooding resilience" was rejected by stakeholders as ambitious flooding goals not met.

3.20 In the sections below we have described our plan for each of the individual elements of the DWMP, which are:

- Storm overflows
- Flooding from sewers
- Treatment works compliance
- Resilience to river flooding

A plan for storm overflows

3.21 Discharging untreated sewage into the environment is unacceptable to Thames Water, our customers and stakeholders. Following the publication of our draft DWMP we received significant customer and stakeholder feedback relating to storm overflows. At the same time, new industry regulatory requirements were published. Stakeholders wanted us to meet our regulatory targets, some wanted more ambitious programmes than the statutory requirements and there were many comments on the transparency of data from monitoring.

[54] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-e-programme-appraisal.pdf

3.22 We know our performance isn't where it needs to be and that we have a lot to do. We have listened carefully to the customer and stakeholder feedback. Reducing the use of storm overflows forms a key part of our "Speak up, Open up, Clean up" approach to improving River Health in our region[55]. We've brought forward investment, committing to reduce the duration of discharges by 50% by 2030; and by 80% at sensitive sites.

3.23 In 2022 we reported a total of nearly 8,000 storm overflow discharge events, however that was in the context of a year of low rainfall. The Baseline Risk and Vulnerability (BRAVA) modelling demonstrates that the effect of climate change and population growth has the potential to increase storm overflow discharges to over 19,000 in an average rainfall year by 2050. We have a clear target outlined in the Defra Storm Overflows Discharge Reduction Plan (SODRP) to reduce overflows to ≤10 events per year (average) per overflow by 2050; to meet this target we will need to address over 13,000 discharges. Table 3-3 summarises the incorporation of the storm overflow discharge reduction plan targets into our DWMP.

Discharge targets	Storm Overflows Discharge Reduction Plan	Final DWMP
No ecological harm	No ecological harm by 2050	≤10 discharges in a typical year by 2045
Discharges to sensitive waterbodies	No ecological harm by 2045	≤10 discharges in a typical year by 2035
Discharges to designated bathing waters	≤ 3 discharges by 2035	≤ 3 discharges in a typical year by 2030
Storm overflow discharge frequency (all overflows)	≤10 discharges in a typical year by 2050	≤10 discharges in a typical year by 2045
Screening controls	All overflows to have screening control	100% coverage of screens by 2045

Table 3-3: Storm overflow reduction plan targets

3.24 Investment to date on storm overflows has focused on the tidal Thames. Decades of investigation, design and delivery has resulted in the Lee Tunnel, in operation since 2016 and Thames Tideway Tunnel in the final stages of construction. These world-leading environmental protection schemes, in conjunction with the Thames Tideway Quality Improvements (TTQI) where our treatment works that discharge into the tidal Thames were upgraded between 2012-2015 have made a generational improvement in water quality.

3.25 Over the next 25 years we need to ensure that we cause no ecological harm from all storm overflows across our region. This is an immense undertaking, and we are starting with sensitive watercourses where discharges have a large effect on water quality. Many are in more rural areas in the Thames Valley.

3.26 Our plan currently covers 749 storm overflow locations, and as of January 2023 we identified that 44% of them may fall into the definition of a High Priority site. This aligns with our AMP8 Water Industry National Environment Programme (WINEP) Storm Overflows

[55] Thames Water - River Health Plan (2022): https://www.thameswater.co.uk/about-us/performance/river-health/investing-in-river-health

Reduction Plan which we submitted to the Environment Agency in January 2023. As we gain a better understanding of our storm overflows and their performance, we will be refining this programme as part of future cycles of the DWMP and future iterations of the WINEP programme.

3.27 Our storm overflow discharge reduction plan requires an ambitious scale of delivery as there are a significant proportion of high-priority sensitive sites to be resolved by 2035. This has resulted in a front-loaded programme and has meant that a large part of our DWMP investment in AMP8 and AMP9 will need to be devoted to the reduction of discharges.

3.28 To comply with the Storm Overflow Discharge Reduction Plan, we forecast expenditure of £10.9bn between 2025 and 2050. This is a significant increase from our draft DWMP forecast of £3.8bn[56]. Our plan for storm overflows is outlined in Table 3-4 and compares our accelerated pace of delivery with the requirements in the storm overflow reduction plan.

fDWMP	Unit	2025 - 2030	2030 - 2035	2035 – 2040	2040 - 2045	2045 - 2050	Total
Capex	£m	682	2,254	3,494	2,982	1,485	10,897
%Total storm overflows improved (Defra Storm Overflow Discharge Reduction Plan target)	%	14	28	52	76	100	n/a
%Total storm overflows improved (Company)	%	20	51	89	99	100	n/a

Table 3-4: Cost and benefit profile on storm overflow performance

3.29 Aligning our plan with regulatory guidelines has an impact on the technology that we will be using to deliver our plan; our project programmes will be delivering an increased number of "end of pipe" solutions such as expanding storm tanks and increasing hydraulic capacity of sewage treatment works. The benefit of this is that we will be implementing proven solutions which will enable us to meet the challenging targets set out in the WINEP guidance. We'll still have the opportunity to review these solutions as the plan develops and progresses and look at the potential for using new technology where possible within the confines of the regulatory recommendations.

3.30 Included in the 2025-30 plan for storm overflows is investment to address infiltration into our network. We propose 278 km of sewer lining in our Groundwater Impacted System Plans[57]. This investment will reduce storm overflow discharges.

3.31 Figure 3-6 is a map of our region with storm overflows and the planned period for investment.

[56] Due to the change in cost base, this value is does not match that reported in our draft plan. It has been adjusted to be in the same cost base as the final plan.
[57] https://www.thameswater.co.uk/about-us/regulation/drainage-plans

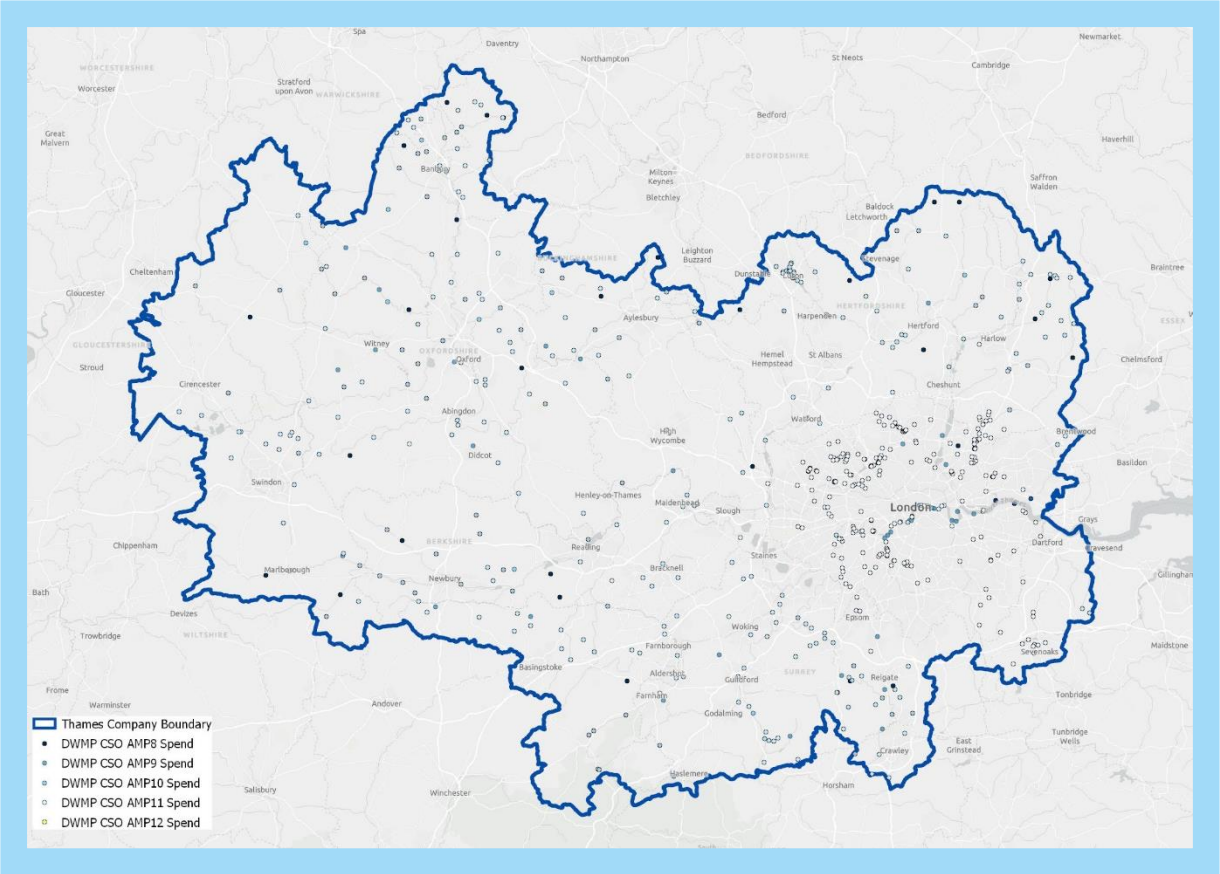


Figure 3-6: Map of storm overflows

3.32 Our DWMP needs to detail our plan to meet the Storm Overflow Discharge Reduction Plan targets. We have produced a dedicated technical appendix on storm overflows[58] containing further plan details.

A plan for flooding from sewers

3.33 From the BRAVA modelling, we know that the impact of climate change and population growth will increase the number of properties at risk of internal sewer flooding in a 1:30 year storm event from 90,310 in 2025 to 138,821 by 2050. Our target is for 100% of properties in the Thames Valley and 95% of properties in London not to be at risk of sewer flooding in up to a 1:50-year storm event. These targets have remained the same as those in our draft DWMP.

3.34 We estimate that it will cost £19.8bn over the 25-year plan period to achieve these targets in the draft DWMP the estimated cost was £18.8bn[59]. The cost increase is due to the change of solutions for storm overflows. Draft DWMP solutions for storm overflows provided flooding benefit. Some of the WINEP solutions for storm overflows provide less flooding benefit. We therefore needed to increase flooding expenditure in the final DWMP to meet the targets.

[58] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-q-storm-overflows.pdf

[59] Due to the change in cost base, this value is does not match that reported in our draft plan. It has been adjusted to be in the same cost base as the final plan.

3.35 At consultation, stakeholders wanted to see the DWMP align to the developing AMP8 plan for 2025 to 2030. This means that at final publication we need to reflect the impact a significant statutory environmental programme (WINEP) might have on the size of the sewer flooding programme in the near term. As WINEP requirements are not finalised at the time of DWMP publication in May 2023, we anticipate having to update parts of our DWMP for sewer flooding investment (via re-submitted data tables) at PR24 submission.

3.36 At public consultation, stakeholders expressed a concern that the proposed pace of implementation in our draft plan was too slow and that we should accelerate delivery so that more properties would be protected, particularly in the early periods of the plan. Our customer research shows that a more evenly paced plan is preferred, so that the impact on bills is more stable[60].

3.37 Stakeholders also expressed concern that the analysis completed in BRAVA with flood risk protection on an up to a 1:50 year storm did not resolve flooding in the most extreme weather events such as in the London July 2021 floods. Here some areas experienced rainfall intensities in excess of a 1:150-year return period storm. To address these concerns, we have compiled a new technical appendix dedicated to analysis of the flooding in London in 2021[61]. The appendix provides an overview of the projects already completed and those in progress, both by us and our partners, in response to the flooding and how DWMP can support further studies going forward.

3.38 The feedback received on sewer flooding during public consultation was detailed and not always unified in response. This, together with the WINEP requirements meant we needed to reprofile the sewer flooding plan for final publication. Our plan for reducing the risk of sewer flooding is outlined in Table 3-5.

fDWMP	Unit	2025 – 2030 (AMP8)	2030 – 2035 (AMP9)	2035 – 2040 (AMP10)	2040 – 2045 (AMP11)	2045 – 2050 (AMP12)	Total
Capex	£m	483	354	2,323	6,072	10,564	19,797
Properties protected in a 1:50	No.	2,472	16,502	15,737	26,180	126,128	187,019
Properties protected internally in a 1:30	No.	1,227	6,107	6,066	9,441	48,658	71,500
Properties protected externally in a 1:30	No.	960	7,595	7,170	11,883	60,522	88,129

Table 3-5: Cost and benefit profile on sewer flood risk reduction

3.39 Table 3-5 shows the profile of costs and benefits AMP on AMP is not uniform over the 25 years. The profile reflects; a restricted spend in AMP8 due to WINEP requirements, a change in delivery model in AMP9 as the 'SuDS delivery pipeline' ramps up, the DWMP decision support tool (DTS) scheduler assigning the most cost beneficial SuDS schemes in

[60] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-n-you-said-we-did.pdf
[61] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-p-response-to-july-2021-floods.pdf

AMP9 and then having to accelerate delivery in the final 3 AMPs to meet ambitious targets. This profile will be smoothed as DWMP transitions into a long-term delivery strategy.

3.40 From 2030, we want to kick start the 'SuDS delivery pipeline' by focusing on a few key areas to deliver a targeted, high-benefit delivery strategy. This will work in specific locations and use tools like the Greater London Authority (GLA) Infrastructure Mapping Application (IMA) to coordinate delivery within London. We'll also make use of the modelling outputs used in the London Strategic SuDS Pilot (LSSP). More details on the mapping application and modelling tools can be found in the SuDS and nature-based solutions Technical Appendix[62].

3.41 Figure 3-7 and Figure 3-8 maps a summary of the proposed number of properties that will be alleviated from sewer flooding, across our area, by 2050. We have split the results into two maps, one for London and a second for Thames Valley. Note that they have difference scales.

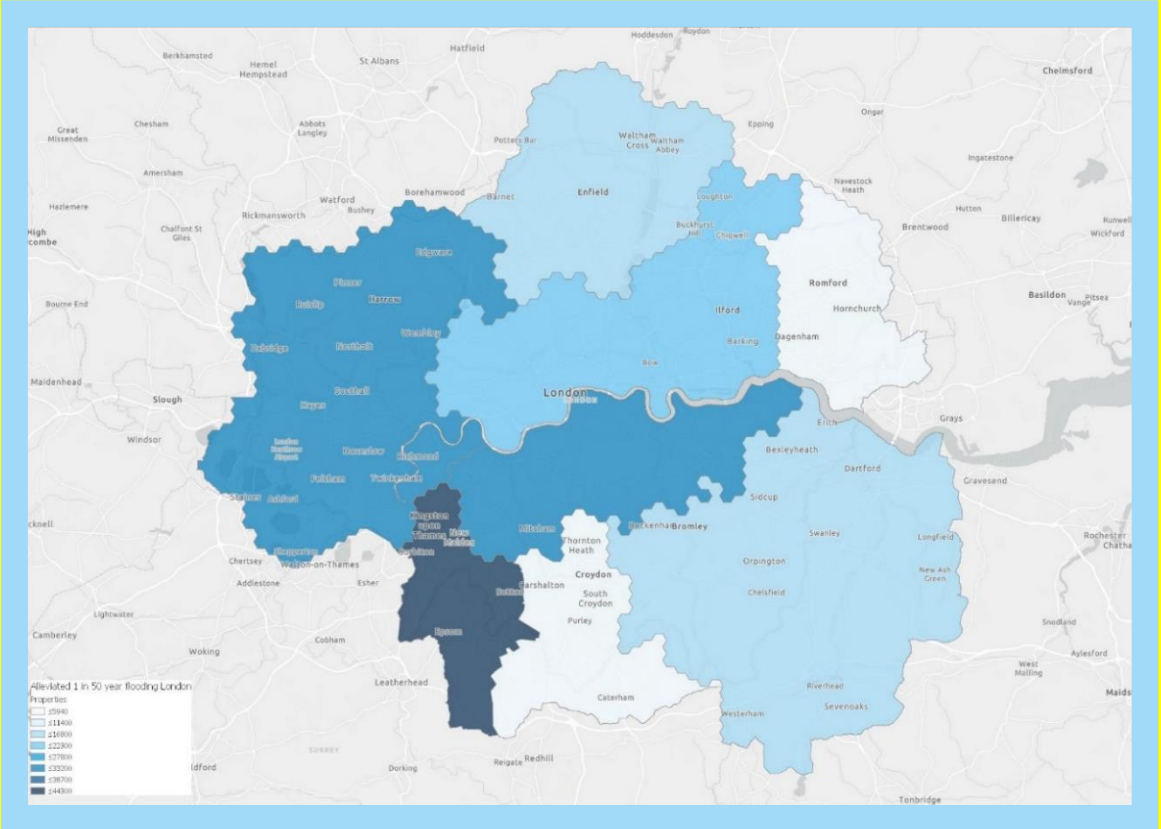


Figure 3-7: Map of number of properties alleviated from sewer flooding in a 1:50 year for by L3 London

[62] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-r-delivery-of-suds-and-nature-based-solutions.pdf

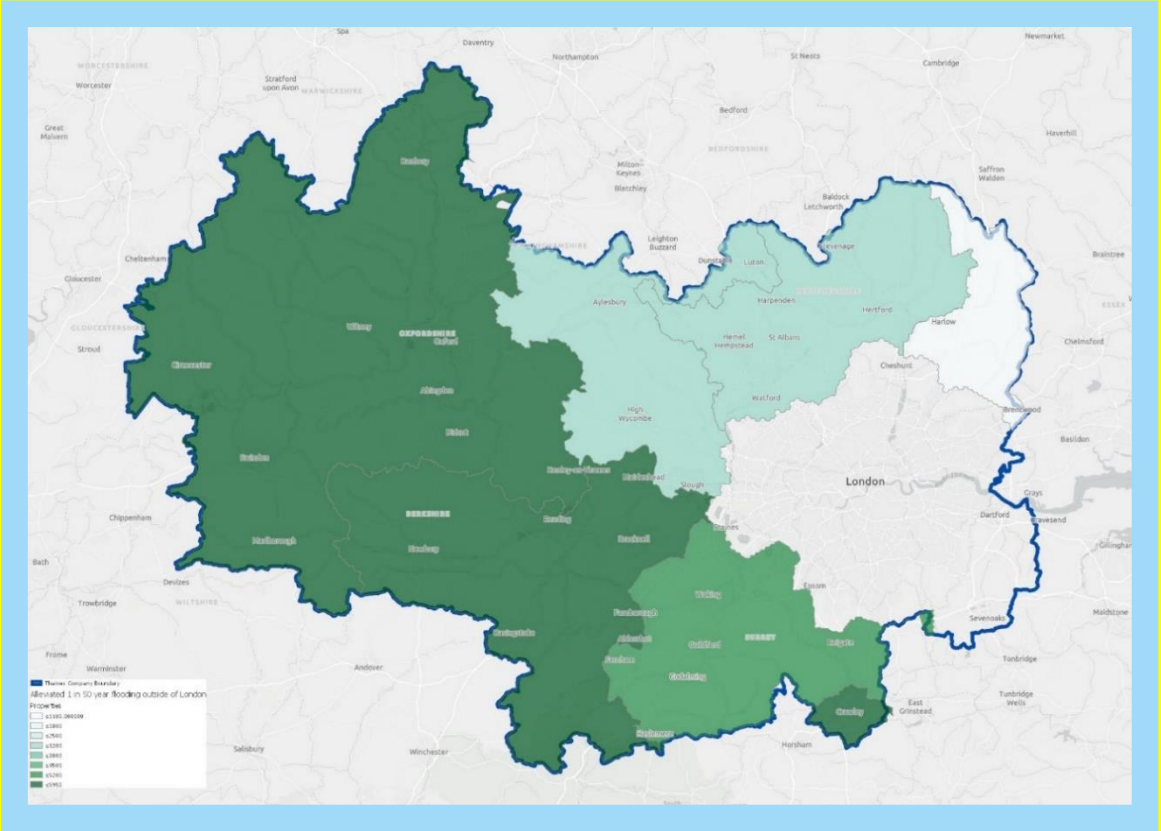


Figure 3-8: Map of number of properties alleviated from sewer flooding in a 1:50 year for by L2 Thames Valley

3.42 Our sewer flood plan is only possible with significant partnership working and at consultation our stakeholders wanted to see more evidence of the basis for this. We have overlaid the EA surface water flood maps[63] with properties where we're planning to address sewer flooding in London to understand the proximity of properties to surface water flood risk. In risk zones (L4) with a low overlap, 40% of properties are within 50 meters of predicted surface water flooding. In risk zones with a high overlap, that figure increases to just above 85%. This analysis supports the collaborative and partnership-led nature of our plan, as there is an opportunity to work closely with our partners to address surface and sewer flood risk. There is also the potential to apply for joint funding from the Environment Agency Flood Defence Grant in Aid (FD-GiA). More details on our approach can be found our Technical Appendix on Partnership Working[64].

A plan for sewage treatment works

3.43 Our preferred plan includes significant investment in treatment works, to ensure they have sufficient capacity to accommodate predicted population growth. This forms a large part of our investment profile, with upgrades proposed to 82 treatment works.

3.44 When we select the most appropriate solution, we assess process intensification (new technology using less land) as well as more traditional solutions.

[63] https://environment.maps.arcgis.com/apps/MapSeries/index.html?appid=4d066e4a4373486e96dff8d3a86207ae
[64] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-s-partnership-working-and-opportunities.pdf

3.45 Our DWMP proposes to invest in 30 site upgrades in the near term (2025 to 2030) and this provides the context for the development of the PR24 submission.

3.46 In our draft plan we proposed an opportunity for a new treatment works in Long Reach catchment near Sevenoaks, Kent. This would be an integrated proposal between the DWMP and the Water Resources Management Plan (WRMP). The river Darent is a sensitive chalk stream that experiences low flow in the river during dry periods, a new discharge from a treatment works may provide much needed water in these conditions. It could also reduce the current treatment capacity demand at Long Reach STW. Stakeholders wanted to know much more about this and queried it during the public consultation and so we followed up with a local workshop between draft and final publication. The proposal is at an initial stage and requires much more 'proof of concept' activities. In this final DWMP we continue to flag it as an opportunity. We will undertake a detailed investigation between 2025 and 2035 and assess both water resource and wastewater costs and benefits. Indicative costs are included within this DWMP.

3.47 Table 3-6 outlines the costs and number of sites being upgraded.

fDWMP	Unit	2025 - 2030	2030 - 2035	2035 – 2040	2040 - 2045	2045 – 2050	Total
Capex	£m	330	599	273	5	26	1,233
Number of treatment works	No.	30	48	4*	0*	0*	82
* For some sites we will upgrade them more than once in the 25-year plan period. This table counts each site the first time it will be upgraded and not again.							

Table 3-6: Cost and number of treatment works to be upgraded

3.48 We have included site-based adaptive plans for two of our complex treatment works in London, at Mogden and Beckton. The plans demonstrate the routes available to upgrade these assets and include an allowance for predicted population growth figures to 2100. More detail on these plans can be found in our Technical Appendix on Adaptive Planning[65].

Resilience of our treatment works to river flooding

3.49 For many years we have been investing to ensure our assets continue to operate during river flooding events, following the Pitt Review[66] (2008) that reported on the catastrophic flooding in Tewkesbury and surroundings. We have now better integrated this work within the DWMP.

3.50 BRAVA modelling was undertaken using baseline river flooding data from the EA. Table 3-7 outlines the costs and the number of sites where upgrades are proposed going forward. This work builds on the previous decade of investment to ensure that when rivers burst their banks near key assets our wastewater service can continue to function.

[65] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-g-adaptive-pathway-planning.pdf
[66] https://webarchive.nationalarchives.gov.uk/ukgwa/20100807034701/http:/archive.cabinetoffice.gov.uk/pittreview/_/media/assets/www.cabinetoffice.gov.uk/flooding_review/pitt_review_full%20pdf.pdf

fDWMP	Unit	2025 - 2030	2030 - 2035	2035 – 2040	2040 - 2045	2045 - 2050	Total
Capex	£m	0	7	5	4	0	16
Number of treatment works	No.	0	80	60	67	0	207

Table 3-7: Cost and number of treatment works to be protected from river flooding

3.51 For further details on river flooding please refer to our Technical Appendix on Resilience[67].

Partnership Working

3.52 Partnership working and has been central to developing our cycle 1 DWMP. Stakeholders have contributed a series of partnership opportunities throughout the development of cycle 1. Our draft DWMP identified 105 potential schemes. Between the draft and final DWMP partners have reviewed all these opportunities and added 47 more. We have also included the 119 applications made and not funded to our AMP7 Surface Water Management Programme. This has yielded a final DWMP with 271 opportunities.

3.53 These opportunities have been screened through a two-stage screening process to better understand which ones are more mature in their development. A quick primary screening exercise was completed followed by a more detailed secondary screening that considered the following elements:

- Type of partner/partnership
- Deliverability of the proposal
- Benefit to customers and the community
- Benefit to the environment
- Benefit to drainage and wastewater services

3.54 The screening exercise has resulted in 80 mature schemes. We have included 71 of these to the final DWMP Data Tables (Table 2 Line 8)[68] . We have written up precis for some of the opportunities in the relevant Catchment Strategic Plans as well as the Non-Technical Summary[69]. To find out more, refer to our Technical Appendix on Partnership Working and Opportunities[70].

3.55 We are proposing to include up to 99 ha. of the 180 ha. of SuDS delivery between 2025 and 2030 for partnership working. This will primarily be selected from opportunities that are currently on (or will be added in the future) our DWMP Partnership Database.

[67] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-u-resilience.pdf
[68] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/data-tables.xlsx
[69] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/technical-summary.pdf
[70] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-s-partnership-working-and-opportunities.pdf

DWMP and AMP8

3.56 In this section we summarise the DWMP plan for AMP8 as developed ahead of May 2023 publication. We expect some elements to change before the AMP8 price review submission in October 2023.

3.57 The DWMP proposes £1.5bn of investment in AMP8 which is split as outlined in Table 3-8. As expected, most expenditure is focused on mitigating spills compared to the draft plan.

fDWMP	Costs (£m)	Benefit	Benefit unit
Storm overflows	682	20%	% of storm overflow locations improved
Flooding	483	2,472	No of properties in a 1:50
		1,227	No of properties resolved from internal sewer flooding in a 1:30
		960	No of properties resolved from external sewer flooding in a 1:30
Treatment Works	330	30	No of sites upgraded

Table 3-8 AMP8: (2025-2030) costs and benefits

3.58 Our AMP8 plan is still under development and will evolve as we get more feedback from the EA on storm overflows within WINEP as well as when final Ofwat cost models are published. Both are expected after publication of the final DWMP. If adjustments to AMP8 plan are significant, we may need to revisit parts of our DWMP publication (data tables) to ensure that they still reflect our near-term plan.

3.59 Our near term DWMP plan is more granular than longer term proposals. A summary of key highlights of our near-term plan are listed below with further details in technical appendices and in the forthcoming price review documentation.

- Sewer flooding proposals differentiated into hot spot locations or clusters with a flood history and predicted future flood risk due to population growth and climate change
- Proposals to support the findings from the July 2021 floods[71]. This includes piloting schemes in catchments. For example, the 'lost' river catchment called the Fillebrook, in the London Borough of Waltham Forest, where regular and repeat flooding has occured, often due to rainfall more than 1:30 year storm, since 2006
- Partnership opportunities to support SuDS[72].
- Proposals for how we are going to generate a 'SuDS delivery pipeline' to mainstream SuDs delivery[73].

[71] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-p-response-to-july-2021-floods.pdf
[72] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-s-partnership-working-and-opportunities.pdf
[73] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-r-delivery-of-suds-and-nature-based-solutions.pdf

What else does the plan provide?

3.60 Our DWMP not only outlines core metrics relating to wastewater service provision but demonstrates additional wider benefits. This is especially relevant as we have implemented a SuDS first approach to our project planning. Green infrastructure provides significant wider benefits to communities and the environment, increasing biodiversity, improving health and well-being, as well as increasing natural capital.

3.61 We used a natural capital assessment for each of the solutions developed to understand if they provide a benefit (positive) or dis-benefit (negative) impact on the environment. We used Natural England's Natural Capital Atlas for seven key ecosystem services.

3.62 As with natural capital, a wellbeing score was created for each of the solutions developed. Datasets of urban areas, open access land, schools and hospitals was used to understand a baseline position and then solutions provided a benefit (positive) or dis-benefit (negative) impact on wellbeing.

3.63 Scores for natural capital and wellbeing were included in the best value assessment undertaken in programme appraisal to define the preferred plan. Details of can be found in the Technical Appendix on Options Development Appraisal[74].

Regional plans

A plan for London

3.64 London benefits from the foresight of the Victorians who constructed the city centre sewer system with twice the capacity needed at the time. While the system, has been hugely extended, especially during the rapid expansion of the city between the two World Wars, the original network still serves our customers every day. London has also benefitted from significant investment in wastewater assets in the past 15 years, predominantly focussed on improving water quality in the tidal River Thames. This includes upgrades at eight sewage treatment works (including a partial rebuild of Deephams STW), completion of the Lee Tunnel and the Thames Tideway Tunnel, which is in the final stages of construction.

3.65 BRAVA indicates that we should expect a 54% increase in the number of properties at risk of flooding internally from a sewer in a 1:30 year storm and a 30% increase for properties at risk of flooding from a sewer in a 1:50 year storm over the next 25 years. In addition, prior to 2035, seven of our eight London treatment works will need to be upgraded to accommodate the demands of London's growing population.

3.66 The challenges facing our London wastewater operations are:

- Keeping up with population growth and economic growth in such a densely occupied city
- Climate change will increase the risk of sewer flooding and storm discharges, which many feel is already at an unacceptable level and disruptive to communities (i.e., July 2021 flooding)

[74] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-d-options-development-and-appraisal.pdf

- A change of approach to solution types and solution delivery to ensure that we do not disrupt this 24/7 capital city

3.67 Our strategy for London is to implement an ambitious and transformational re-greening programme, where we take a 'SuDS-first' approach to reducing and slowing the rate and volume of rainwater entering our sewers. This will deliver wider benefits through enhancing biodiversity, improving air quality and the public realm, and drawing communities together.

3.68 At our treatment works we need to maximise our usage of existing space and intensify our treatment capacity.

3.69 In addition, we aim to develop our thinking on integrated water and wastewater planning with solutions that will benefit both water resources and wastewater. A series of case studies are outlined in our Technical Appendix on DWMP and WRMP alignment[75]. They are:

- A new treatment works near Kempton Water Treatment Works that takes flow from one of the sewers flowing into Mogden STW that will increase flow upstream of Teddington Weir in the river Thames
- Construction of a new treatment works near Sevenoaks to increase base flow in the river Darent

3.70 In conjunction with stakeholders, we agreed three core targets for London that are outlined in Figure 3-9. The costs as well as benefit for flooding and storm overflows for London are in Table 3-9 reported in five-year intervals and Figure 3-10 is a schematic of the profile of activities planned to meet the targets.

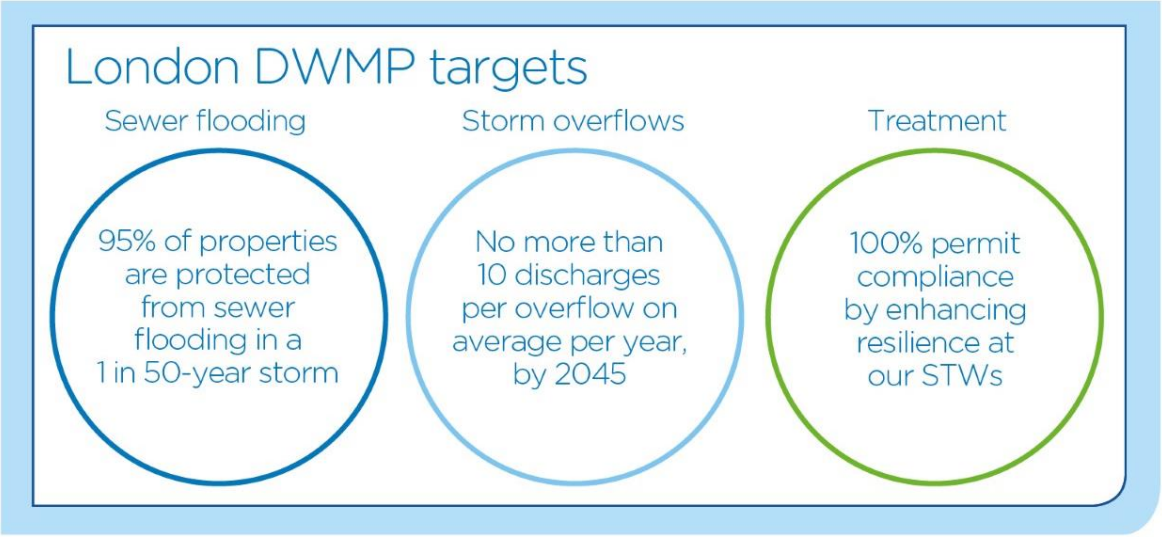


Figure 3-9: Core targets for London

[75] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-j-dwmp-and-wrmp-alignment.pdf

	2025 - 2030	2030 - 2035	2035 - 2040	2040 - 2045	2045 - 2050	Total
Capex (£m)	439	2,314	4,547	6,723	8,898	22,922
Properties protected in a 1:50	1,406	15,001	15,003	22,977	110,319	164,706
% London storm overflow locations resolved	10*	43	75	100	100	n/a
* This excludes improvements due to the Thames Tideway Tunnel						

Table 3-9: Costs and benefits for London

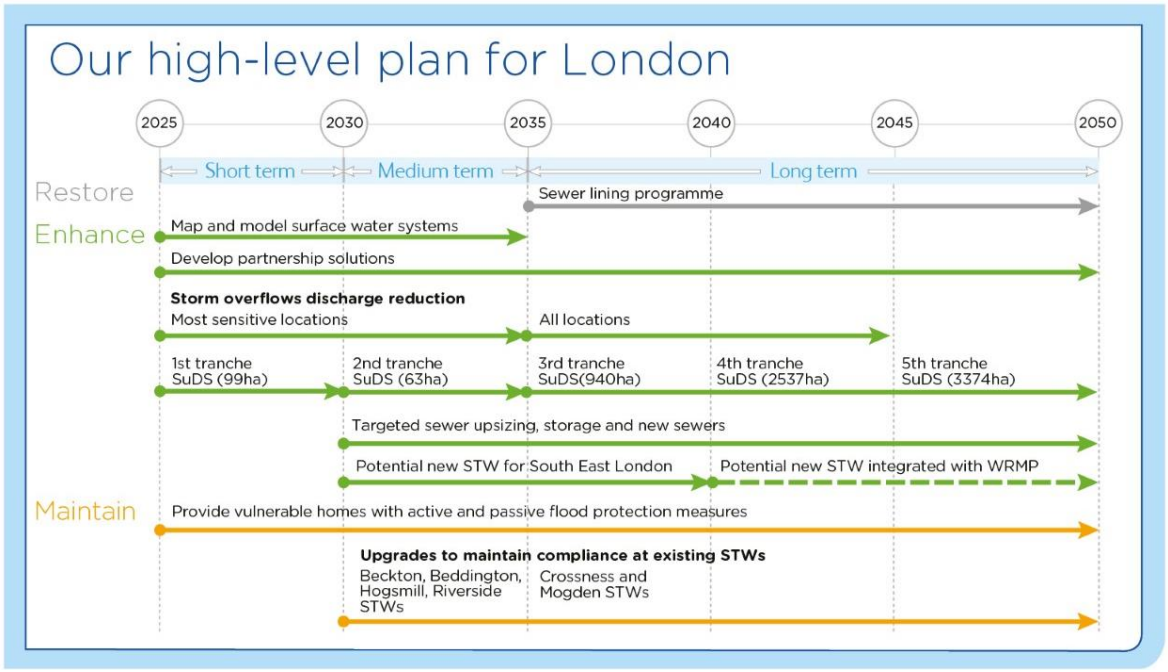


Figure 3-10: Schematic of the plan for London

3.71 From 2025 to 2035 we aim to map and model more surface water sewers. This will allow a more comprehensive understanding of flood risk in London. In east London our catchments experience much higher levels of groundwater infiltration. We will initiate a 15-year programme of sewer lining is proposed to start in 2035 in which 656 km of sewer will be relined, predominantly in Riverside and Long Reach.

3.72 SuDS and partnership solutions underpin the plan, and we propose delivery to extend across the entire plan period with 6,914 hectares – nearly 50 times the area of Hyde Park, proposed across all eight of our London catchments. Almost a third of this is in the Crossness catchment, which encompasses Central London south of the river Thames. For more details on SuDS please refer to our Technical Appendix on delivering SuDS and nature-based solutions[76].

3.73 In addition to the 'green' engineering being undertaken, we will need to deliver extensive, traditional, 'grey' engineering. This will include upsizing existing and creating new sewers,

[76] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-r-delivery-of-suds-and-nature-based-solutions.pdf

and increasing storage capacity in the network, which will be carried out during a 20-year window from 2030 to 2050.

3.74 We plan upgrades to our sewage treatment works upgrades predominantly in the 10 years from 2030 to 2040 to accommodate population growth.

3.75 Table 3-10 outlines the level of activity and quantities proposed by catchment.

Catchment	SuDS (ha.)	Sewer lining (km)	Sewer upsizing (km)	Storage (m^3)	Property Protection*
Beckton	1,104	0	165	950,061	31
Beddington	157	32	21	35,079	0
Crossness	2,412	0	33	565,188	11
Deephams	613	0	1	602,737	0
Hogsmill	357	0	582	495,218	0
Long Reach	306	423	115	413,662	0
Mogden	1,885	0	36	2,008,204	310
Riverside	79	201	2	199,572	0
Total	6,914#	656	953	5,269,721	352

* Property level protection is a term for a collection of devices that can be installed at property level to protect the property from flooding. # 99 ha are not allocated to any catchment and will be delivered through partnership opportunities

Table 3-10: Catchment level activity for London

3.76 The best value plan is demonstrated by radar plots. Our preferred plan demonstrates best value in Figure 3-15.

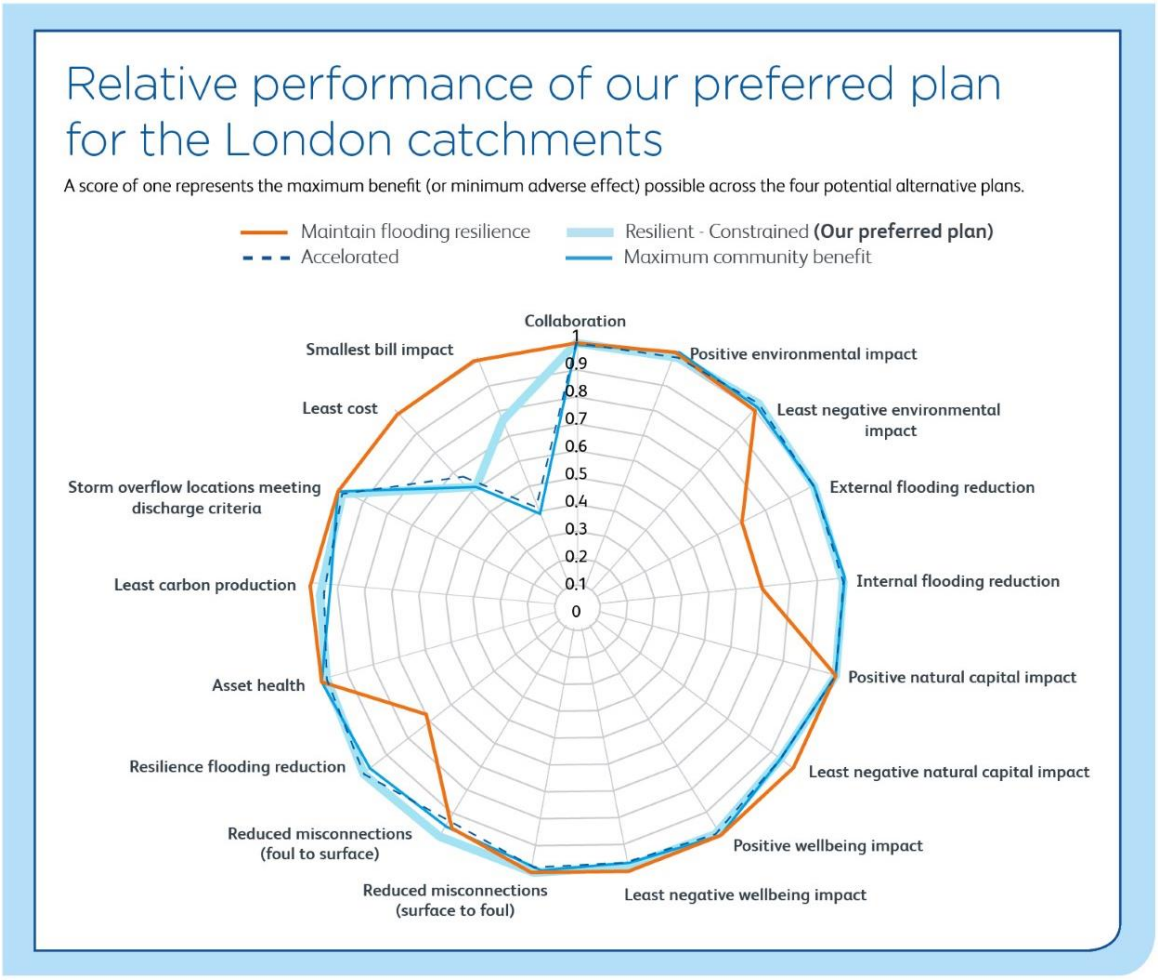


Figure 3-11: Radar plot showing the best value plan for London

A plan for Thames Valley

3.77 Our network in the Thames Valley is decentralised, consisting of more than 350 systems, most of which are not connected to each other. 80% of the systems serve a population of fewer than 10,000 people with the 200 smallest systems serving less than 1% of our total population.

3.78 While strategic intervention is not as relevant, small systems are still important as they often interact with small and sensitive rivers and flood risk can blight an entire village or community. Our customers treasure the rural nature of their surroundings and place high regard on the environment. This region also contains many protected environments including Sites of Special Scientific Interest (SSSI), Areas of Outstanding Natural Beauty (AONB) and globally rare chalk streams.

3.79 BRAVA indicates that we should expect a 56% increase in properties at risk of flooding internally from a sewer in a 1 in 30-year storm and a 54% increase for properties at risk of flooding from a sewer in a 1 in 50-year storm over the next 25 years. In addition, 41 treatment works will need to be upgraded to accommodate population growth.

3.80 The challenges facing Thames Valley are:

- Groundwater infiltration into sewers. The chalk geology means the water table is active and groundwater infiltration into sewers affects 20% of our catchments
- Surface water misconnected to foul sewers
- A high number of ecologically sensitive rivers
- Large levels of growth often extending local towns and villages

3.81 Our strategy for Thames Valley is to deal with flows at the source before they enter our networks. This is both for groundwater and misconnected surface water. We have prioritised sensitive systems irrespective of size. Treatment works are generally not land-locked which allows for expansion using existing technology.

3.82 In conjunction with stakeholders, we agreed three core targets for Thames Valley that are outlined in Figure . The costs for Thames Valley are in Table 3-11 reported in five-year intervals and Figure 3-133 is a schematic of the profile activities planned to meet the targets.

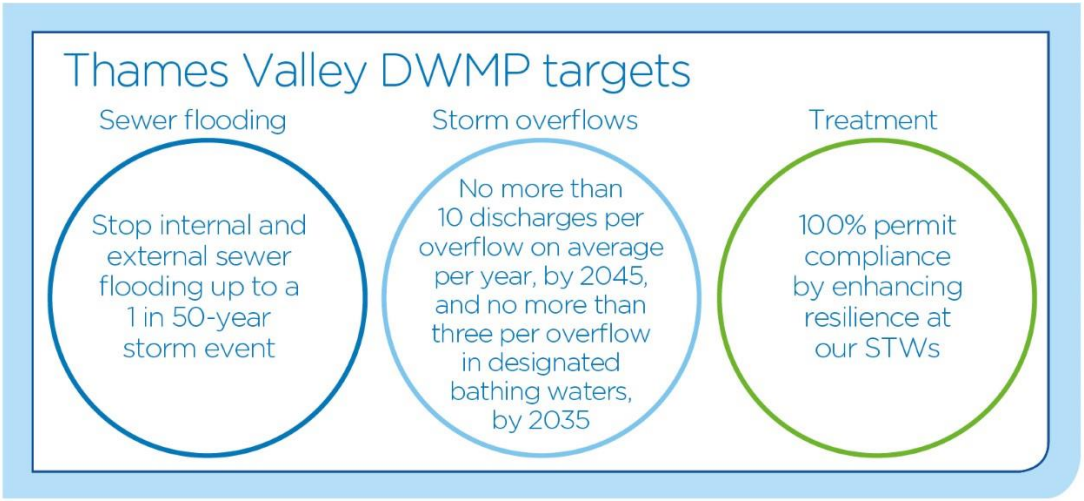


Figure 3-12: Core targets for Thames Valley

	2025 - 2030	2030 - 2035	2035 - 2040	2040 - 2045	2045 - 2050	Total
Capex (£m)	1,055	900	1,549	2,339	3,177	9,020
Properties protected in a 1:50	1,066	1,501	734	3,203	15,809	22,313
% Thames Valley Storm overflow locations resolved	26	56	97	100	100	n/a

Table 3-11: Costs for Thames Valley

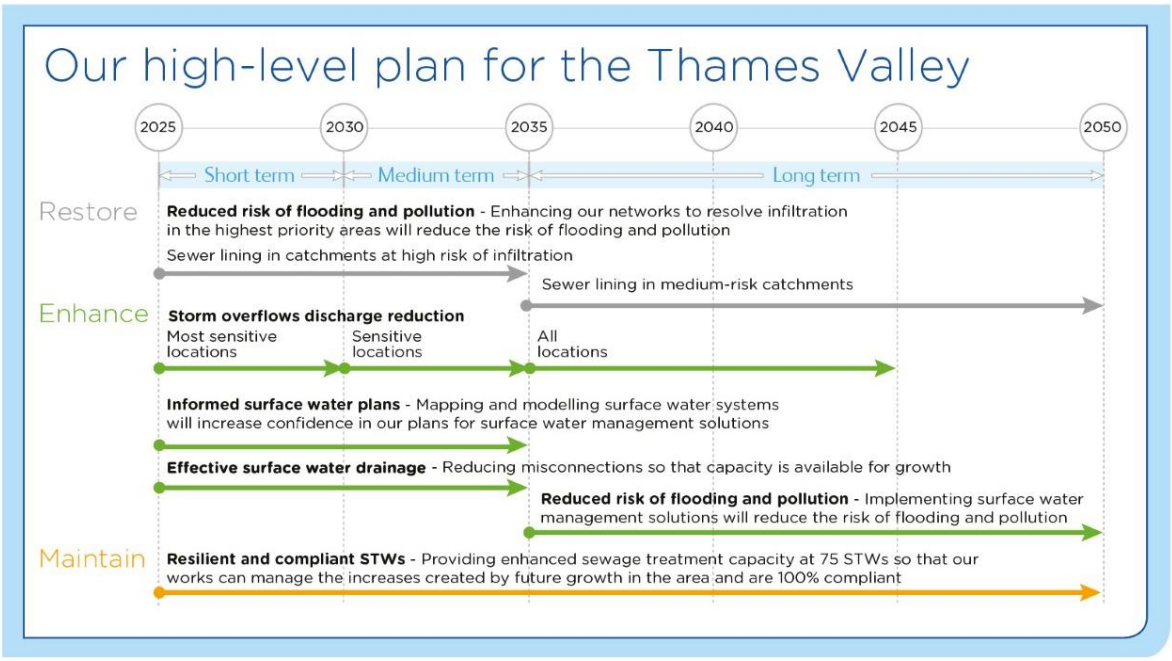


Figure 3-13: Schematic of the plan for Thames Valley

3.83 In the 10 years between 2025 and 2035 we aim to map and model more surface water sewers. This will allow a more comprehensive understanding of flood risk and interaction with our foul water systems where that exists. This will support improving surface water drainage and reducing misconnections into our foul sewers. We anticipate using the ten years between 2025 and 2035 to create capacity for new development with the following 15 years to focus on reducing flood risk and pollution.

3.84 Sewer lining to reduce infiltration is a core element of our Thames Valley plan. The first 10 years will be focussed on high-risk infiltration catchments and the following 15 years the medium risk catchments. We propose to deliver 1,396 km of sewer lining which is more than double that proposed for London.

3.85 Treatment works upgrades are proposed to be carried out across the 25-year plan period and prioritised by their available headroom and when the growth is planned to occur.

3.86 Due to the low density of properties, we often have isolated properties that are at risk of flooding. Property level protection is often more cost effective and therefore proposed for 1,390 properties. This is just above 1,000 more properties than in London.

3.87 Table 3-12 outlines the level of activity and quantities proposed by the L2 regions.

Level 2	Surface water management (ha.)	Sewer lining (km)	Treatment works upgrades
Hertfordshire	116	125	5
Central Bedfordshire, Buckinghamshire, Slough and Luton	75	107	6
West Berkshire, Reading, Wokingham, Bracknell Forest, Windsor and Maidenhead, Hampshire and West Sussex	81	337	20
Surrey	115	23	7
Essex & Thurrock	19	17	5
Oxfordshire, Swindon, Wiltshire, Gloucestershire and Warwickshire	179	588	32
Total	585	1,197	75

Table 3-12: TRFCC partnership level activity for Thames Valley

3.88 The best value plan is demonstrated by radar plots. Our preferred plan demonstrates best value in Figure 3-14.

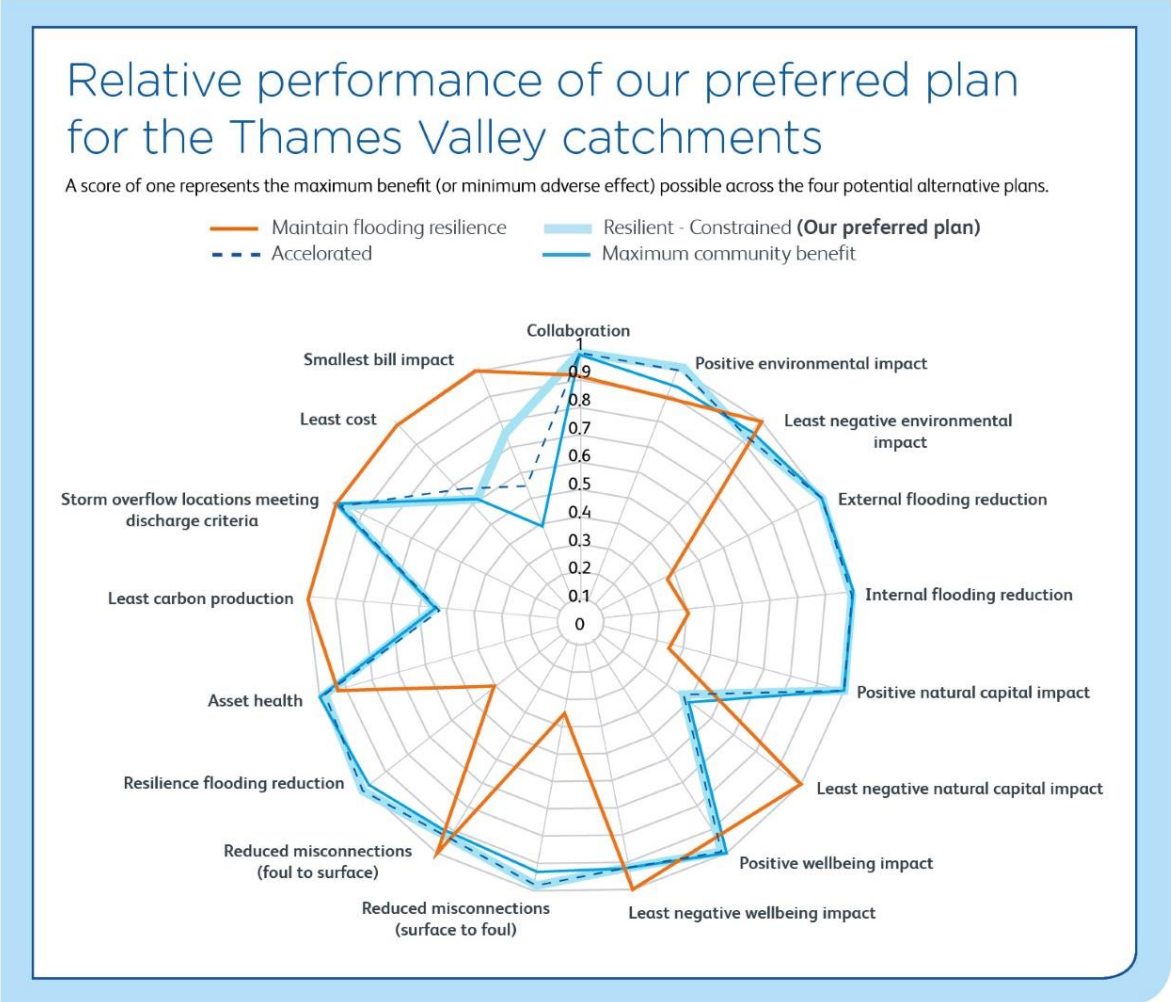


Figure 3-14: Radar plot showing the best value for Thames Valley

Bill impact

3.89 The impact on customer bills is a key consideration for us. This DWMP was developed in times of economically challenging times driven by macro-economic pressures, which have adversely affected many of our customers.

3.90 Customers have reminded us that our plans need to be cognisant of the impact it will have on their bill. They have recognised government and society expects improvements and that these come at a cost. They are also aware that many customers are struggling to pay for essential utilities and services. For more details on our customer research please refer to our Statement of Response called 'You said we did'[77] as well as our Technical Appendix on Customer Engagement[78].

3.91 Table 3-13 outlines indicative customer bill impact in 5-year regulatory periods for London, the Thames Valley and overall.

Preferred Plan	Indicative customer bill impact (£'s)					
	2025-2030	2030-2035	2035-2040	2040-2045	2045-2050	Average Impact
London	3.55	19.92	55.80	113.23	181.66	74.83
Thames Valley	14.55	33.47	54.27	87.38	135.13	64.96
Thames Water	7.36	24.61	55.27	104.29	165.57	71.42
1 – Indicative average annual bill impact over the 25 years of the plan (£ / household) as described in our Technical Appendix on Programme Appraisal[79].						

Table 3-13: Indicative customer bill impact (£ per year per household)

3.92 As we collaborate more with partners and develop co-funded schemes in the future, we expect this bill impact to change as costs are met elsewhere.

Dealing with uncertainty

3.93 Long-term planning like our DWMP is subject to uncertainty, given changes that may take place. The main areas we focussed on in our plan were:

- Costs and maturity of solutions
- Realisation of growth forecasts
- Expected changes to climate forecasts
- Scale of SuDS implementation proposed compared with historic delivery rates

3.94 Uncertainties relating to the costs and maturity of solutions are addressed in our Technical Appendix on Risk and Uncertainty[80]. This appendix explains our routine solution development process. As the maturity of our solutions increases, the cost uncertainty

[77] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-n-you-said-we-did.pdf
[78] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-h-customer-engagement.pdf
[79] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-e-programme-appraisal.pdf
[80] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-i-risk-and-uncertainty.pdf

decreases. For the final DWMP we have estimated that the cost uncertainty on the £31.9bn plan is ±£3,2bn.

3.95 Population growth forecasts and expected changes to climate forecasts are included below in our sections on Adaptive Planning. These and other factors are outlined below and addressed in our Technical Appendix on Adaptive Planning[81].

3.96 The scale of SuDS implementation, especially for London, is very ambitious. Our collaboration with other European and North American megacities, through the UNESCO Megacity Alliance for Water and Climate (MAWaC)[82] has revealed that very few cities aspire to the scale of our green infrastructure ambitions. Some of our stakeholders have raised concerns in relation to our ambitious plan to include a SuDS first approach as part of mainstream project delivery. To address this feedback, we're working across many organisations within the London Surface Water Strategic Flooding Group to ensure we maintain collaborative and partnership-led working. We've also written a Technical Appendix specifically on SuDS and nature-based solutions[83]. More information on the London Strategic Flooding Group can also be found in the Technical Appendix on London flooding[84].

Adaptive Planning

3.97 We estimate £31.9bn investment to address DWMP requirements over the next 25 years. This section assesses whether this plan is future proofed. In other words, in a changing world what could result in a change of the scale, pace and type of solution and is the plan flexible enough to accommodate this change. This is known as adaptive planning.

3.98 In our draft DWMP as a precursor, we produced adaptive pathways plans for key London treatment works demonstrating how growth and technology may drive different investment pathways. We followed a framework used in The EA's Thames Estuary 2100 project[85]. For the final we applied this learning to the whole DWMP plan following the subsequent guidance published by Ofwat on Long Term Delivery Strategies (LTDS)[86]. Our stakeholders at the consultation phase were encouraged to see adaptive planning principles at an asset level and wanted us to apply the learning across the DWMP plan.

3.99 This section provides an overview of how we applied the Ofwat LTDS framework to produce adaptive plans and the insights we learnt on what is driving most change to our plan, what would trigger us to change tack and how adaptable our solutions are to change. For a detailed account refer to our Technical Appendix on Adaptive Planning[87].

---

[81] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-g-adaptive-pathway-planning.pdf
[82] https://en.unesco.org/mawac
[83] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-r-delivery-of-suds-and-nature-based-solutions.pdf
[84] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-p-response-to-july-2021-floods.pdf
[85] thames-estuary-2100-adaptation-pathway-project
[86] https://www.ofwat.gov.uk/publication/pr24-and-beyond-final-guidance-on-long-term-delivery-strategies
[87] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-g-adaptive-pathway-planning.pdf

3.100 Adaptive planning provides a framework for exploring how sensitive a plan may be to alternative scenarios, risks and uncertainties, to ensure that our preferred plan is flexible and resilient to different futures. The approach identifies where thresholds and trigger points for alternative adaptative pathways exist, providing the basis for monitoring and review of the strategy and interventions, mitigating the risk that short-term decision making might reduce or jeopardise choices in the future.

Scenario testing

3.101 The guidance on LTDS specifies a series of eight drivers of uncertainty, each with an adverse and benign scenario. These are referred to as the 'common reference scenarios'. There are drivers of uncertainty for both water and wastewater. We identified that six of the common reference scenarios are most applicable to the DWMP. They are:

- Climate change driver of uncertainty
    i. Adverse climate change scenario
    ii. Benign climate change scenario
- Demand change driver of uncertainty
    i. Adverse demand change scenario
    ii. Benign demand change scenario
- Technology change driver of uncertainty
    i. Adverse technology change scenario
    ii. Benign technology change scenario

3.102 These six scenarios were applied to the three key components of the DWMP. They are:

- Reducing storm overflow discharges
- Protecting properties from sewer flooding
- Addressing sewage treatment works compliance risk

3.103 The methodology applied for each of these common reference scenarios and core components is outlined in Table 3-14.

Drivers of uncertainty & associated common reference scenarios		Reducing storm overflow discharges	Protecting properties from sewer flooding	Addressing sewage treatment works compliance risks
Climate change	Adverse	Latest climate change tools used to create an annual rainfall representative of a high global emissions scenario.	2050 rainfall intensity uplift increased by 20% compared to our preferred plan forecast of 15%.	Not applicable as the climate change estimate is an annual average volumetric increase. This does not change the treatment requirements at a works. Storm tanks at treatment works are addressed within the storm overflow discharges component.*
	Benign	Our preferred plan is representative of a benign scenario and no changes were needed.	2050 rainfall intensity uplift decreased by 8% compared to our preferred plan forecast of 15%.	
Technology#	Adverse & Benign	We compared the forecasts in our preferred plan (for the amount of wastewater generated by the population our networks serve), for a large sample of catchments, against forecasts representative of the definitions for adverse and benign scenarios in the Ofwat LTDS guidance (arising from variation in the extent of smart water meters installed in properties). From this analysis, we created a new adverse (high) or benign (low) forecast for all catchments, depending on which forecast was used in our preferred plan.		We reviewed all sites with investment identified in our preferred plan alongside those indicated in the BRAVA as being at 90% of their Dry Weather Flow (DWF) permit in 2050. We compared the basis of the flow assessment, in relation to return to sewer (RTS) flows, against low (benign) and high (adverse).
Demand	Adverse & Benign	We separately assessed every catchment against Local Authority Local Plans and Office for National Statistics population forecasts, to create a new adverse (high) or benign (low) forecast, depending on which forecast was used in our preferred plan (see note 3)		

* Storm discharges at treatment work are included in the storm discharge column and not the treatment works column. # Technology is defined in the LTDS as smart water meters.

Table 3-14: How we changed our preferred plan forecasts to represent the common reference scenarios

3.104 We conducted analysis on how sensitive our preferred plan was to different climate change, growth and technology scenarios. Figure 3-15 outlines the percentage change in cost. From the data we found that:

- Our preferred plan is most sensitive to the adverse climate change on storm overflows. A high global emissions climate change scenario may require 29% more investment in the

longer-term (up to 2050) to achieve our ambition of reducing storm overflow discharges, compared to our preferred plan. This is because high climate change scenarios may lead to storms of a far greater intensity and with consequent need for our networks and treatment works to handle much higher flows of surface water leading to higher storm overflow discharge volumes

- The second most sensitive element is a benign change in demand on treatment works compliance (i.e., homes are not constructed as quickly as expected) on treatment works compliance
- When considering our solutions for protecting properties from sewer flooding, our preferred plan is in the middle of the benign/adverse range (plus or minus 6%). Climate change has a smaller impact on sewer flooding proposals than it does on storm overflows, as the variation between benign/adverse scenarios is lower for the rainfall we model when testing property sewer flooding solutions, compared to the rainfall we model when testing storm overflow discharge solutions[88]
- Technology scenarios show a significantly lower impact. This is because the timing and scale of solutions in our preferred plan is driven primarily by future flood volumes (due to hydraulic overload of our sewer network) and storm overflow discharge volumes. Both of these will be significantly impacted by rainfall under future climate change scenarios. This significantly outweighs the potential impact of technology scenarios on wastewater generated by our customers

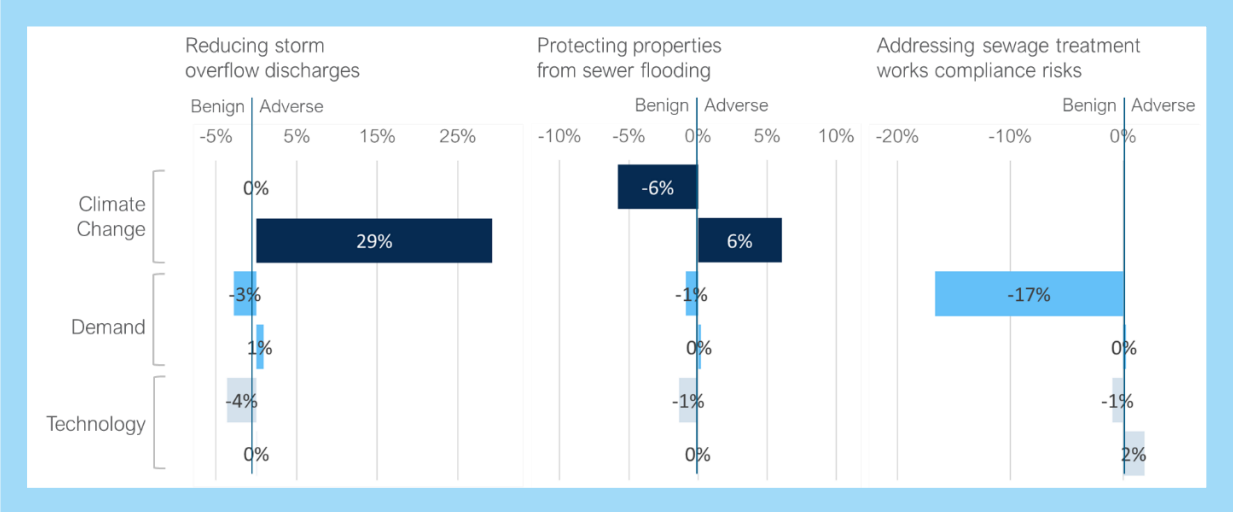


Figure 3-15: Percentage change in costs due to uncertainty using the common reference scenarios

Comparing our preferred plan against a range of plausible futures

3.105 Following Ofwat's LTDS framework we combined climate change, growth and technology scenarios to generate plausible futures that drove different plans or pathways. We then compared our preferred plan to the subsequent "core" and "adverse" pathways. Figure 3-15 shows that the results of this work for sewer flooding and storm overflow investment.

[88] Our target is to ensure properties are protected against sewer flooding in storms that have a 1 in 50 chance (2% probability) of being equalled or exceeded in any given year. When considering storm overflow discharges, the targets require consideration of storms with much higher probabilities as they relate to storms typically occurring every year.

See our technical appendix for further details how we did this and a full definition of tested scenarios and their impact on different types of solution.

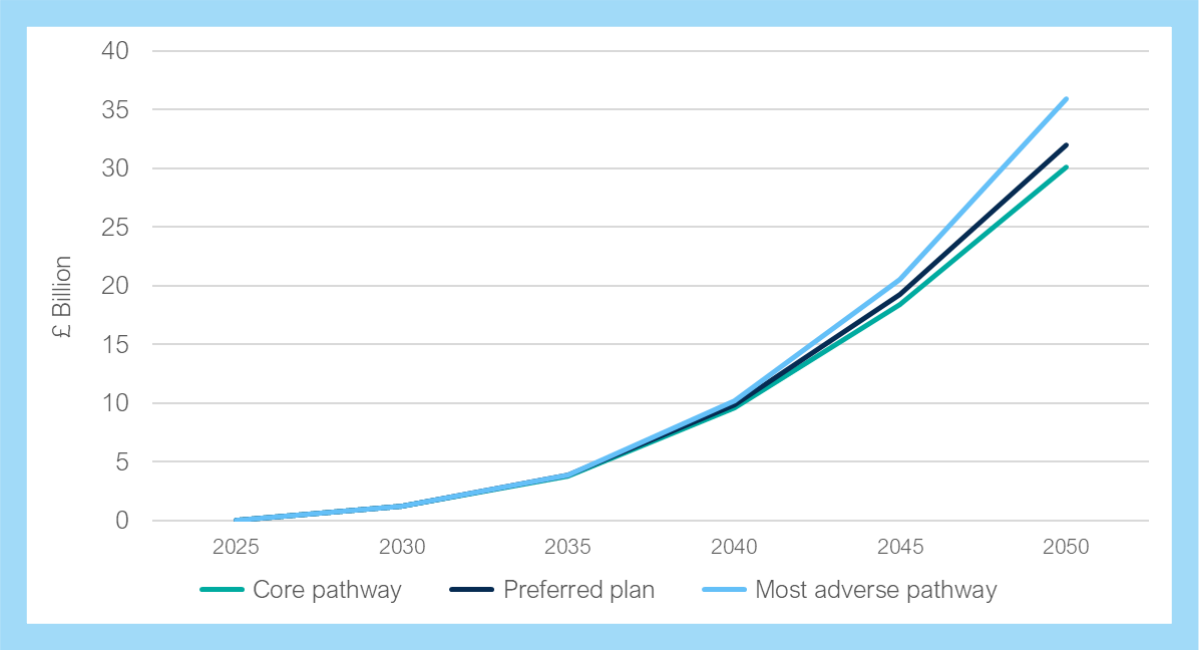


Figure 3-16: Impact of different futures on our investment profile (reducing storm overflow discharges and protecting properties from sewer flooding)

3.106 In the medium term different combined forecasts (climate change, growth and technology) do not have an impact on driving different plans as meeting ambitious environmental targets dictate the spend trajectory. So as a result, our preferred plan is aligned to a no- and low-regret (core) pathway up to 2040 in terms of overall investment.

3.107 Beyond 2040, divergent climate change forecasts drive different pathways. Our preferred plan tracks a position between the core and adverse pathways. The cost of our preferred plan is 4% greater than the core pathway cost, and over 25% less that the most adverse pathway cost. The positioning of the preferred plan closer to the core, enables us to more easily accelerate or de-accelerate the pace of the plan, retaining flexibility. We are able to set this position as our solutions are small, dispersed, or modular making it easier to adjust. If our plan was dominated by single point, long lead time, large infrastructure solutions then this would not be possible, and a core pathway throughout would be more pragmatic.

Setting trigger points

3.108 Knowing when we must change pace is a key element of adaptive planning. Using these results, we have determined future trigger points where, if the forecasts were to be realised (or predicted more accurately), we may need to deviate from our preferred plan.

3.109 There are two trigger points for climate change, which consider both storm overflows and sewer flooding and a separate trigger point for demand. Additionally, at each trigger point both an adverse and benign alternative pathway is plausible. Combining these together has resulted in 9 possible alternative pathways that were considered.

3.110 We have a choice on when to change trajectory for the climate change driver. If adverse forecasts are predicted in the near term, we have the option to change trajectory as early

as 2040. These are labelled alternative pathways 1 and 2. If climate change forecasts remain uncertain, we could delay to 2045 and still deliver the investment needed for realisation of an adverse forecast by 2050. These are the alternative pathways labelled 3 and 4. These changes assume that climate change forecasts are not refreshed but tracked. We expect refreshed forecasts before the changes are required and we will then repeat this analysis with the refreshed forecasts.

3.111 We can also choose to change trajectory for demand. Our growth forecast in the preferred plan is adverse, if growth does not materialise at the rate we forecast, we can switch to a benign forecast. It would be prudent to change in 2030. If we chose to move to a benign trajectory for demand after 2030, we would have a duplicate set of 4 climate change scenarios (as above) now applicable. These are labelled alternative pathways 5, 6, 7 and 8.

3.112 Figure 3-17 is a graphical representation of all nine adaptive pathways identified for our plan as outlined above.

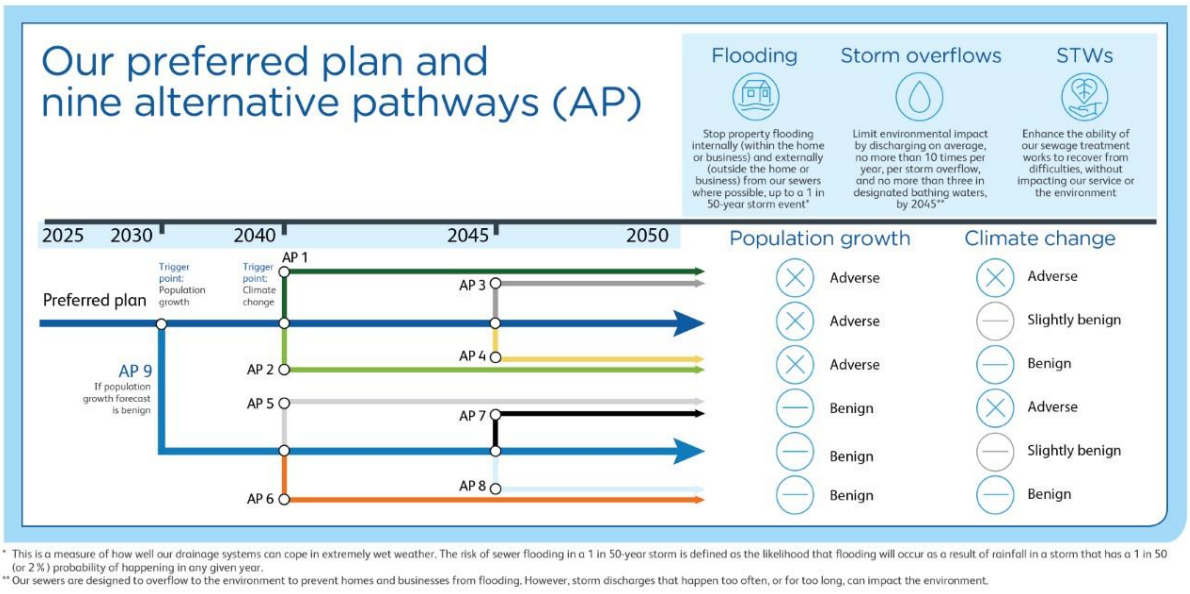


Figure 3-17: Adaptive plan pathways for our DWMP

3.113 Cumulative costs for all the adaptive pathways are in the Table 3 of the Data Tables[89] with more information on our work for adaptive planning pathways, please refer to the Technical Appendix on adaptive Planning [90]. Our main insights from this analysis are:

- Our 25-year forecasts seem to be mostly sensitive to climate change, with variation expected after 2035
- Future decision points are predicted in the last 10 years of our plan, mostly driven by climate change science. If current forecasts that predict significant uncertainty materialise, the investment needed may be larger than our preferred plan
- Our solutions are scalable, which makes the risk for maladaptation low. For example, process intensification for treatment works within the existing site footprint, is more

[89] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/data-tables.xlsx
[90] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-g-adaptive-pathway-planning.pdf

scalable than land purchase for larger or new treatment works. Similarly, on network solutions that address the root cause of the problem i.e., unwanted flows (infiltration, surface water etc.) allow us to vary the level of activity to keep pace with change. If predictions on climate change are different from our preferred plan, we can ramp up or down the level of SuDS we undertake or misconnections we resolve

- Our analysis based on the six relevant common reference scenarios provides a robust basis for long tern adaptive planning

3.114 This is our first comprehensive adaptive planning analysis on an ambitious 25-year investment programme. Many of the key assumptions on population growth and climate change will continue to be updated. We will repeat this in cycle 2 of the DWMP, refining our approach further and changing our adaptive plan accordingly

4 PART C: THE DWMP AS AN INTEGRAL PART OF PLANNING

4.1 The DWMP is not a stand-alone planning framework. It has close links with other plans and strategies as mentioned in the introduction. In this section we explore the relationships between the DWMP, WINEP, PR24 and Long-Term Delivery Strategies and consider base and enhancement expenditure.

How and why the preferred final DWMP plan differs from the draft DWMP

4.2 Our preferred plan has fundamental differences to the draft plan that was consulted on in summer 2022. These changes are due to feedback we received at consultation as well as expectations from regulators. The key changes are:

- Comprehensive inclusion of storm overflows as well as alignment of costs, solution types and profile from WINEP
- Inclusion of river flooding to our treatment works
- Alignment of our treatment works growth and flooding programmes for 2025-2030 between the DWMP and PR24
- Amendment of our flooding programmes to take account for the London flooding events in July and August 2021
- Significant reprofiling of investment due stakeholder feedback (for acceleration) and to include all the other changes proposed

4.3 The cost increase between the draft and final DWMP is a £8.5bn (or 37%) with a £7.5bn (48%) increase in London and a £1.1bn (14%) increase in the Thames Valley.

Vision 2050

4.4 Vision 2050 is the Thames Water 25-year aspirational long-term vision for our water and wastewater business. It encompasses the assets, people and interactions required to provide the services. We used it in the DWMP Strategic Context stage to clearly set the level of ambition within our DWMP.

4.5 Figure 4-1 maps the alignment between Vision 2050 and targets for planning objectives set within the DWMP Strategic Context stage. Our corporate vision sets the long-term goals and our DWMP describes in broad terms what needs to happen to get us there. Both Vision 2050 and DWMP are supported by stakeholder consultations with the Vision 2050 customer consultation[91] considering a much wider range of activities undertaken by water companies.

[91] https://www.thameswater.co.uk/media-library/home/about-us/performance/customer-research-library/vision-2050-may-2022.pdf

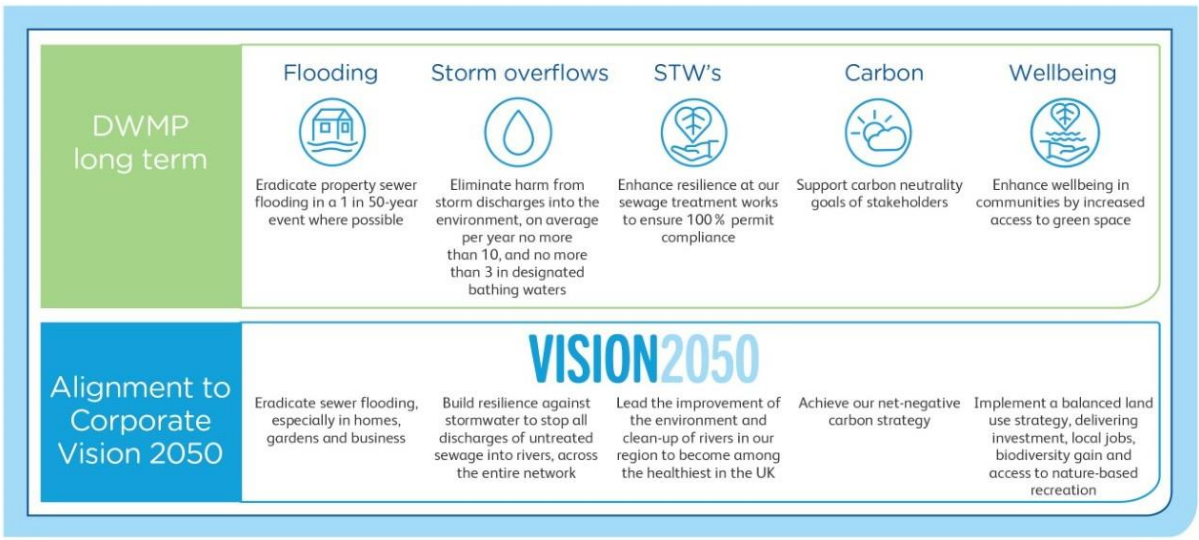


Figure 4-1: Relationship between our corporate 2050 vision and our DWMP

Long-Term Delivery Strategies

4.6 To help us make the right decisions for the long term, Ofwat requires that our five-year business plans (PR24) are set out in the context of a long-term delivery strategy (LTDS). Industry guidance has been produced to support the delivery of LTDS and to embed adaptive planning approaches. The LTDS sets out long-term outcomes aligned to our Vision 2050 and how we are going to get there in an adaptable way given the uncertainties ahead of us.

4.7 Our LTDS will rely heavily on DWMP and WRMP findings as both produce long term adaptive pathway plans. The key differences between the LTDS and the DWMP are:

- The DWMP is focused on storm overflows, flooding and treatment works compliance. This is a sub-set of the areas covered in the LTDS which applies across all water and wastewater assets
- Cycle 1 of the DWMP is non-statutory and is a 25-year plan. It sets ambitious targets aligned to our ambitious 2050 Vision while complying with the DWMP framework. It is therefore unconstrained in the long term. This makes it a driver for change as it clearly defines the size of the challenge ahead. It is not a delivery plan which sets out who pays for what and is constrained by affordability and deliverability. In contrast the LTDS will incorporate elements of deliverability and bill-payers' contributions more holistically than the DWMP
- The DWMP is published ahead of regulatory price reviews with the aim of being the evidence base for the price review. The LTDS is published as part of the price review document suite to ensure medium term plans are clearly framed in the context of a long-term delivery plan

Water Industry National Environment Programme

4.8 The WINEP is a delivery focussed list of interventions agreed with the EA that water companies need to implement to improve the environment. The targets and objectives are defined by regulators with companies proposing the best interventions to meet those targets.

4.9 DWMP in its first cycle sets out the plan to achieve the targets set in the Storm Overflow Discharge Reduction Plan. Addressing performance on storm overflows is a key part of WINEP. DWMP therefore describes the scale of intervention and the outline plan for storm overflows which feeds into a part of WINEP delivery. WINEP encompasses a broader range of programmes than spills (e.g., measures to reduce phosphorus) and future cycles of DWMP may broaden to reflect all aspects of WINEP.

Price Reviews

4.10 PR24 (Price Review 2024) is the regulated process water companies go through to determine costs, benefits, targets, and expenditure for their next Asset Management Period (AMP). It is the regulatory mechanism that funds the first five years of DWMP, subject to Ofwat approval.

4.11 Price reviews determine the revenues a company can raise from customers over a 5-year period, to deliver the performance and outcomes the company has committed to achieve. The DWMP feeds into price reviews albeit only part of price reviews as DWMP focuses on part of the wastewater sector requirement.

4.12 The final DWMP is published on 31 May 2023 and the PR24 submission to Ofwat is due to be submitted in October 2023. Our consultation feedback from regulators stated the requirement for the first five years of the DWMP and the PR24 submission to be in alignment. This includes WINEP proposals on storm overflows as these are in PR24.

4.13 This alignment has resulted in our DWMP reflecting the cost and delivery restrictions anticipated for the first five years (i.e., constrained) and then our plan being unconstrained between 2030 and 2050.

4.14 Our programme to address storm overflows at the highest priority sites (submitted to the Environment Agency in January 2023) is consistent in the WINEP and DWMP plans. The final list of storm overflows to be addressed between 2025 and 2030 is subject to change depending upon decisions we will have to make when developing the WINEP, but the solutions we choose will remain consistent in both plans. For more details, please refer to the Technical Appendix on Storm Overflows[92].

4.15 Ongoing review of the solutions we plan to deliver in WINEP and PR24 will continue until we make our PR24 submission in October 2023.

4.16 Through our DWMP we have demonstrated that unless action is taken, population growth and climate change will increase the number of properties at risk of sewer flooding. We have identified the strategic interventions and their associated costs to address this risk in DWMP which will inform PR24.

4.17 Our final area of alignment between PR24 and DWMP is sewage treatment works upgrades. We ensure that our PR24 STW upgrade plan is developed using the DWMP data. This ensures that the list of sites requiring an upgrade, as well as the cost of these projects, are

[92] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-q-storm-overflows.pdf

aligned. We anticipate that the STW upgrade plan for PR24 will be further developed following DWMP publication. We currently view that this may only impact a handful of sites where more detailed solutions and cost development work are progressing post DWMP submission.

4.18 If, as a result of the finalisation of WINEP, there are significant shifts required to DWMP submitted in May, we may have to re-state part of DWMP (data tables) at PR24 submission in October 2023 to ensure a continued line of sight between DWMP and PR24.

Base and enhancement expenditure

4.19 Water companies and Ofwat categorise expenditure into different themes. There are two main elements of expenditure: base and enhancement.

4.20 Ofwat defines **Base expenditure** as '*routine, year-on-year, expenditure which companies incur in the normal running of their business - to provide a base level of good service to customers and the environment. It includes expenditure to maintain the long-term capability of assets, as well as expenditure to improve efficiency.*'[93]

4.21 Furthermore, they define **Enhancement expenditure** as *'generally where there is a permanent increase or step change in the current level of service to a new 'base' level and/or the provision to new customers of the current service. Enhancement funding can be for environmental improvements that are required to meet new legal obligations, improving service quality and resilience, and providing new solutions for water provision in drought conditions.'*[93]

4.22 A key principle of DWMP is that we maximise the performance we get from base activities prior to proposals for enhancement expenditure. For example, in the sewer flooding programme, before recommending enhancement schemes to increase capacity by either reducing flow or building bigger sewers, we ensure that our assets are appropriately maintained. We also maximise any opportunities for optimising our existing assets and operation, to increase capacity and reduce flood risk. Keeping our networks silt-free and 'Smart network' approaches (holding back flow) are tactical maintenance activities that are an integral part of managing performance where hydraulic deficits exist. This is represented in a hierarchy of options reproduced below from our Technical Appendix on What Base Buys[94]. This shows that maintenance activities and efficient ways of working are the platform. They will not solve that hydraulic deficit but are accounted for in our modelling of what is additional required to address growth and climate change. For more details see the Technical Appendix on What Base Buys[94]

[93] Ofwat (2022), Creating tomorrow, together: Our final methodology for PR24: https://www.ofwat.gov.uk/regulated-companies/price-review/2024-price-review/final-methodology/
[94] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-o-what-base-buys.pdf

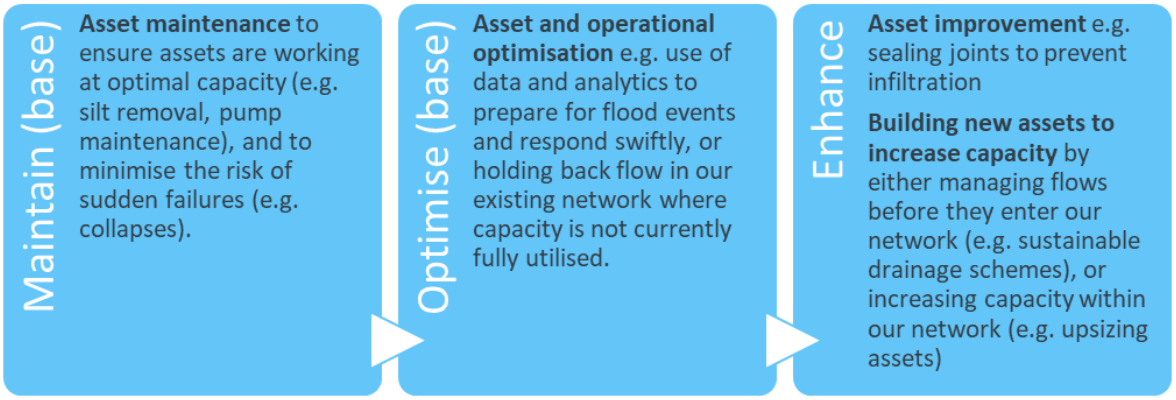


Figure 4-2: Base and enhancement activity

5 PART D: HOW WE DEVELOPED THE PLAN

5.1 We followed the DWMP framework[95] to develop this plan. Appendix F[96] of the industry-wide framework provides an example of the contents of a DWMP. We have retained the content in this document but restructured it to put a clear focus on the scale of the problem (section 2, Part A) and the details of the plan (section 3, Part B).

5.2 We anticipate this section (Part D) will be of interest to a more technical audience. For each of the stages in the process there is a dedicated Technical Appendix that provides more detail in each area. Annex A provides a summary of how in developing this plan we have complied with the DWMP Guiding Principles.

Strategic context

5.3 The first stage in the DWMP process is called Strategic Context. In this stage we collaborated with stakeholders to:

- Confirm the planning period
- Set draft and final planning objectives
- Agree the metrics we want to measure (called drivers in the documentation)
- Set the DWMP definition and scope
- Confirm the geographic extent of the plan

[95] https://www.water.org.uk/policy-topics/managing-sewage-and-drainage/drainage-and-wastewater-management-plans/
[96] https://www.water.org.uk/wp-content/uploads/2020/01/Water_UK_DWMP_Framework_Appendices_September-2019-F.pdf

5.4 Figure 5-1 is a visual representation of the main components of the Strategic Context stage.

Figure 5-1: Main components of Strategic Context stage

5.5 Strategic Context development was completed in the 12 months from September 2019. Over 70 stakeholder groups were engaged and commented on a draft Strategic Context document. The engagement included a series of five questions that can be found in Figure 5-2.

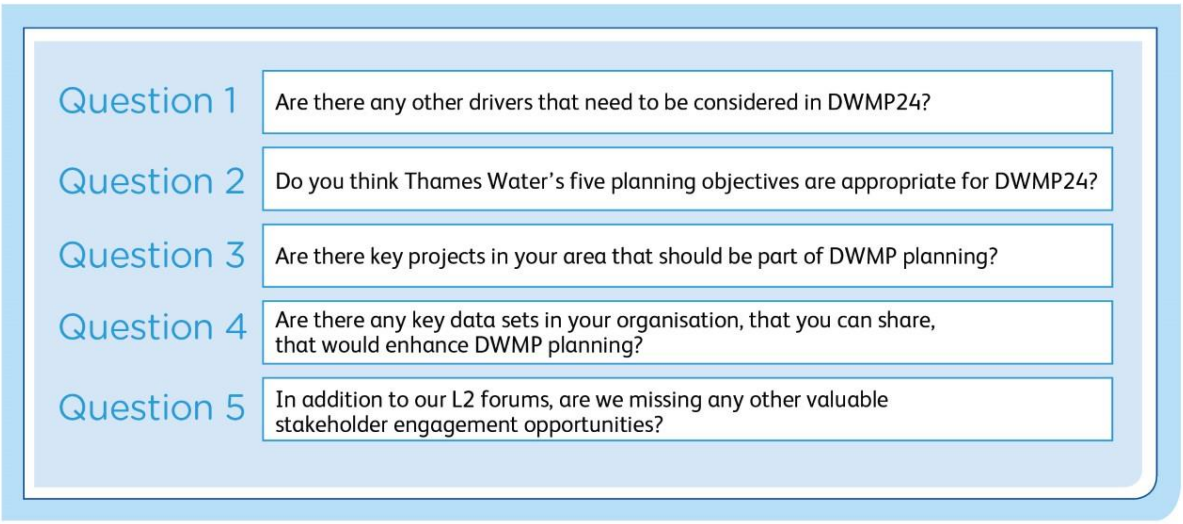


Figure 5-2: Consultation questions for Strategic Context stage

5.6 Feedback was received from representatives for all 13 of the Thames Regional Flooding and Coastal Committee partnerships.

5.7 The planning period was set at 25 years. The DWMP framework specifies a minimum of 25 years with assessment done at 5-year and 10-year intervals. We have additional interim assessment periods to help improve the delivery profile of our plan. Figure 5-3 represents the three dominant time periods in the DWMP.

Figure 5-3: DWMP planning horizons

5.8 When working with partners during the development of our DWMP we recognised that some other plans, notably the Thames Estuary 2100 plan, have a 75-year plan period. For Cycle 2 of the DWMP, we may extend the plan period in some regions or for specific cases, to align with other related plans.

5.9 The metrics we chose to measure (called drivers in the documentation) for the DWMP were developed through collaboration. National drivers were identified and prioritised to develop a set of common drivers through a DWMP Task and Finish group. These were agreed by Water UK in September 2020.

5.10 Stakeholder consultation contributed to drivers which are summarised in Table 5-1.

Driver	Description	DWMP applicability
The climate is changing	The weather and climate are changing. We expect more extreme events including heat waves and flash flooding.	Predict the likely impact of climate change on our systems and propose interventions to reduce the risk.
The population is increasing	The population of our region is set to grow by more than 2 million in the be 2045.	Predict the likely impact of climate change on our systems and propose interventions to reduce the risk.
We have a legacy of surface water in foul sewers	Rainwater enters our foul system, reducing capacity for new development, causing flooding to occur and storm overflows to discharge	Proposed interventions that address the root cause of the problem: not making pipes bigger but keeping systems separate and attenuating flow before it enters the appropriate sewer.
We need to take care of our rivers	Social awareness of the environment is increasing. Customers desire cleaner rivers with reduced pollutants	Propose interventions to eliminate the impact of storm overflows on the environment. Propose interventions to ensure treatment works can accommodate growth and remain compliant with their permit conditions.
Customers expect more	Mega trends research[97] we conducted in 2017 shows customers' demands, behaviours, preferences and expectations of their wastewater service is changing.	Develop a DWMP plan that accounts for future customer expectations.
We need greater resilience and mitigate our assets from deterioration	System resilience and adaptability to uncertainty, especially in population growth and climate change, is fundamental to dealing with the uncertainties of the future.	Use adaptive planning approaches to understand how our DWMP would differ if different growth or climate change scenarios were to be realised.
Technology is changing	Not only is technology changing but the application of it in wastewater is significant. This is predominantly in the field of monitors and sensors that collect and report real time (or near real time) data. Use of short-term predictive planning tools like Digital Twins are beginning to be used in the industry.	Plan to change. Use the most up to date data for our first cycle of DWMP and expect that we will know much more in each future cycle.
Land for expansion is limited	Available land to use for drainage and wastewater is ever decreasing.	We recognise that land is scare in urban areas. Land we intend to use needs to provider additional benefits to local communities. (i.e., implement nature-based solutions). Use process intensification technology at treatment works where these is no or restricted available land.
The legislative and regulatory environment could change	There is the potential for legislative and regulatory change within the water industry	The DWMP (especially in cycle 1) will remain closely aligned to legislative and regulatory changes as they emerge.

Table 5-1: Summary of future drivers of change

[97] https://www.thameswater.co.uk/media-library/home/about-us/london-2100-a-case-for-change.pdf

5.11 Common planning objectives align with and were agreed by all companies and ratified by Water UK. Bespoke planning objectives are relevant to our Thames Water DWMP only.

5.12 Figure 5-4 is a schematic of our planning objectives. They are colour coded with green objectives being common, blue objectives bespoke and orange objectives not currently amenable to long-term forecasting. These have been labelled 'outcome measures'.

5.13 The eight measures that are amenable to long-term forecasting progress to Stage 3 BRAVA, where the forecasting is completed. The four remaining measures are quantified when the plan is created in Stage 5 Programme Appraisal.

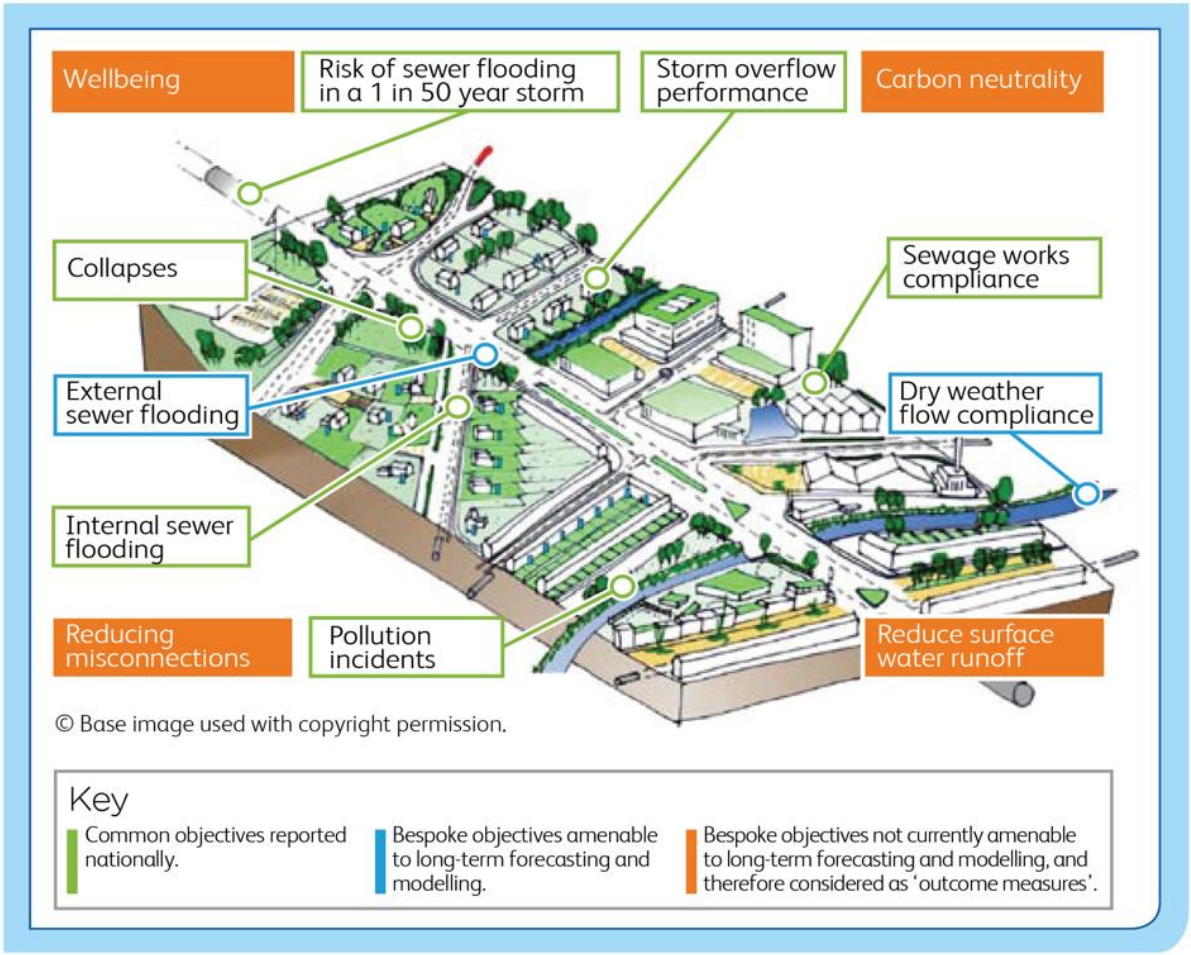


Figure 5-4: Agreed planning objectives for cycle 1 DWMP

5.14 A summary of the planning objectives and metrics can be found in Figure 5-5.

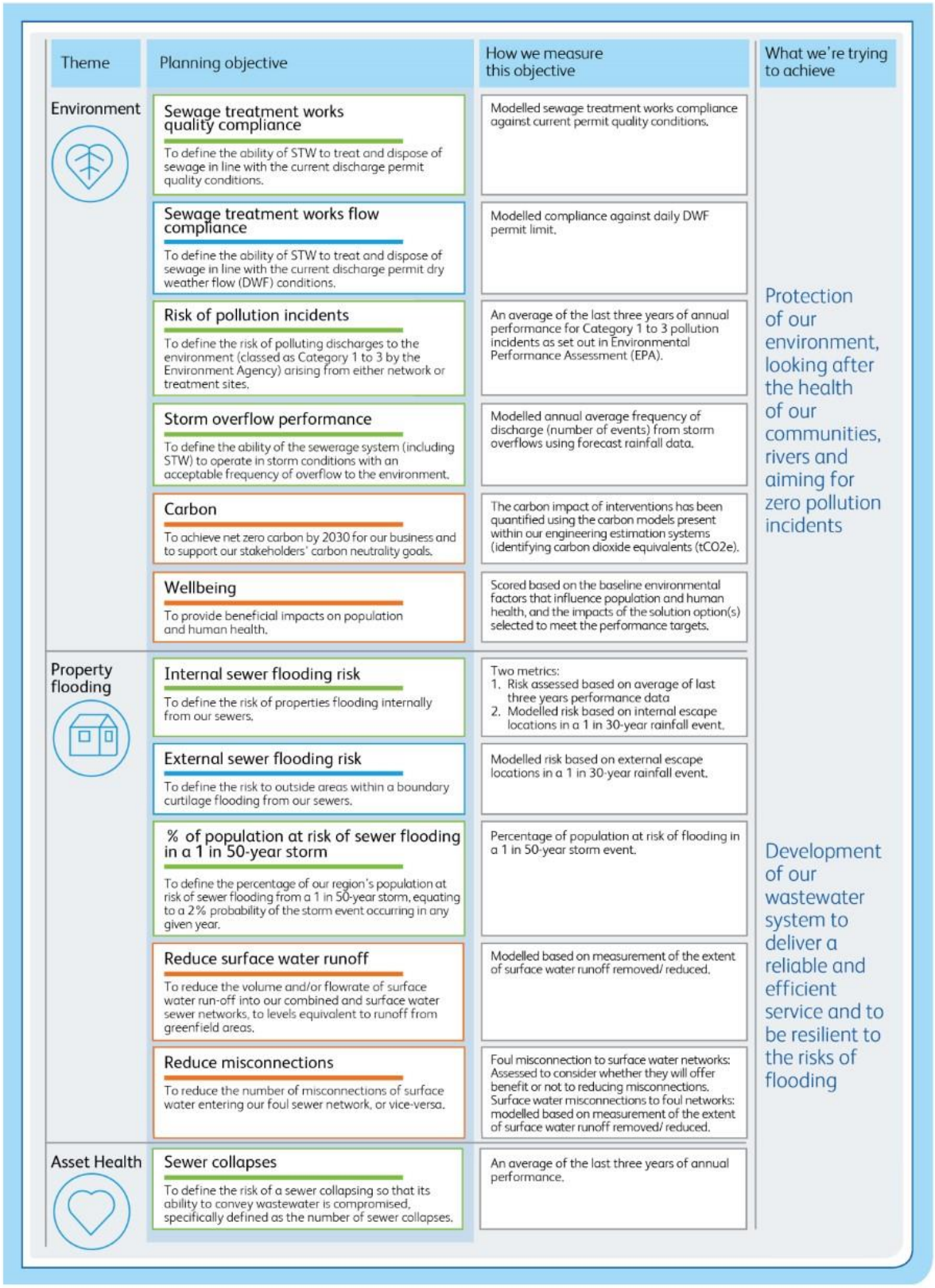


Figure 5-5: Summary of planning objectives and metrics

5.15 Using the outputs from both national collaboration and stakeholder contributions, a series of planning objectives were formulated (both common and bespoke) and consulted on with stakeholders. Following their feedback, we doubled the number of planning objectives to 12.

5.16 Once the planning objectives were set, the scope of the DWMP was finalised. While the guiding principles still require the DWMP to be ambitions and comprehensive, we recognise that in the first cycle the plan needs to focus on drivers relating to capacity, like climate change and population growth. As the DWMP matures and becomes statutory we expect this to be extended to cover other drivers. Figure 5-6 summarises elements that are in and out of the DWMP scope for cycle 1.

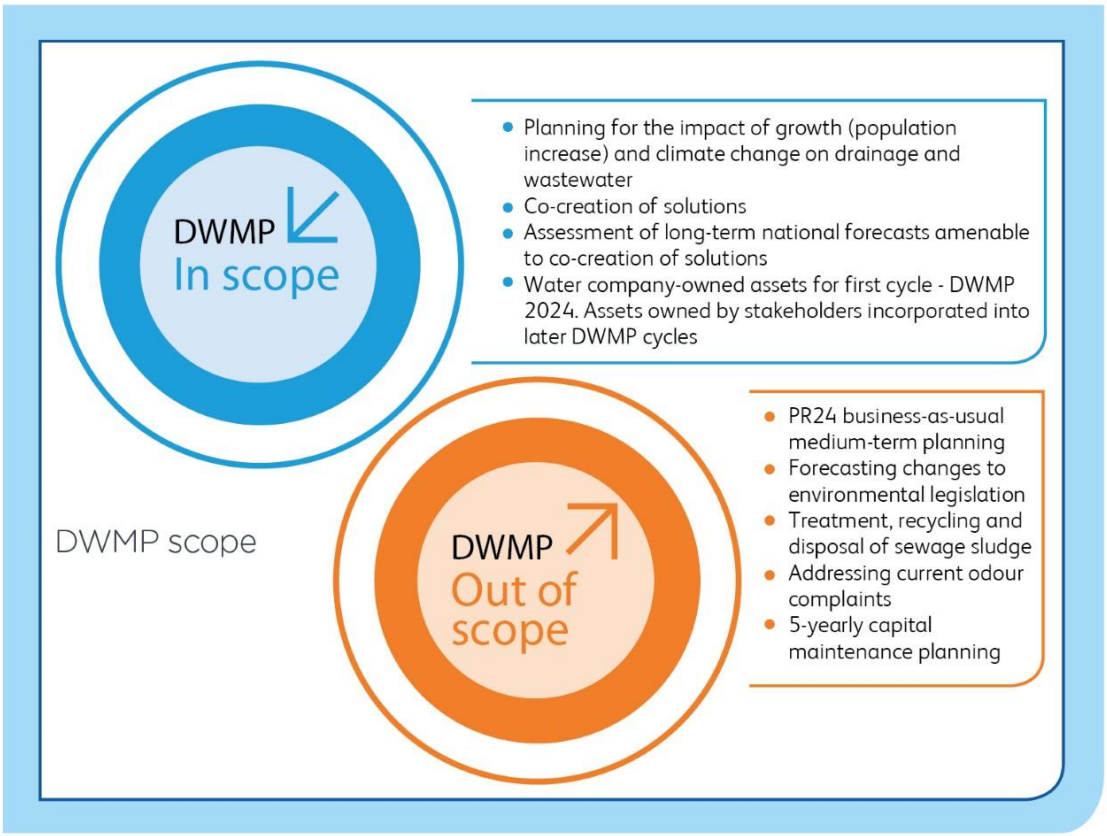


Figure 5-6: DWMP scope for cycle 1

5.17 For a detailed understanding of Strategic Context refer to the Technical Appendix on Strategic Context[98].

Risk-based catchment screening

5.18 The DWMP is a risk-based, long-term planning process. Stage 2 of the framework (Risk-based catchment screening) aims at filtering out catchments that are less susceptible to longer term pressures and do not require detailed risk forecasting (in Stage 3 BRAVA).

[98] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/strategic-context-document.pdf

5.19 An industry wide process assessing 17 risk screening indicators, was applied at Level 3 to all our catchments. The indicators are a mixture of historic (or lagging) future (or leading) as well as key environmental indicators.

5.20 Once the assessment was complete, we identified that 293 catchments breached sufficient risk indicators to require progression to Stage 3 of the framework and 89 were screened out. That is 77% of catchments but 99.8% of our population equivalent[99]. Only 32,730 p.e. was excluded at this stage.

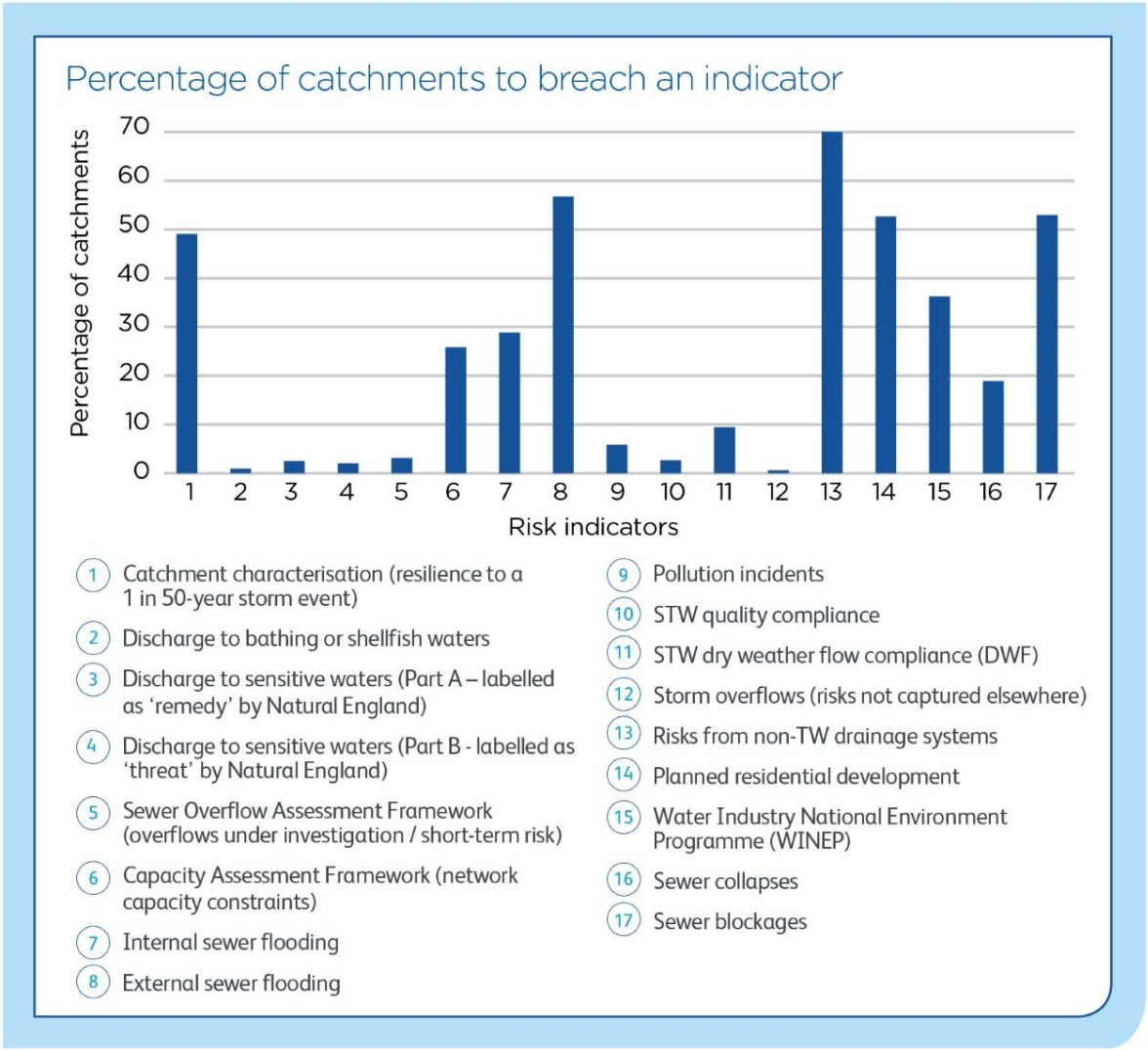


Figure 5-7: Percentage of catchments breaching each indicator to demonstrate the significant differences between the indicators[100]

5.21 Figure 5-7 is a graph of the percentage of our catchments that have breached each risk indicator. Six of the seventeen risk indicators are breached by 10% or less of the catchments. The highest breaches are by 'other risk management agency systems', external sewer flooding and sewer blockages.

[99] Population Equivalent (PE) represents a measure of the equivalent people a treatment works, or part of the network serves. Commuters, tourists, as well as trade flows are converted into an equivalent person.
[100] SOAF: Storm overflow assessment framework, CAF: capacity assessment framework, WINEP: Water Industry National Environment Programme

5.22 We shared our results with other companies and a redacted national view of all companies was compiled and shared with the Water UK DWMP steering Group in December 2019.

5.23 We shared our results with Level 2 stakeholders, prior to finalisation and published them on our DWMP GIS customer portal to allow wider engagement.

5.24 For a detailed understanding of risk-based catchment screening and to view which risk indicators each catchment passed or failed, please refer to the Technical Appendix on Risk based catchment screening[101].

Baseline Risk and Vulnerability Assessment (BRAVA) and Problem Characterisation

5.25 The Baseline Risk and Vulnerability Assessment (BRAVA) is stage 3 in the DWMP framework and is aimed at understanding the current (or baseline) performance of the planning objectives, before predicting how they will change in the future due to population growth and climate change.

5.26 The size of the gap is then addressed in Stage 4, Options Development Appraisal. Only catchments that have passed through RBCS are analysed in BRAVA.

[101] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-b-risk-based-catchment-screening.pdf

5.27 Table 5-2 is a summary of the BRAVA planning objectives as well as the methodology applied in measuring them.

Objective type	Planning Objective	Methodology for measurement
Common	Risk of sewer flooding in a 1:50 storm	Percentage of the population at risk of sewer flooding in a 1:50 year rainfall event in 2020 (baseline) and 2050.
	Storm overflow performance	Modelled (10-year time series) annual average discharge (number of events) from a storm overflow using forecast rainfall data in 2020 (baseline) and 2050.
	Treatment works quality compliance	Steady state modelled treatment works compliance against current permit quality parameters in 2020 (baseline) and 2050.
	Risk of internal sewer flooding in a 1:30 storm	1. National Picture approach: Risk assessed based on the average of the last three years of performance data. 2. BRAVA approach: Modelled (design storm) risk of internal sewer flooding based on volumetric escape from manholes om a 1:30 year rainfall event in 2020 (baseline and 2050).
	Risk of pollution incidents	Risk assessed based on the average of the last three years of annual performance for Category 1 to 3 pollution incidents as set out in the Environmental Performance Assessment (EPA) in 2020.
	Sewer collapses	An average of the last three years of annual performance reporting in 2020.
Bespoke	Treatment works flow compliance	Steady state modelled treatment works compliance against current permit dry weather flow parameters in 2020 (baseline) and 2050.
	Risk of external sewer flooding in a 1:30 storm	Modelled (design storm) risk of internal sewer flooding based on volumetric escape from manholes om a 1:30 year rainfall event in 2020 (baseline and 2050).
Outcome measures	Carbon neutrality	Measure counted in Stage 4 Options Development Appraisal
	Wellbeing	Measure counted in Stage 4 Options Development Appraisal
	Reduce surface water run-off	Measure counted in Stage 4 Options Development Appraisal
	Reduce misconnections of surface water to foul sewer	Measure counted in Stage 4 Options Development Appraisal

Table 5-2 Summary of the planning objectives used in BRAVA

5.28 The DWMP framework does not state risk thresholds. We assessed thresholds based on performance that aligned with our 2025 forecast performance. This allows for consistency between companies, as 2025 forecast performance for many of the common planning objectives was set by Ofwat during PR19.

5.29 We summarised our BRAVA data and collated into a national assessment, published through Water UK in December 2020

5.30 Thames Water results for the 2020 baseline and 2050 positions of the national picture can be found in Figure 5-8 for treatment works, Figure 5-9 for storm overflows and Figure 5-10 for 1:50 flood risk mapped to L2 using the ranged specified above.

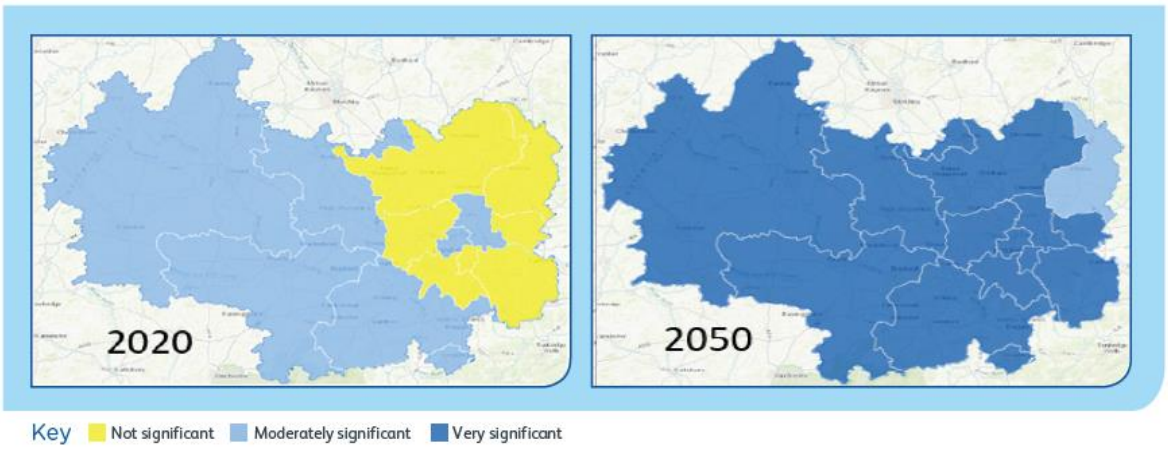


Figure 5-8 : Change in risk position on STW compliance with permit conditions by 2050

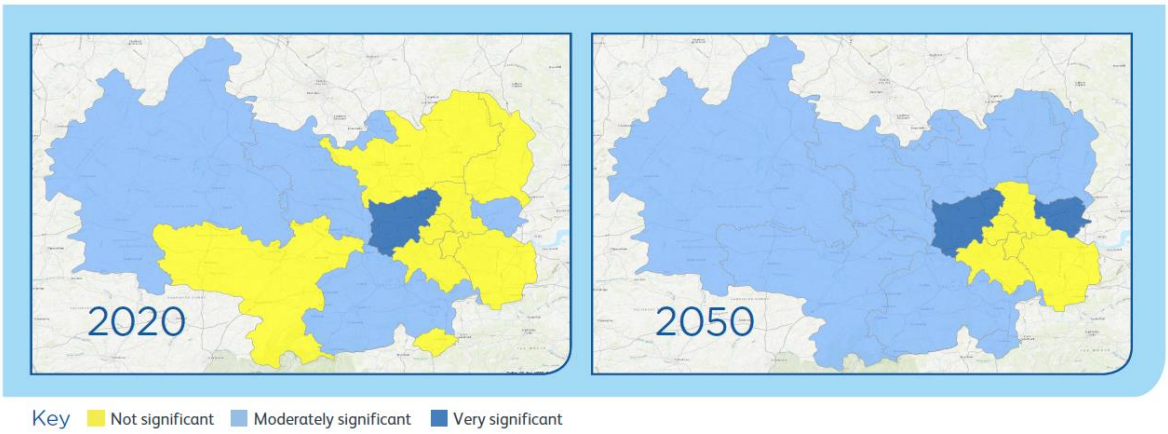


Figure 5-9 : Projected increasing risk of storm overflow performance by 2050

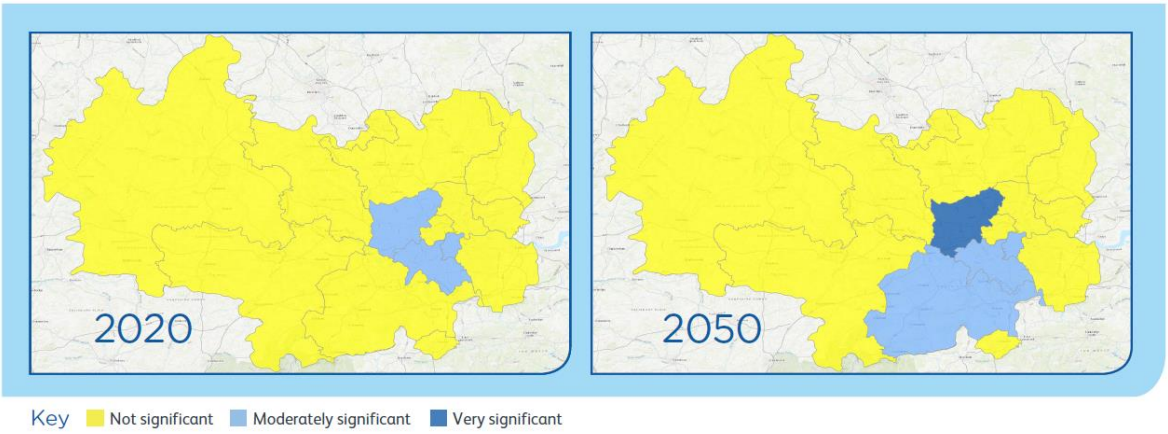


Figure 5-10 : Projected risk of property flooding by 2050

5.31 The maps show that there is a significant change to treatment works meeting their effluent quality standards, an average change in storm overflows and a smaller change in 1:50 flood risk.

5.32 Details on the National Picture outputs are on or Customer Portal[102] and the Practitioners Portal.

5.33 We produced are more detailed assessment down to risk zones (L4) for London that provided the data and insight to complete Problem Characterisation. A wealth of location-specific detailed information is now available to us. Data volumes are so extensive that we built a bespoke internal GIS-based platform that allows us to view and interact with this and other data.

5.34 To facilitate engagement with BRAVA for our stakeholders an external GIS portal was provided. The portal also holds the risk-based catchment screening data and stakeholder engagement opportunities. BRAVA datasets are presented as heatmaps to ensure individual property level risk is not identifiable. We released the data on the portal following a series of stakeholder engagement workshops explaining the BRAVA data and walking stakeholders through how the data is visualised. Figure 5-11 is a series of snapshots of the external practitioner's portal showing RBCS, BRAVA and stakeholder opportunity data.

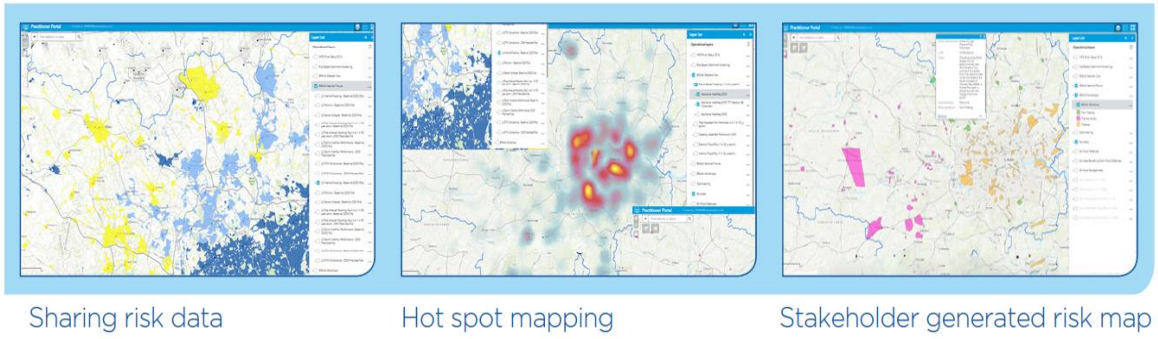


Figure 5-11: Our DWMP data sharing GIS portal

5.35 The final element of BRAVA is Problem Characterisation. We assessed each Level 3 catchment for which BRAVA was undertaken against a strategic needs score and complexity factor on a 4 by 3 matrix. The is used to determine the level of complexity required in Stage 4 Options Development Appraisal. Figure 5-12 shows the problem characterisation template used.

[102] https://storymaps.arcgis.com/stories/201050209c7a4658a1c2265aa4411375

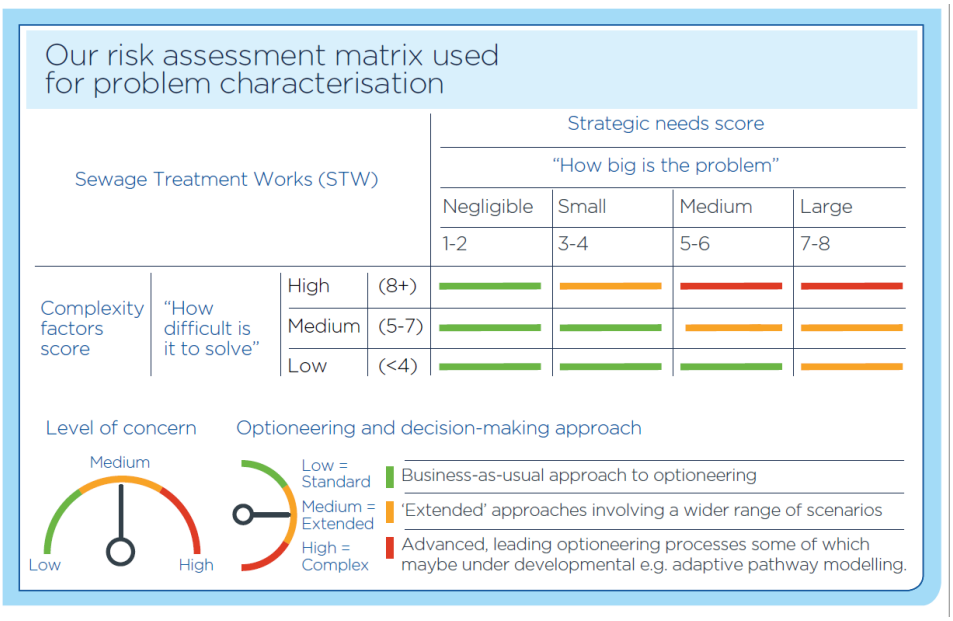


Figure 5-12 : Problem characterisation matrix

5.36 Within London all the catchments were high or medium complexity with our three largest catchments (Beckton, Crossness and Mogden) all high. In the Thames Valley over 90% of catchments were low complexity.

5.37 Figure 5-13 represents the number of catchments for each of the levels of complexity required.

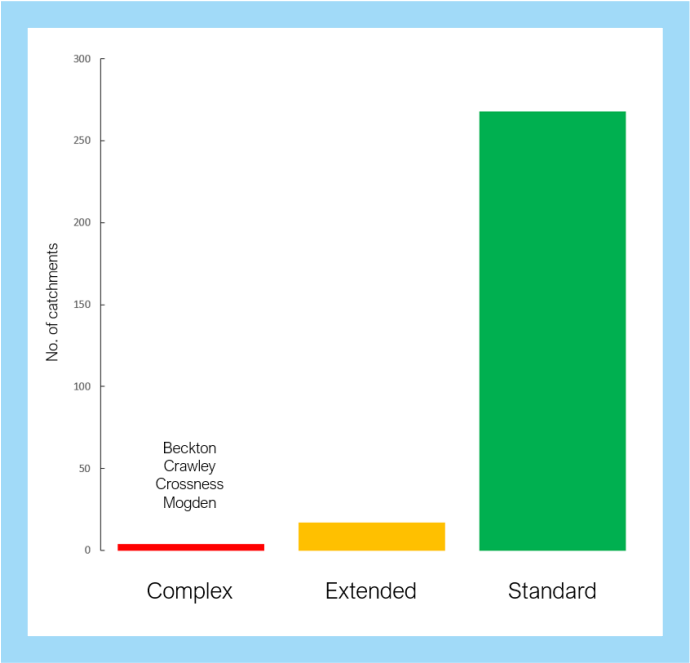


Figure 5-13 Results of the problem characterisation stage in terms of the number of catchments requiring the three different levels of optioneering complexity

5.38 For a detailed understanding of BRAVA and problem characterisation, please refer to the Technical Appendix on BRAVA[103].

[103] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-c-baseline-risk-and-vulnerability-assessment-and-problem-characterisation.pdf

Options Development and Appraisal (ODA)

5.39 Options development or solution identification in the DWMP is focussed on delivering a 'best value' set of solutions for a catchment that mitigate the impact identified at BRAVA. Solution options were developed by the industry, informed by customer research, and created with stakeholders. Our focus was to ensure that solutions provide wider benefits than just resolving a single issue. This meets stakeholder expectations, especially for the outcome measures identified in our Strategic Context.

5.40 We designed an optioneering approach learning from the WRMP as well as our work for London 2100. This improves consistency and allows for transparent decision making. It also allows for a fair comparison between green and grey solutions.

5.41 Our approach is outlined in Figure 5-14 and comprises four phases. They are:

- Development of generic options (qualitative)
- Refinement of generic options to unconstrained options (qualitative)
- Refinement of unconstrained options to constrained options (qualitative)
- Refinement of constrained options to feasible options (quantitative)

5.42 Feasible options are then used in Stage 5 Programme Appraisal.

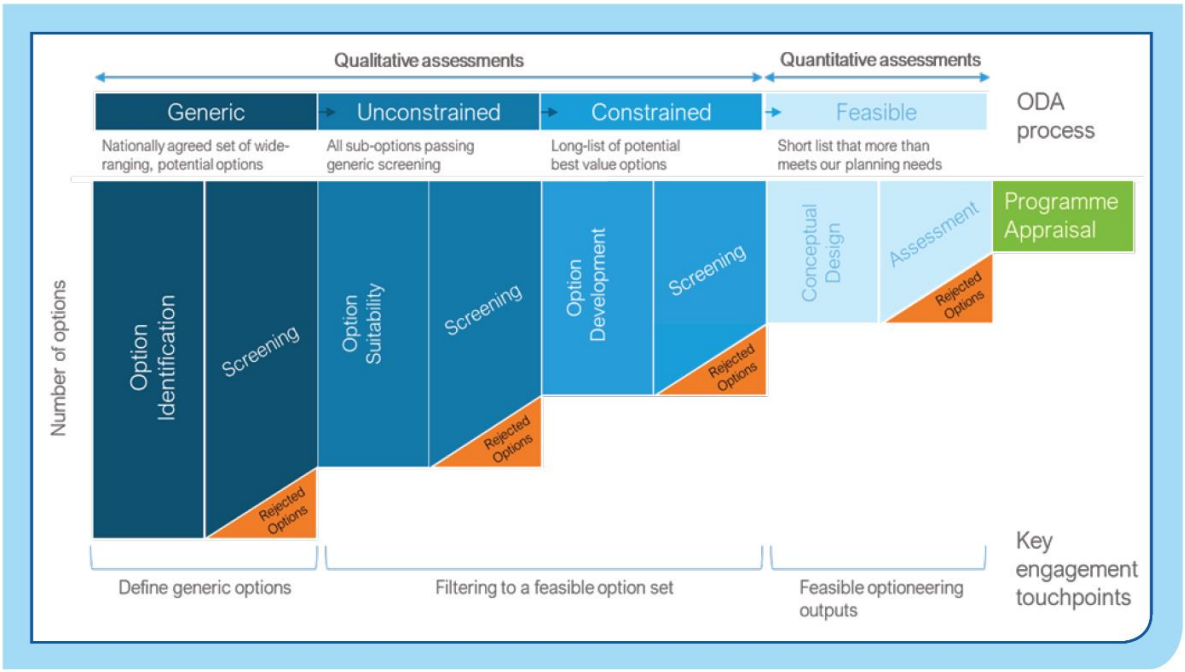


Figure 5-14: Overview of our optioneering framework for cycle 1 DWMP

5.43 We wanted to ensure that from the start we have a broad range of solutions and therefore developed, in collaboration with the industry, generic options which are listed in Table 5-3. Their grouping can also be found in the table.

Grouping	Reference	Generic option title
Property and community level water management	A1	Water efficiency measures (property, community or industrial level)
	A2	Rainwater harvesting (property, community or industrial level)
	A3	Greywater treatment and re-use (property, community or industrial level)
	A4	Blackwater treatment and re-use (property, community or industrial level)
Surface water management	B1	Surface water source control measures
	B2	Surface water pathway measures
	B3	Surface water receptor measures
Combined and foul sewer systems	C1	Intelligent automated sewer network operation
	C2	Intelligent automated asset maintenance
	C3	Increase sewer capacity (e.g., pipe replacement)
	C4	Stormwater storage tanks and tunnels
	C5	Sewer lining to target infiltration hotspots
	C6	Utilise and optimise existing inter-catchment connections
	C7	Create new inter-catchment connections
	C8	Create strategic connections between sewage treatment works (STWs)
	C9	Transfer wastewater across company boundaries
Sewage treatment	D1	Treat wastewater in the network
	D2	Increase level of performance in existing STWs
	D3	Increase treatment intensity at existing STWs
	D4	Expand existing STWs
	D5	Construct new/additional STWs
	D6	Increase treatment centralisation
	D7	River catchment-based discharge permitting
	D8	Dynamic permitting
	D9	Catchment management treatment initiatives
	D10	Indirect re-use of effluent
	D11	Wastewater treatment resource recovery
	D12	Transfer sludge across boundaries
Indirect measures	E1	Customer education and awareness
	E2	Customer incentivisation
	E3	New and amended wastewater and drainage regulations
	E4	Alternative wastewater and drainage business models
	E5	Integrate drainage and wastewater policy/management within local authorities or wider regional partnerships
	E6	Influence where population growth can occur
Other	M	Monitor risks
	WC	'Wild cards' – options that may be identified by our stakeholders through engagement during the ODA process, which cannot be categorised as any other generic option
	WRMP	Water Resource Management Plan integrated option

Table 5-3: Generic options

5.44 Refinement from generic to unconstrained options was done on a catchment basis with staff that hold a good working knowledge of the systems. It was centrally administered to ensure consistency and consulted with stakeholders to ensure that the unconstrained list was not limiting. The aim of the unconstrained list was to have a substantial list of options available that can be implemented in a specific catchment.

5.45 Further refinement from unconstrained to constrained options was completed by the same internal team. In this step, options were rejected where they would prove impractical of cost prohibitive for the specific catchment. We also prioritised the retained options. This was completed at risk zone in London and catchment in Thames Valley. Figure 1-15 and Figure 1-16 outline an example from the Mogden catchment in London and typical option types selected for a catchment in the Thames Valley.

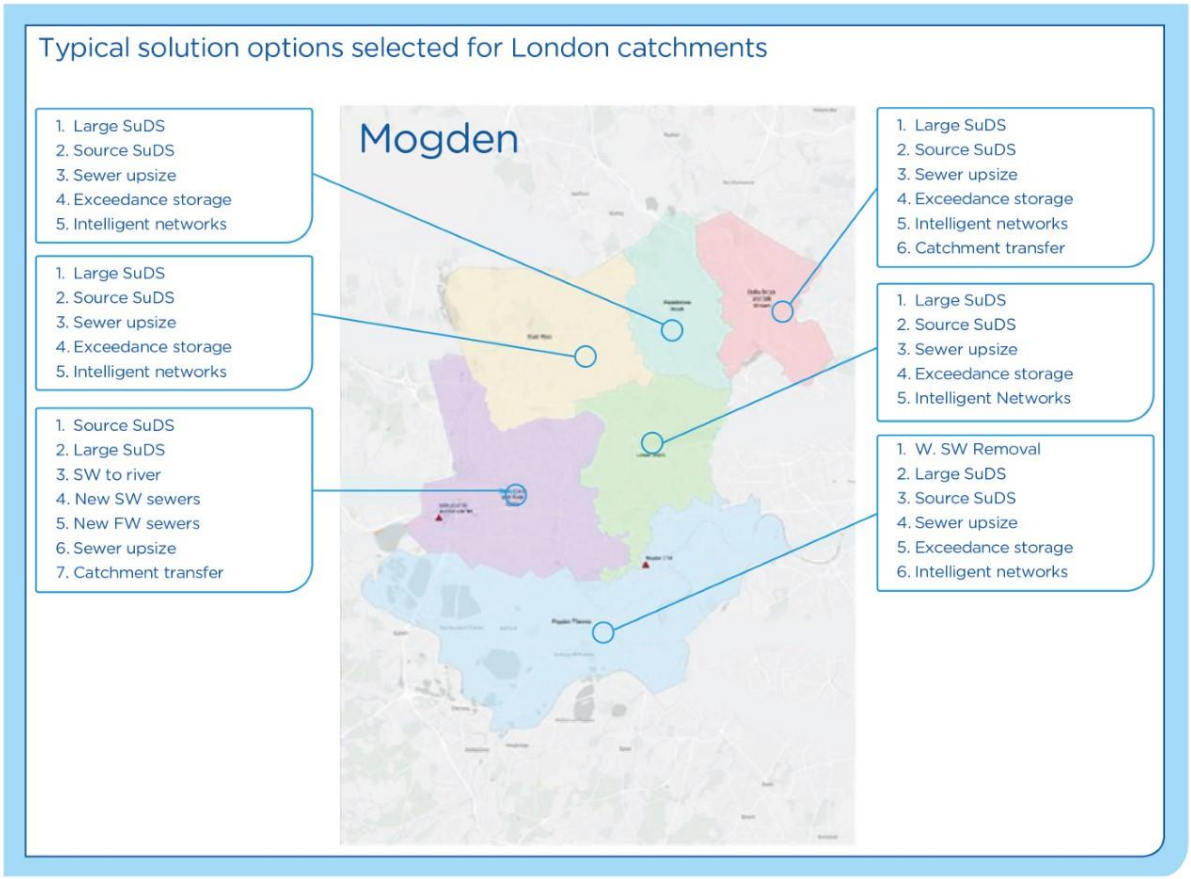


Figure 5-15: Example constrained option types for the Mogden catchment

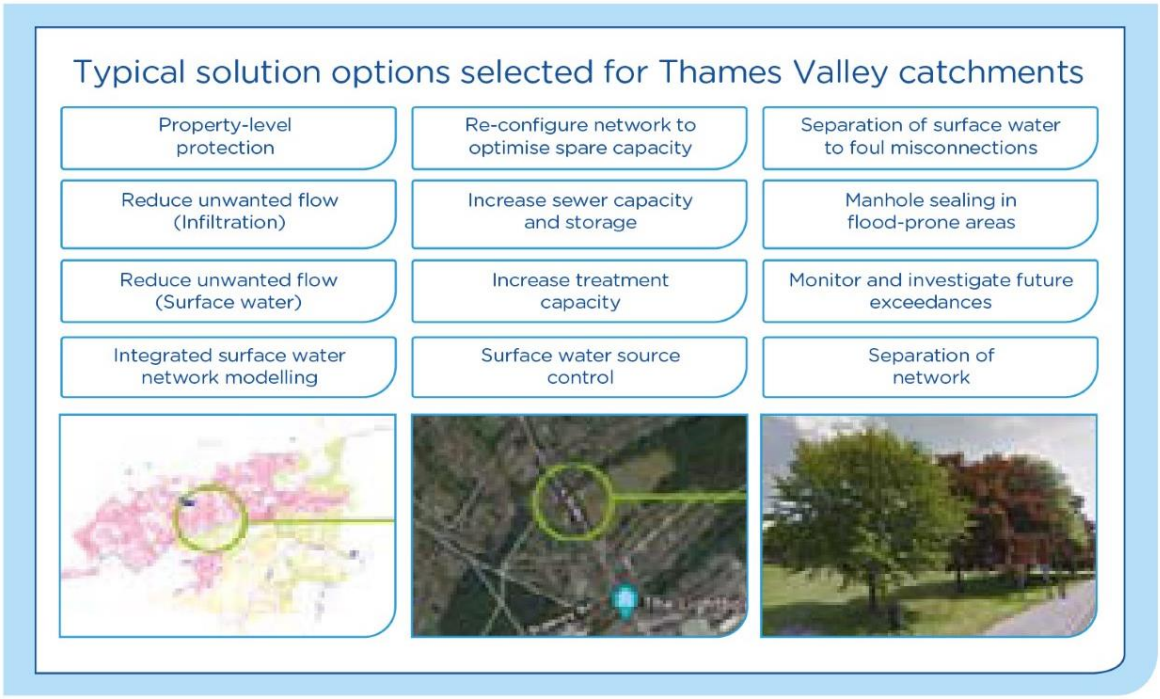


Figure 5-16: Option types in Thames Valley catchments

5.46 For feasible optioneering in London the hierarchy of constrained options (as seen in Figure 5-16) was applied to each risk zone. In addition, network solutions were selected to meet levels of service defined for each planning objective. This was done in a cumulative approach in the following order:

- Solutions to meet storm overflow levels of service
- Solutions to meet internal 1:30 flooding levels of service
- Solutions to meet external 1:30 flooding levels of service
- Solutions to meet 1:50 flooding levels of service
- Solutions to meet the capacity assessment framework levels of service

5.47 For many of the risk zones, during solution development solutions at the start of the hierarchy delivered some or all the benefit needed for near the end of the hierarchy. Similarly, in some risk zones, only one or two of the prioritised solution types were required,

5.48 Feasible solution development also considered factors including:

- Is the proposed solution technical feasible to deliver when considering location specific constraints like land
- Are there any environmental restrictions that would yield the solution not feasible
- Does the solution comply with local policy requirements and would it need to obtain planning approval
- Are the effects on local communities acceptable

5.49 Feasible solution development also contained assessments on environmental and social benefits as well as a Strategic Environmental Assessment[104] and Habitats Regulation

[104] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-k-strategic-environmental-assessment.pdf

Assessment[105]. A summary of these two assessments is in the Technical Appendix for Options Development Assessment[106].

5.50 We assessed our solutions for a range of further metrics, to aid our building a best value programme. This ensured that our solutions were assessed against multiple benefits addressing a key point made by our stakeholders in their consultation responses that they wanted to see wider benefits embedded in our optioneering. More detail can be found in the Technical Appendix for Options Development Assessment[107]:

5.51 Solutions needed to accommodate pre-defined target levels. We proposed levels and agreed them after stakeholder consultation. Different target levels were set in London (Table 5-4) to Thames Valley (Table 5-5).

<table>
<tr><th rowspan="2">Planning objective</th><th colspan="3">Maintain current performance target</th><th colspan="3">ODA target</th></tr>
<tr><th>2030</th><th>2035</th><th>2050</th><th>2030</th><th>2035</th><th>2050</th></tr>
<tr><td>Internal sewer flooding risk</td><td colspan="3" rowspan="3">Maintain baseline (2025) level of performance</td><td colspan="2" rowspan="3">Glidepath baseline (2025) level of performance to 2035 target</td><td>No greater than 1.5% of properties at risk per zone</td></tr>
<tr><td>External sewer flooding risk</td><td>No greater than 3% of properties at risk per zone</td></tr>
<tr><td>Risk of flooding in a 1 in 50 storm</td><td>No greater than 7.6% of properties at risk per zone</td></tr>
<tr><td>Storm overflow performance</td><td colspan="6">Compliance with our obligations under the Environment Act and the Storm Overflows Discharge Reduction Plan[34]. Specifically, <=10 discharges in a typical year (as a proxy for no environmental harm[3]), with <=3 discharges in a typical year for discharges to designated bathing water sites.</td></tr>
<tr><td>Sewage treatment works quality compliance</td><td colspan="3" rowspan="2">Not applicable</td><td>100%</td><td>100%</td><td>100%</td></tr>
<tr><td>Sewage treatment works flow compliance</td><td>100%</td><td>100%</td><td>100%</td></tr>
<tr><td colspan="7">Note 1. For our large London catchments, we assessed options and targets across smaller areas (risk zones) to ensure assessment was undertaken at an appropriate spatial extent, recognising hydraulically discrete areas and variations in performance.
Note 2. Our 2035 and 2050 flooding targets (percentage of properties at risk) ensure that current performance is at least maintained in all risk areas. Areas where there is currently the greatest predicted sewer property flooding risk benefit from improved performance in the future.
Note 3. Our plan is based on achieving the 'backstop' target of no more than 10 discharges, and in parallel there is also a programme of investigations and monitoring to confirm whether or not 10 discharges per year will be sufficient to demonstrate that there is no local adverse ecological impact. If this is not the case, then further improvements will be made to avoid discharges causing ecological harm.</td></tr>
</table>

Table 5-4: London catchments – ODA planning objective targets

[105] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-l-habitats-regulations-assessment.pdf
[106] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-d-options-development-and-appraisal.pdf
[107] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-d-options-development-and-appraisal.pdf

Planning objective	Maintain current performance target			ODA target		
	2030	2035	2050	2030	2035	2050
Internal sewer flooding risk	Maintain baseline (2025) level of performance			50% reduction[1]	75% reduction[1]	100% reduction[1],[2]
External sewer flooding risk				25% reduction[1]	50% reduction[1]	100% reduction[1],[2]
Risk of flooding in a 1 in 50 storm				50% reduction[1]	75% reduction[1]	100% reduction[1],[3]
Storm overflow performance	Compliance with our obligations under the Environment Act and the Storm Overflows Discharge Reduction Plan[34]. Specifically, <=10 discharges in a typical year (as a proxy for no environmental harm[4]), with <=3 discharges in a typical year for discharges to designated bathing water sites.					
Sewage treatment works quality compliance	Not applicable			100%	100%	100%
Sewage treatment works flow compliance				100%	100%	100%

Note 1. Reduction from baseline (2025 level of performance).

Note 2. Achieving the target for 'risk of flooding in a 1 in 50 storm' will also achieve internal and external flooding targets.

Note 3. Stop property flooding up to a one in 50-year storm event where possible.

Note 4. Our plan is based on achieving the 'backstop' target of no more than 10 discharges, and in parallel there is also a programme of investigations and monitoring to confirm whether or not 10 discharges per year will be sufficient to demonstrate that there is no local adverse ecological impact. If this is not the case, then further improvements will be made to avoid discharges causing ecological harm.

Table 5-5: Thames Valley– ODA planning objective targets

5.52 During public consultation our stakeholders made a series of regional and location specific recommendations for use within the DWMP. Many of these focussed on solutions and included:

- Suggestions for solutions to implement
- Suggestions of additional wider benefits that may be calculated
- Support for some solution types (especially nature base solutions)

5.53 We have compiled all their feedback into our Statement of Response (called 'You Said, We Did')[108] that holds a section specifically on solutions.

5.54 During the public consultation, stakeholders wanted to see alignment between WINEP and our DWMP. To do this we needed to add in additional storm overflows and amend the solutions, especially of those proposed for delivery between 2025 and 2030. Solutions were developed as part of PR24 WINEP and then incorporated into the DWMP. The WINEP

[108] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-n-you-said-we-did.pdf

requires a best value framework that differs from our DWMP framework. It also encourages end-of-pipe solutions.

5.55 Regulators also told us to ensure alignment between PR24 and DWMP. This was predominantly flooding solutions. We identified the local flooding solutions developed during PR24 and added them to our DWMP. PR24 developed solutions to a series of small local clusters. By added in these solutions, we needed to amend our original DWMP solutions to ensure that we are not double counting.

5.56 Finally, regulators told us to include Resilience options into our DWMP. Please refer to our technical appendix on Resilience[109] to understand the details of how we addressed resilience. Solution development was to ensure that our treatment works do not stop working when the sites flood from the river. Using experience in delivering solutions to this risk, we developed options to raise assets to allow them to remain in operation during a flooding event.

5.57 The benefit of green versus grey engineering was also assessed at a more detailed level through a case study in the Deephams[110] catchment. Using our feasible optioneering approach a green only solution was developed that met all the targets. We then developed and costed an alternative grey only solution that also meets the target. Following a costing exercise, the green solution was 70% of the cost of the grey solution. Additionally, the green solution provides a wide range of wider benefits that the grey one does not. For more details on the Deephams Case please refer to the Technical Appendix on Options Development Appraisal.[111]

5.58 Figure 5-17 and Figure 5-18 graph the percentage cost split by network solution option of London and Thames Valley respectively. In the London graphs we can clearly see the preference for green solutions with more traditional solutions and sewer lining being prominent in the Thames Valley.

[109] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-u-resilience.pdf
[110] Deephams is representative of large urban separately drained catchments in our area with challenges not as large as observed in central London.
[111] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-e-programme-appraisal.pdf

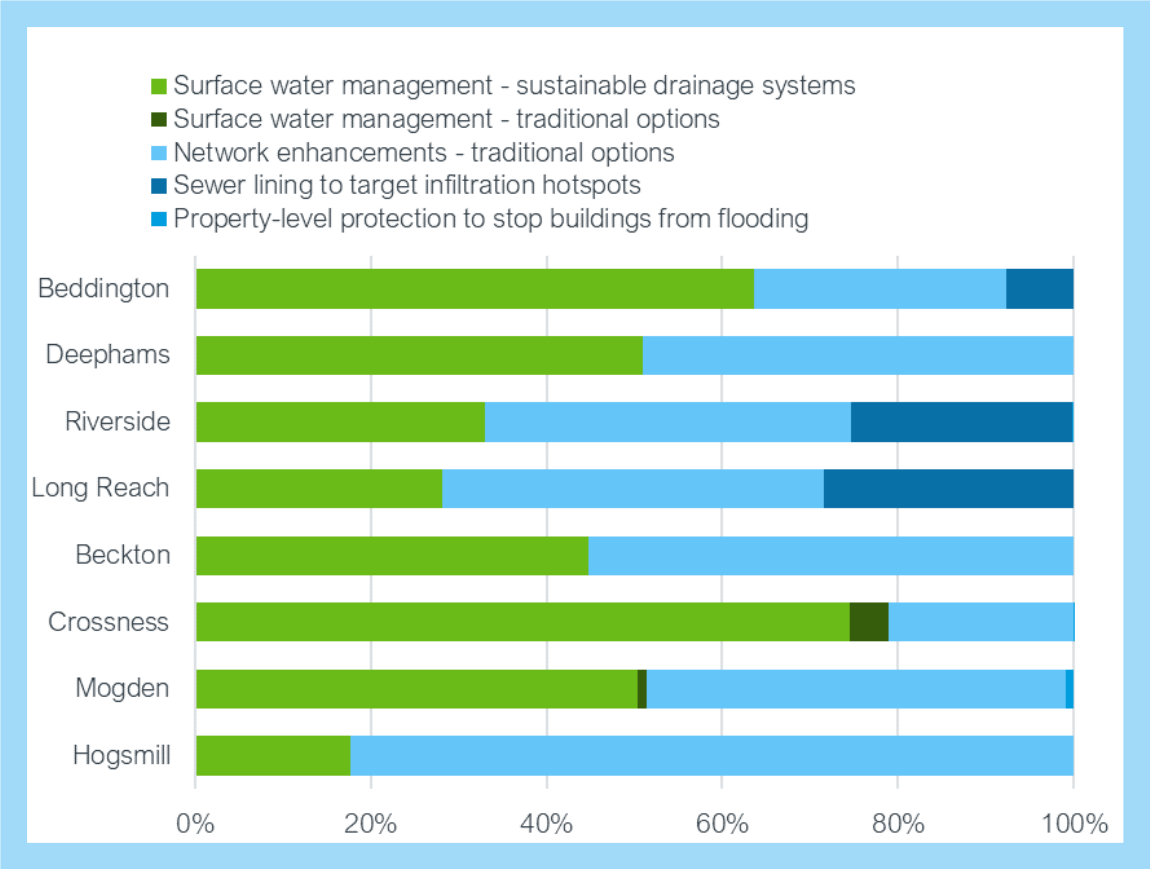


Figure 5-17: Network option types developed for London catchments as a proportion of total construction costs (to achieve planning objective targets by 2050)

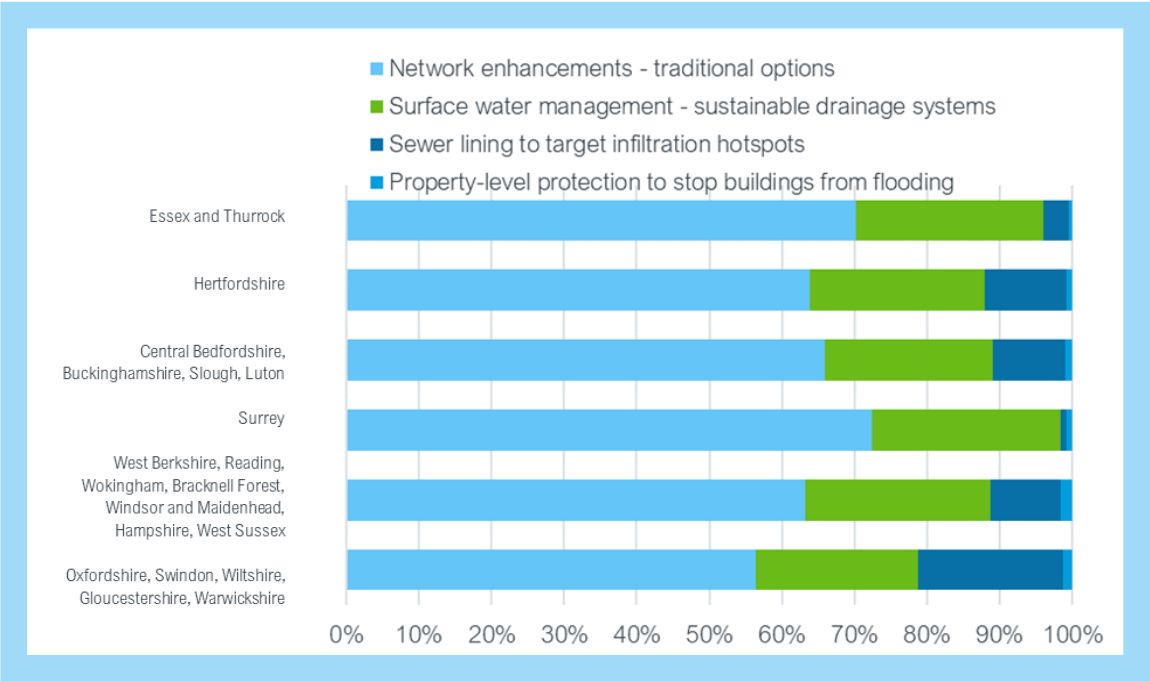


Figure 5-18 Network option types developed for L2 areas outside of London as a proportion of total construction costs (to address planning objective targets by 2050)

5.59 For more details on the Option Development Appraisal, refer to the Technical Appendix[112].

[112] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-e-programme-appraisal.pdf

Programme Appraisal (PA)

5.60 Programme appraisal is the final step in the DMWP stages. It takes the outputs from the previous Option Development Appraisal stage and uses the solutions identified to build a 25-year programme of investment.

5.61 Additional data in terms of regulatory requirements, stakeholder expectations, and customer preferences are required. The wider benefits framework and value of the proposed plan is also developed.

5.62 Ofwat provided guidance on producing Long-Term Delivery Strategies (LTDS)[113] which are a mandatory requirement for PR24. We enhanced our Programme Appraisal to account for this guidance. We stress tested our plan using an Adaptive Planning approach. Details of how our approach aligns with the LTDS can be found in the Technical Appendix on Programme Appraisal[114].

5.63 We ran Programme Appraisal ahead of draft publication. We developed a series of plans and presented one of those as our plan of choice at public consultation. Due to the amount of stakeholder feedback and change in regulator requirements on storm overflows we re-cast our plans, developing a new series of plans and selected a preferred one for the final DWMP.

5.64 A bespoke decision support tool (DST) developed by our supply chain was used to complete Programme Appraisal. This was based on experiences of optimising the WRMP and allowed all our value criteria to be considered.

5.65 The steps undertaken in programme appraisal as well as when stakeholder engagement was completed is outlined in Figure 5-19. This complies with the DWMP framework as it allows for different elements of the plan to be prioritised against each other, promotes an informed debate, and generated a best value programme.

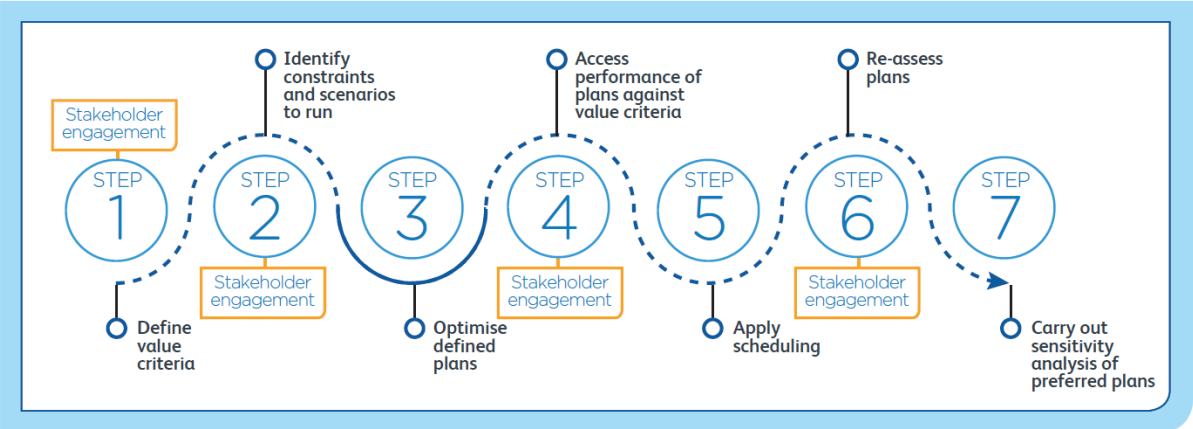


Figure 5-19: Overview of programme appraisal

[113] https://www.ofwat.gov.uk/publication/pr24-and-beyond-final-guidance-on-long-term-delivery-strategies/
[114] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-e-programme-appraisal.pdf

5.66 Customers' views and priorities are important to ensure that any plan we select meets customers' needs in a cost-efficient way and is therefore a 'best value' plan based on least cost solutions. We developed the value criteria and then undertook research to understand our customers' priorities. Figure 5-20 demonstrated the customer weightings for our value criteria. More details on customer weightings can be found in the Technical Appendix on Customer Engagement[115].

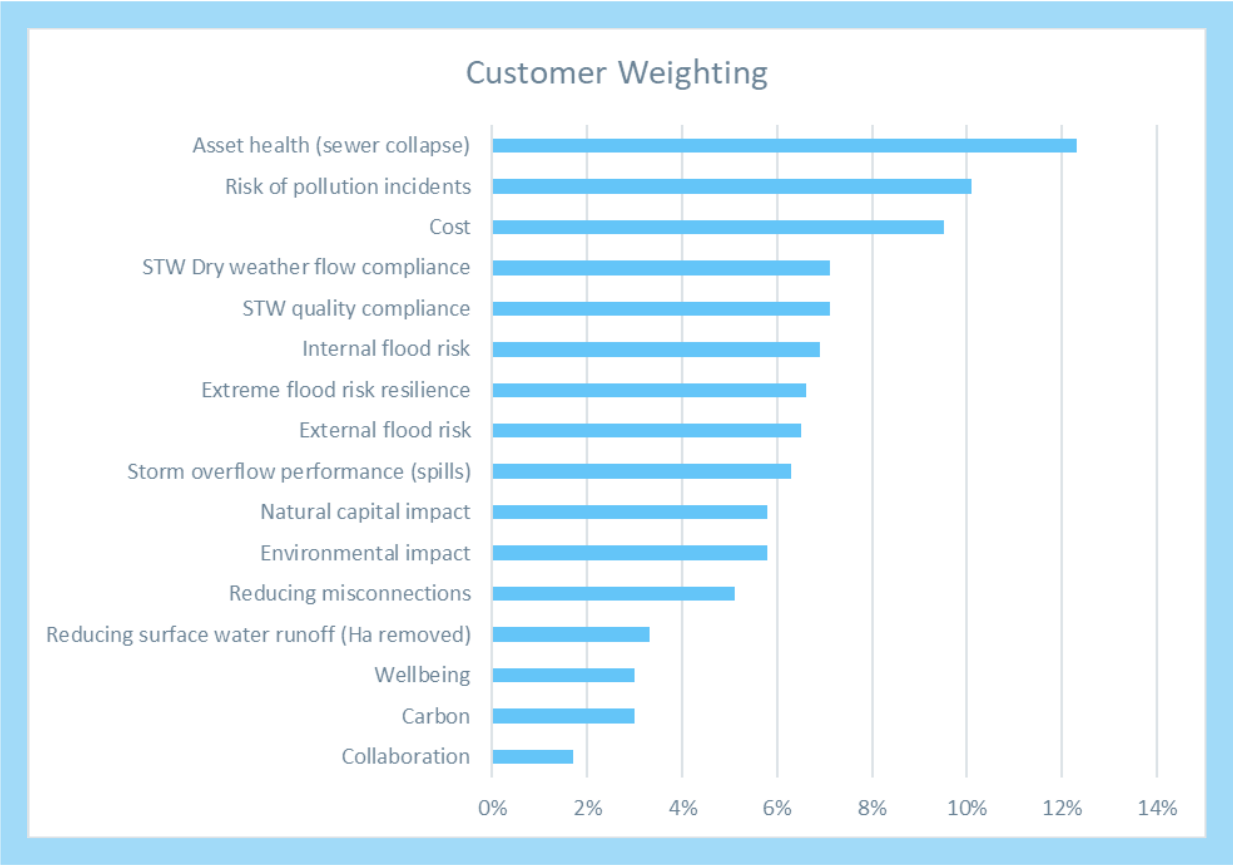


Figure 5-20: Value criteria weightings

5.67 This document focusses on the plan developed after public consultation but includes the draft plan for comparison. For details on plan development pre-public consultation, please refer to the consultation document suite as well as the Technical Appendix on Programme Appraisal[116].

5.68 We developed more than 70 plans. Many of these aided our understanding of best value and helped define the timing in which solutions will be delivered over the 25-year period.

5.69 The final plan selection was derived from three predominant plan elements. They are:

- Address storm overflows
- Upgrading treatment works for growth
- Reducing flood risk

[115] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-h-customer-engagement.pdf
[116] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-e-programme-appraisal.pdf

5.70 Resilience is also relevant but due to the smaller cost it did not generate noticeable changes to the timing of solutions.

5.71 When developing our plan, we considered a variety of alternatives that included testing the pace of delivery. We evaluated these plans against stakeholder views expressed during the public consultation.

5.72 Alternative plans were developed to those included in our draft DWMP based on feedback received. The complete suite of plans can be found in the Technical Appendix for Programme Appraisal[117].

5.73 Table 5-6 outlines the additional alternative plans that were developed between the draft DWMP and final DWMP.

Plan Name	Plan Description
Maintain flooding resilience	This plan is similar to the draft plan in maintaining flooding performance but now prioritises delivery of our storm discharge reduction programme to meet legislative requirements and represents the minimum investment to achieve our current performance levels and regulatory requirements. The 'maintain flooding' plan has been assessed despite it being a low priority to stakeholders, as it provides a clear reference point against which more ambitious plans can be assessed.
Resilient – constrained	This plan prioritises delivery of our storm discharge reduction programme to meet legislative requirements and imposes a constrained/steady pace of investment on flooding performance in AMP8 and AMP9 to manage impact on customers' bills and deliverability. This follows the approach to flooding developed for the (preferred) resilient plan consulted on at draft DWMP.
Accelerated /deliver sooner	This plan prioritises delivery of our storm discharge reduction programme to meet legislative requirements by 2035 and delivery of our flooding targets sooner than the 'Maintain flooding resilience' plan
Maximum community benefit	This plan prioritises delivery of our storm discharge reduction programme to meet legislative requirements and, as with the 'maximum benefit' plan at draft, selects those options that meet our DWMP planning objectives which also create the most benefit to communities and the environment

Table 5-6: Plans considered between draft DWMP and final DWMP.

5.74 Variations in costs and benefits of the alternative plans are outlined in Table 5-7.

Impact	Area	Maintain flooding resilience	Resilient - constrained	Accelerated / deliver sooner	Maximum community benefit	Draft plan
Cost (£bn)	London	15.774	22.922	23.397	23.119	15.446
	Thames Valley	5.505	9.020	8.985	10.307	7.922
	Total	21.279	31.942	32.382	33.426	23.368
Bill Impact (£ pa per household)	London	58.58	74.83	129.36	140.52	56.20
	Thames Valley	45.35	64.96	96.63	141.08	52.86
	London	116,968	164,706	166,698	165,337	155,018

[117] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-e-programme-appraisal.pdf

Impact	Area	Maintain flooding resilience	Resilient - constrained	Accelerated / deliver sooner	Maximum community benefit	Draft plan
No of properties no longer at risk of sewer flooding in a 1:50 year return period	Thames Valley	8,101	22,313	22,313	22,313	20,651
	Total	125,169	187,019	189,011	187,650	175,669
No of properties no longer at risk of internal sewer flooding in a 1:30 year return period	London	47,429	66,559	67,775	67,410	65,331
	Thames Valley	1,892	4,941	4,915	4,982	4,382
	Total	49,321	71,500	72,690	72,392	69,713
No of properties no longer at risk of external sewer flooding in a 1:30 year return period	London	53,231	76,527	77,633	76,841	71,356
	Thames Valley	4,292	11,602	11,547	11,682	10,498
	Total	57,523	88,129	89,180	88,523	81,854

Table 5-7 Cost and benefit variances for the alternative plans

5.75 When selecting the preferred plan we considered the commitments and deliverables we needed to achieve with affordable bills. Figure 5-21 represents some of the challenges we faced.

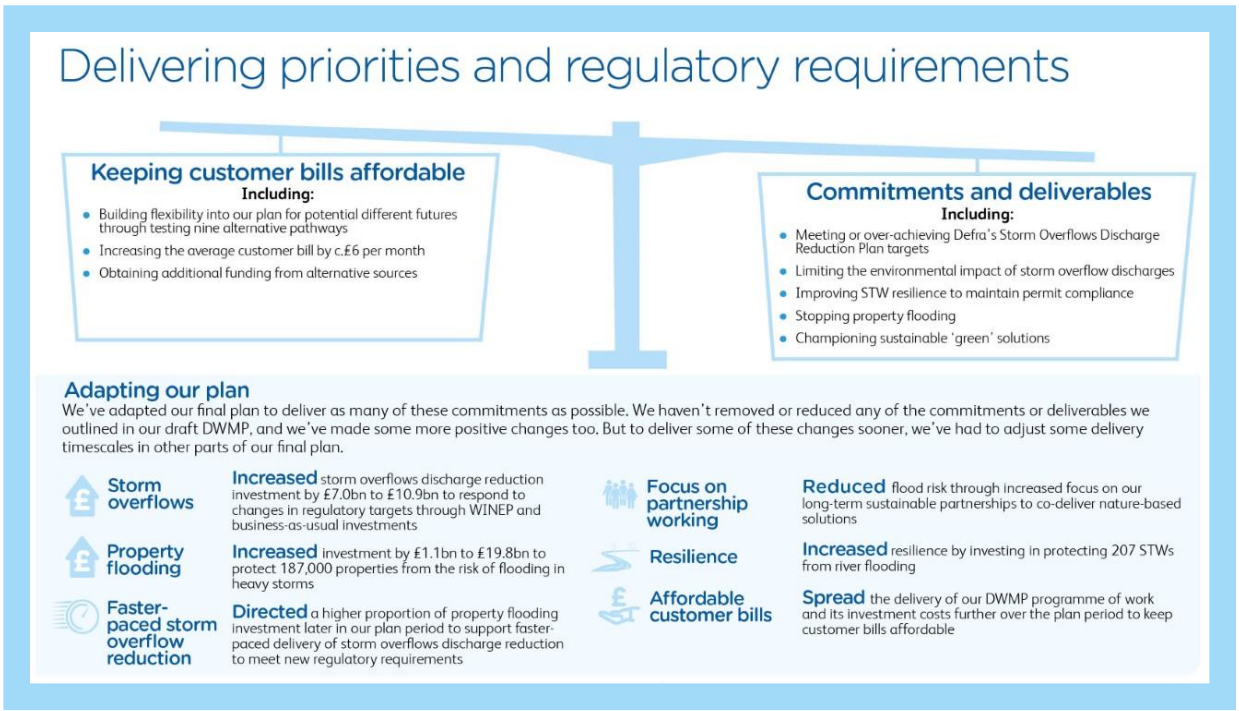


Figure 5-21: Priorities and regulatory requirements assessed in plan selection

5.76 We discounted the 'maintain flooding resilience plan' as it did not meet DWMP targets for flooding. It maintained not improved flooding performance over 25 years and was rejected by the majority stakeholders at consultation phase. We focused on comparing the three other plans that achieved DWMP targets over the 25-year planning period but had different delivery profiles.

5.77 The delivery profiles of the three remaining plans "Resilient-constrained", "Accelerated delivery" and "maximum community benefit" are shown in Figure 5-22 and Figure 5-23 for London and Thames Valley respectively. This shows that that all plans have similar overall

cost to meet DWMP outcomes but "Accelerated delivery" and "Maximum community benefit" have a more upfront delivery profile.

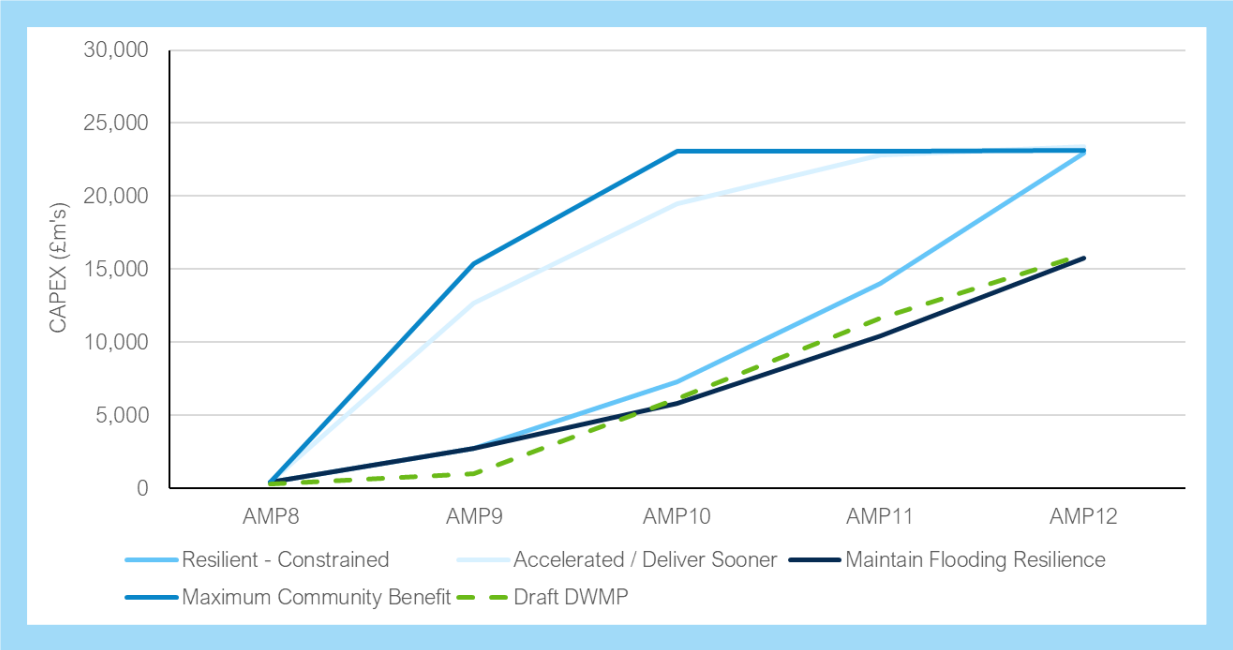


Figure 5-22 Comparison of Capex spend profile for alternative plans at final DWMP for London

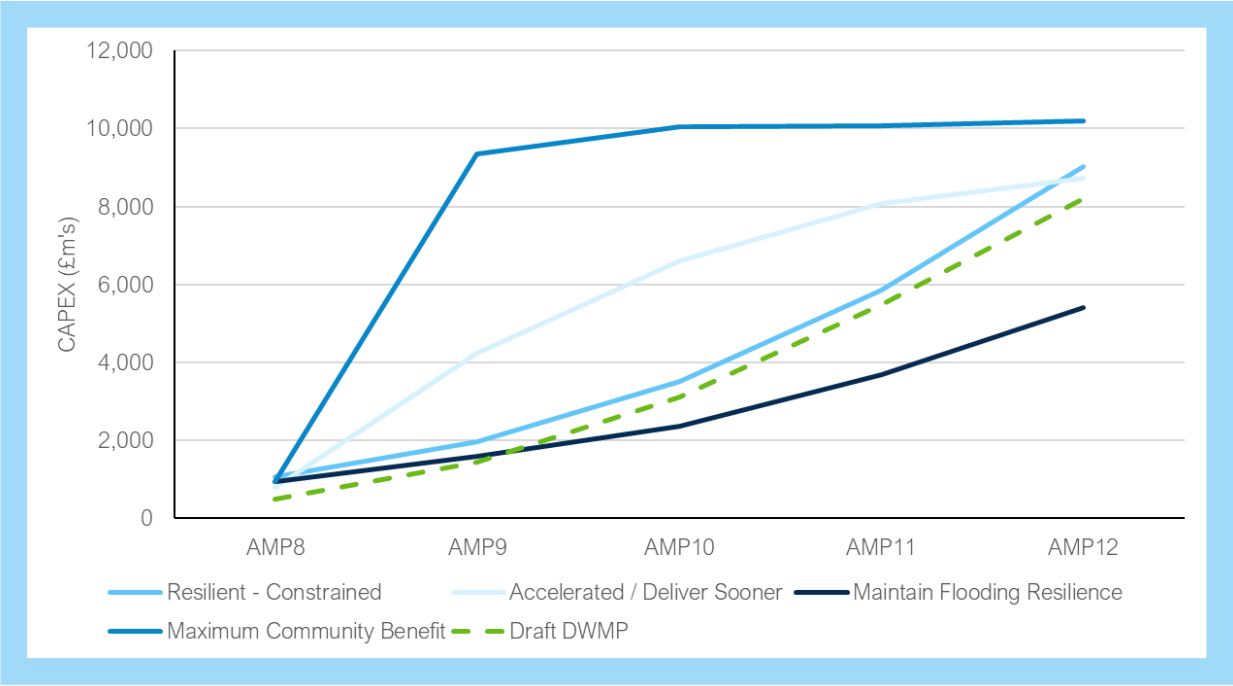


Figure 5-23 Comparison of Capex spend profile for alternative plans at final DWMP for the Thames Valley

5.78 We then assessed these three plans under our best value framework to see which one performed best against the wider benefits described by the value criteria. The results are simplistically represented in the radar plot in Figure 5-24 and show that the plan that performed the best (i.e., largest area under the radar plot) was the "resilient constrained plan". The reason it performs well is because it achieves the same long-term outcome, but the more phased delivery profile means a smaller bill impact over the planning period.

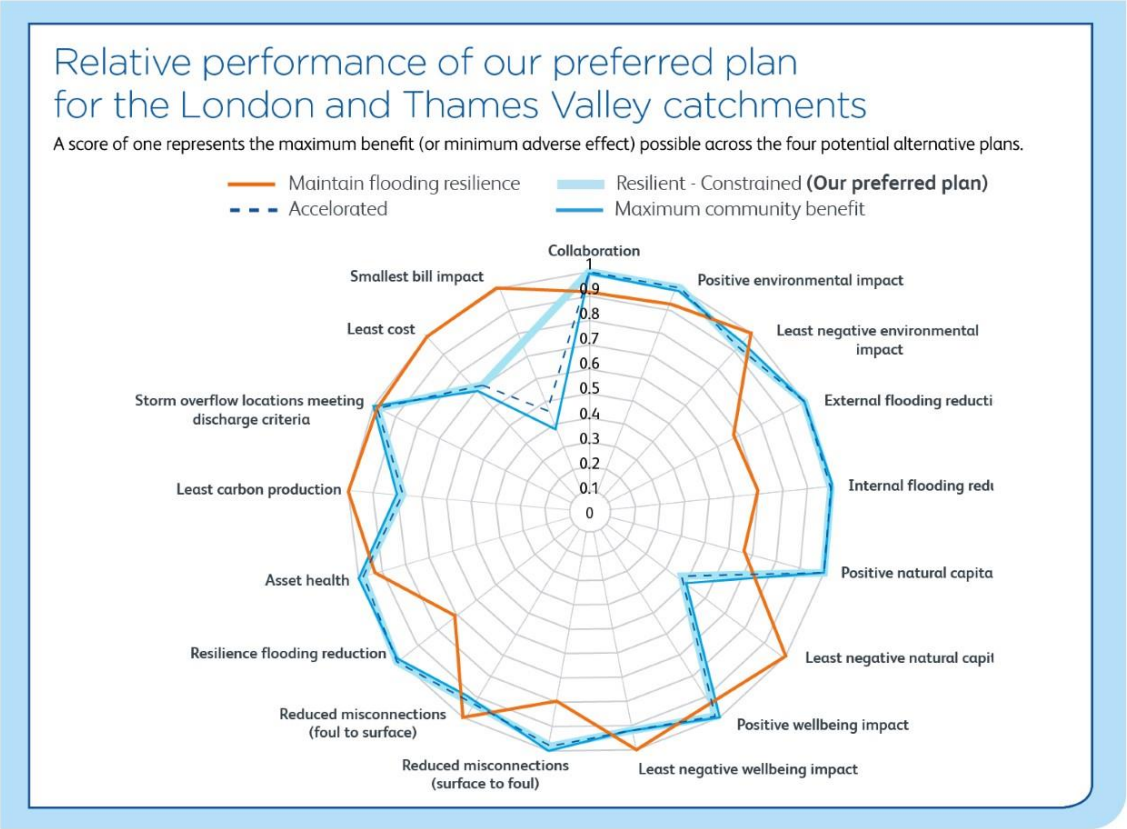


Figure 5-24 Radar plot to show how different plans performed under our best value framework[118]

5.79 Other more pragmatic considerations were also favouring the selection of the "resilient/constrained" plan as the preferred plan. Overall, the PR24 deliverability constraints due to potential WINEP requirements in the near term (AMP 8), means a reduction in the available capacity to address flood risk in the next amp. These pragmatic considerations are best accounted for in the "resilient constrained" plan profile.

5.80 While we recognise that there is strong stakeholder support for a more accelerated rate of delivery on flooding performance, our customer research shows a clear expectation to limit increases to their bills.

5.81 In summary, all plans prioritise delivery of our storm overflow reduction plan. However, the plan which we believe provides the better balance of cost, risk, ambition, and deliverability is the 'Resilient – constrained' plan. On balance, this is because:

- It prioritises delivery of our storm overflow discharge reduction plans in advance of the legislative requirements of the Environment Act - at all high priority overflows by 2035, at our two designated Bathing Water sites by 2030, and all overflows by 2045
- It ensures compliance for our STWs
- It delivers our flooding objectives over the long term
- It provides the least impact on customer bills
- It provides time for investigations to reduce risks and uncertainties in our plan

[118] Note 1: Least cost relates to the construction cost of each plan. Smallest bill impact represents the household bill increase of each plan which considers the profiling of investment. Carbon is considered as part of the natural capital element
Note 2: The plan with the largest area under the radar plot indicates that plan provides the greatest value across all value criteria. The closer the line is to the outside of the graph, the better the outcome for any metric.

- It provides time to build capacity and develop innovation to achieve the step change in delivery of an ambitious surface water management plan

5.82 For more details on plan alternatives please refer to Section 7 of the Technical Appendix on Programme Appraisal[119].

[119] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-e-programme-appraisal.pdf

6 PART E: NEXT STEPS

Introduction

6.1 The DWMP has been built using learning from previous long term planning initiatives (including London 2100), consolidating knowledge and applying industry frameworks to produce a companywide plan. It has taken three years and eight months to develop.

6.2 As this first cycle is non-statutory, we have been able to use it as a testing ground for cycle 2 which will be statutory. Approaches that have proven successful we will retain and enhance.

Things we are going to focus on

6.3 Our partnership opportunity data is comprehensive. We want to develop, mature and in anticipation of co- funding start delivering schemes.

6.4 In preparation for cycle 2 we will work with our stakeholders and establish the lessons learned from cycle 1. This will ensure we improve delivery in cycle 2. We will include this learning in the Strategic Context engagement for cycle 2.

6.5 There is significant ongoing activity to finalise the Storm Overflow Discharge Reduction Plan and the WINEP. Solution development for storm overflow discharges will be a key focus now and into the future.

6.6 We need to continue to develop our sewer models. We have an extensive and high quality one-dimension hydraulic sewer model library that was used in cycle 1. For the next cycle we need to:

- Improve the model coverage of surface water sewers
- Identify and represent in the models third party assets that affect our sewer systems including ditches and watercourses
- Incorporate two-dimensional modelling to be able to enhance predictions on how water flows at ground level

6.7 Our process models are steady-state, and we could transition into dynamic models in some key locations. This can be incorporated into future Digital Twins.

6.8 There is also an opportunity to use alternative models within BRAVA. We have collaborated with Imperial College and the Greater London Authority on the use of WSIMOD[120] to assess population growth and climate change in the Lower Lee Valley. This model incorporates both flow and water quality into a single application. The Lower Lee Valley sub-Regional Integrated Water Management Strategy is expected to be published by the GLA in the second half of 2023. WSIMOD has also been used in Greater Manchester.

[120] WSIMOD demonstration video: https://www.youtube.com/watch?v=qBxO-2yJ8hE

6.9 Extensive and cost-effective rapid delivery of nature-based solutions, especially in urban areas, is a challenge that stakeholders commented on. While we have a Technical Appendix on delivery of SuDS and nature-based solutions[121], extensive work is needed until the delivery can match the ambition of the plan. We are keen to work with other international megacities through the UNESCO Megacity Alliance for Water and Climate[122] to use their knowledge and experience in SuDS delivery and how they have revolutionised delivery.

6.10 We have many choices to make at some of our large treatment works in London to accommodate population growth. The site based adaptive plans for Beckton and Mogden will need to be refreshed and enhanced to help inform future decision making on technology choices, interaction with other plans (especially for Mogden) and interaction with asset deterioration (already considered for Beckton). We believe site based adaptive planning will allow for long term, no-regret and transparent decision making at these sites.

How our plan could change

6.11 The DWMP is re-iterated every 5 years and a new plan published. We anticipate that in the next cycle 2 statutory phase, the development framework will be reviewed and republished. We look forward to playing an active role in this review.

6.12 We are working in an information-rich age in the water industry with the volume of data increasing exponentially. As more data becomes available our plans will inevitably change. Some of the key potential sources for better data are:

- More event duration monitoring (EDM) data both from existing monitors and new monitors currently proposed for delivery in WINEP.
- Sewer depth monitors (SDMs) that will reduce blockages but also improve hydraulic sewer models with real time data.
- The potential continuous quality monitoring for final effluent and storm discharges that Defra are consulting on in spring 2023.

6.13 These sources of more and better data, as well as refreshed growth and climate change forecasts, have the potential to substantially change our plan in the future. Our current adaptive planning framework accommodate changing climate change and growth forecasts. We may need to develop additional "better information" scenarios in our adaptive planning frameworks to fully account for other aspects of data enhancement.

6.14 In the long term the DWMP is unconstrained to drive ambition. As it matures through subsequent cycles, we anticipate deliverability and 'who pays for what' to be a focus to improve the affordability of the plan.

[121] https://www.thameswater.co.uk/media-library/home/about-us/regulation/drainage-and-wastewater/appendix-r-delivery-of-suds-and-nature-based-solutions.pdf
[122] https://en.unesco.org/mawac

Conclusions

6.15 Cycle 1 clearly identified that the challenges of the future cannot be solved by the solutions of the past. Historically big problems have resulted in big infrastructure whereas in this plan we are proposing to deal with big problems by 'going green' and 'working together'.

6.16 We recognise that spending £32bn over 25 years is neither affordable nor deliverable based on how we do things today. Our plan indicates a trajectory in the long term which can only be affordable with partnership working. Subsequent plan iterations will need to provide more detail on how we are going to deliver this profile and who pays for what.

6.17 Planning is always looking to the future, and we have therefore started work on DWMP cycle 2 with the Strategic Context stage commencing in Summer 2023.

7 ANNEX

Progress 

ANNEX A – Evidence of compliance with DWMP Guiding Principles

7.1 The table below is a summary of the main evidence presented to various assurance forums to demonstrate evidence of compliance with the DWMP Guiding Principles.

Guiding principle	Summary of evidence demonstrating compliance
Be comprehensive, evidence based and transparent in assessing, as far as possible, current capacity and actions needed in 5, 10 and minimum 25-year periods considering risks and issues such as climate change. Plans should also align, as far as possible, with other strategic and policy planning tools	**Be comprehensive:** • The DWMP was developed following the five-stage Water UK DWMP Framework • 77% of the catchments, representing 99% of the PE were passed through the framework • Where there was uncertainty regarding applying the Framework, the consultants who created the framework for Water UK have helped translate strategic intent into the detail of the plan • Catchment plans have been enhanced between draft and final to better signpost linkages between plans • Technical appendix that provides detail of early integration of DWMP and WRMP schemes • Adaptive planning has following Ofwat Long Term Delivery Strategy guidance • Plan clearly sets out staged investment over 5, 10, 25-year timeframes. Data tables provide cost and benefit data at additional time intervals. **Be evidence based:** • Long-term drivers are clearly defined, and their impact quantified through BRAVA process • Assured hydraulic models have been used where available providing detail to asset level • First iteration of DWMP, so core strategic objectives limited to issues where the key metrics can be consistently and confidently modelled • Programme appraisal uses DST which enables comparative assessment of plan options. Use of simple radar plots to demonstrate how plans were discounted.

Guiding principle	Summary of evidence demonstrating compliance
	Be transparent: • Data published on webpages with GIS mapping of results to meet needs of local stakeholders • Stakeholders engaged at each step of the framework with 90+ workshops with Level 2 and 3 stakeholders on key stages presenting intended approach and results • Strategic forum of key stakeholders to review proposed approach ahead of implementation
Strive to deliver resilient systems - that will meet operational and other pressures and minimise system failures.	**Identifying and assessing risks** • The DWMP assesses the risks to customers and the environment from sewerage assets (not surface water sewers) considering the changes in flood and pollution risk from three key drivers - climate change, population growth and urban creep • Key parameters are nationally consistent enabling country-level comparison of risk **Timeframes and future trends** • Investments presented in five-year intervals to 2050 (meets minimum 25-year requirement). Further differentiation in data tables. • At final DWMP work on 'what base buys' has highlighted the platform that maintenance provide for DWMP. Silt removal and Smart Network concepts are highlighted as measures that can tactically manage performance but their impact on hydraulic incapacity due to climate change and growth is limited in the long term **Potential hazards and threats to sewerage assets** • Previous work on flood risk to key operational assets is integrated • Green infrastructure options feature in optioneering stage and demonstrated in investment plans (London is a 'SuDS-first' plan) **Prioritising resilience upgrades to assets** • DWMP prioritises investment to sites with greatest flood and environmental risk • Storm overflow plan considered priority sites first based on sensitivity of receiving catchment

Guiding principle	Summary of evidence demonstrating compliance
Consider the impact of drainage systems on immediate and wider environmental outcomes including habitats and in developing options for mitigation to include consideration of environmental net gain and enhancement	**Protecting and enhancing the environment** • Sets out plan to meet government targets on storm overflow discharges • Two-thirds of planning objectives focus on the environment • 'Green' options are incorporated and assessed in the optioneering stage • Very ambitious 'SuDS-first' approach proposed for London • SEA and HRA assessments undertaken • Best value assessment criteria include broad environmental parameters **Nature-based solutions** As above, nature-based solutions are identified in the optioneering stage, and their wider benefits valued
Be collaborative - recognising the importance of sectors working together to consider current and future risks and needs and to deliver effective solutions, setting out how they will do this, how they have engaged with and responded to stakeholders.	• Stakeholder engagement has doubled the number of planning objectives in DWMP. • Four summary documents produced to enable clear articulation of the ambition for a water company-led, stakeholder co-created plan • The 'customer journey' stating how stakeholder feedback was sought articulated in stakeholder engagement summary documentation • Three levels of engagement in place to account for local, strategic, and regional views • No information provided on jointly funded solutions - expect to develop in Cycle 2
Show leadership - in considering the big picture for an organisation's operational capacity to develop and deliver the plan, and mindful of linkages with other strategic planning frameworks	**We expect companies to lead on the development of the plans and engagement with others, building on leadership shown in DWMP Steering Group, DWMP Implementation Group and the Task and Finish Groups** • Significant programme of multi-level stakeholder engagement (covered in 'Be collaborative' principle) • High-level governance process documented **Company boards provide sufficient resources, steer on expectations on the plan, take an active interest in their development, provide exemplars for multi-sector engagement** • Sustained programme of Exec engagement throughout DWMP development • Board have directed that the DWMP aligns with TW's corporate direction • Board engagement via four sessions. Board have reviewed and commented on a selection of the key outputs and external assurance reports to fulfil their role in assuring DWMP against five criteria set by stakeholders

Guiding principle	Summary of evidence demonstrating compliance
Improve customer outcomes and awareness and that solutions and actions provide both value for money and consider societal benefits	*Meaningful and effective engagement with customers in developing plans* Early and sustained customer engagement in setting the objectives and developing the plan • Customer views were sought on priorities for DWMP - qualitative survey, building on PR19 customer research • Customer preferences were sought on 16 categories of options - qualitative survey • Customer research undertaken to prioritise household and commercial customers priorities for planning objectives and outcomes (customer weightings used in plan balancing) • Customer online survey commissioned as part of consultation phase
	Engagement fully represents customer diversity • Industry experts commissioned to undertake customer surveys. Industry best practice sampling code applied by industry experts (Eftec)
	Use of accessible channels, appropriately moderated (technical) language • Eftec reports provided industry code compliant process • Due to Covid, customer engagement was via digital forums. Specific sessions were designed and held to include less digitally confident customers
	Use of customer representative bodies for more technical input • Consumer Council for Water and CCG representatives are represented on our Level 1 Forum. Briefing sessions with TW's CCG during the Plan's development

Guiding principle	Summary of evidence demonstrating compliance
	Clear line of sight between customer preferences and changes to the Plan • Summary of how customer engagement on priorities, options and plan balancing provided. More info in technical appendix.
	Clear plan for customer engagement in the Plan • Consultation programme designed to engage customers - consultation framework, webinars, website, upload on portal, bespoke customer research exercise tailored for different plan

Figure 7-1 : Compliance with the guiding principles

Glossary

Term	Description
1 in 30-year storm	A storm that has a 1 in 30 chance (3.33% probability) of being equalled or exceeded in any given year. This does not mean that a 30-year flood will happen regularly every 30 years, or only once in 30 years.
1 in 50-year storm	A storm that has a 1 in 50 chance (2% probability) of being equalled or exceeded in any given year. This does not mean that a 50-year flood will happen regularly every 50 years, or only once in 50 years.
Asset Management Plan (AMP)	A five-year planning cycle used by English and Welsh water industry regulators to set allowable price increases for privately owned water companies and for the assessment of performance indicators such as water quality and customer service.
Baseline Risk and Vulnerability Assessment (BRAVA)	Following Risk Based Catchment Screening (RBCS), more detailed risk assessments on those catchments where we believed there was an adverse risk to performance over time. We modelled their performance to 2020 (baseline), 2030, 2035 and 2050.
Business Plan	Business Plans are produced by water companies every 5 years. They set out their investment programme to ensure delivery of water and wastewater services to customers. These plans are drawn up through consultation with the regulators, stakeholders and customers and submitted to Ofwat for detailed scrutiny and review.
Catchment Strategic Plans (CSPs)	Summary reports to promote system thinking across large wastewater catchments. These provide early sight of our final plans enabling co-authoring opportunities for our stakeholders. Each document outlines the challenges that the catchment will face in the future and the long-term plans to address these issues.
Combined sewer	A sewer designed to receive both wastewater and surface water from domestic and industrial sources to a treatment works in a single pipe.
Customer Challenge Group (CCG)	An independent body that challenges both our current performance and our engagement with customers on building our future plans.
Cycle 1 and Cycle 2 DWMP	Our current DWMP is referred to as Cycle 1, it covers a planning period of 2025-2050. Our next plan will be published in five years' time and is referred to as our Cycle 2 DWMP, it will cover a planning period of 2030-2055.
Department for Environment, Food and Rural Affairs (Defra)	UK government department responsible for safeguarding the natural environment, food and farming industry, and the rural economy.
Drainage and Wastewater Management Plan (DWMP)	A Drainage and Wastewater Management Plan (DWMP) is '*a long-term strategic plan that sets out how wastewater systems, and the drainage networks that impact them, are to be extended, improved and maintained to ensure they are robust and resilient to future pressures*'. The planning period is 25 years, from 2025 to 2050. DWMP is iterated every five years; the first known as 'Cycle 1', published as a final plan in May 2023.
dDWMP	The draft version of the Drainage and Wastewater Management Plan, published in June 2022.
fDWMP	The final version of the Drainage and Wastewater Management Plan, to be published in May 2023.
Dry Weather Flow (DWF)	Dry Weather Flow is the average daily flow to a Sewage Treatment Works (STW) during a period without rain.

Environment Agency (EA)	UK government agency whose principal aim is to protect and enhance the environment in England and Wales.
EA Pollution Categories 1 to 3	Category 1 incidents have a serious, extensive or persistent impact on the environment, people or property. Category 2 incidents have a lesser, yet significant, impact. Category 3 incidents have a minor or minimal impact on the environment, people or property with only a limited or localised effect on water quality. Further Ofwat guidance available here: WatCoPerfEPAmethodology v3-Nov-2017-Final.pdf (ofwat.gov.uk)
Event Duration Monitoring (EDM)	Event duration monitoring (EDM) measures the frequency and duration of storm discharges to the environment from storm overflows.
External hydraulic sewer flooding	External flooding occurs within the curtilage of a property due to hydraulic sewer overload. Further Ofwat guidance available here: Reporting-guidance-sewer-flooding.pdf (ofwat.gov.uk)
Foul sewer	A foul sewer is designed to carry domestic or commercial wastewater to a sewage works for treatment. Typically, it takes wastewater from sources including toilets, baths, showers, kitchen sinks, washing machines and dishwashers from residential and commercial premises.
Grey infrastructure	New sewers, sewer upsizing and attenuation storage to provide additional capacity in the wastewater networks. Also covers new pumping stations, rising mains and/or civil structures at STWs.
Green infrastructure	Sustainable surface water management solutions, including sustainable drainage systems (SuDS), that are designed to mimic naturally draining surfaces. Typically applied to surface water or combined sewerage systems, but can also be applied to land, highway or other forms of surface drainage.
Historic England (HE)	A non-departmental public body of the government whose aim is to protect the historical environment of England by preserving and listing historic buildings, ancient monuments.
Hydraulic overload	Hydraulic overload occurs when a sewer or sewerage system is unable to cope with the receiving flow.
Internal hydraulic sewer flooding	Flooding which enters a building or passes below a suspended floor caused by flow from a sewer. Further Ofwat guidance available here: Reporting-guidance-sewer-flooding.pdf (ofwat.gov.uk)
L2 Area (Strategic Planning Area)	An aggregation of level 3 catchments (tactical planning units) into larger level 2 strategic planning areas. The level 2 strategic planning areas allow us to describe strategic drivers for change (relevant at the level 2 strategic planning area scale) as well as facilitating a more strategic level of planning above the detailed catchment assessments.
L3 Catchment (Tactical Planning Unit)	Geographical area in which a wastewater network drains to a single STW. Stakeholders may be specifically associated with this area. Includes for surface water sewerage that may exist which serves the wastewater geographical area but drains to a water course.
Lead Local Flood Authorities (LLFAs)	LLFAs are Risk Management Authorities as defined by the Flood and Water Management Act 2010. They have statutory duties with respect to flood risk management, investigating flooding and the compilation of surface water management plans.

Long-Term Delivery Strategy (LTDS)	A requirement by Ofwat on water companies, to ensure that short term expenditure meets long term objectives for customers, communities, and the environment. These will be submitted as part of the Price Review.
Misconnections	Misconnections are where either surface water drainage or foul water is connected to the wrong system e.g., surface water to foul only or foul to surface water systems.
Natural capital accounting	The process of calculating the total stocks and flows of natural resources in a given system, either in terms of monetary value or in physical terms.
Natural England (NE)	A non-departmental public body sponsored by the Department for Environment, Food and Rural Affairs to protect the natural environment in England, helping to protect England's nature and landscapes.
Non-governmental organisation (NGO)	An organisation that operates independently of any government, typically one whose purpose is to address a social or political issue.
Options Development and Appraisal (ODA)	A method to focus the level of planning effort, i.e., proportionate to the risks identified, with a view to providing a measure of consistency across the industry.
Ofwat	The regulatory body responsible for economic regulation of the privatised water and wastewater industry in England and Wales.
PR24	Every five years, water companies set out their plans for what they'll deliver and how much they'll charge customers[123]. Their plans over the next five years should include how they will: • Provide a safe and clean water supply • Provide efficient sewerage pumping and treatment services • Control leaks • Install meters • Maintain pipes and sewers • Maintain and improve environmental standards This process is known as the price review, and the next one will be in 2024, when Ofwat will make its final decisions. We call this PR24.
Risk-Based Catchments Screening (RBCS)	A first-pass screening exercise of catchment vulnerability against 17 different risk indicators. To understand which catchments are low risk catchments and those that are likely to be at risk in the future if not supported by our long-term plan.
Risk Management Authorities (RMAs)	Authorities responsible for Flood Risk as defined in the Flood and Water Management At 2010. These include, Lead Local Flood Authorities, Highway Authorities, Local Planning Authorities, Natural England and the Environment Agency.
Sewage Treatment Works (STW)	A sewage treatment works receives and treats wastewater to a standard legally agreed with the Environment Agency, before it is released back into the environment.
Specific, Measurable, Achievable, Relevant, and Time-Bound (SMART)	A framework for setting effective targets.
Storm overflow discharges	Storm overflows are used to manage excess flows, which typically occur as a result of heavy rainfall. Excess flow that may otherwise have caused flooding is released through a designated outfall to a water course, land area or alternative drainage system.

[123] https://www.ccwater.org.uk/priorities/price-review/

Strategic Environmental Assessment (SEA)	A systematic decision support process to ensure that environmental and other sustainability aspects are considered effectively in policy, plan and programme making.
Surface water sewer	A surface water sewer collects rainwater from domestic and commercial roofs, driveways, patios etc to a local watercourse or suitable surface water drainage system.
Sustainable Drainage systems (SuDS)	Drainage solutions that provide an alternative to the direct channelling of surface water through networks of pipes and sewers to nearby watercourses. SuDS aim to reduce surface water flooding, improve water quality, and enhance the amenity and biodiversity value of the environment. SuDS achieve this by lowering flow rates, increasing water storage capacity and reducing the transport of pollution to the water environment.
Thames Regional Flood and Coastal Committee (TRFCC) area	The TRFCC area was established by the Environment Agency under the Flood and Water Management Act 2010 that brings together members representing the Constituent Authority. Featured TRFCCs are listed here on our DWMP portal: Drainage and Wastewater Management Plan (arcgis.com)
Water Industry National Environmental Programme (WINEP)	The framework under which Defra and the EA require environmental improvements to be delivered by water companies. Guidance is released by regulators, which water companies interpret for their geographical area, and resubmit the outputs back to regulators for endorsement.

Navigating our DWMP

We've developed a comprehensive document suite to share our final DWMP. This includes five summary documents that contain increasing levels of detail. To help you to navigate around our document suite and to find key DWMP content, we provide a Navigation index below and on our DWMP webpage. The orange cells refer to where key DWMP content can be found across our final document suite.

Navigation index		Protecting the environment and providing a reliable, sustainable wastewater service							Best value and delivery					Working together		DWMP stages and data				
		Storm overflows	Sewer flooding	Level of ambition & pace of delivery	Growth & climate change	Resilience: flooding & power	Groundwater	Environmental assessments	Affordability & bill impact	Best Value	Base vs Enhancement	Solutions & deliverability	Programme alignment	Partnership working	Stakeholder & customer engagement	DWMP stages & process	Level 2 regional summaries	Level 3 regional summaries	Data tables	Risk & Assurance
Summary documents	Customer summary																			
	Non-technical summary																			
	Technical summary																			
	The Plan																			
	Catchment Strategic Plans x13																			
Technical appendices x11	Appendix A - Strategic context																			
	Appendix B - Risk-Based catchment screening																			
	Appendix C - Baseline risk and Vulnerability assessment																			
	Appendix D - Options development and appraisal																			
	Appendix E - Programme appraisal																			
	Appendix F - Stakeholder engagement																			
	Appendix G - Adaptive pathway planning																			
	Appendix H – Customer engagement Part A – Draft DWMP																			
	Appendix I - Risk and uncertainty																			
	Appendix J - DWMP and WRMP alignment																			
	Appendix M - Assurance																			
New technical appendices x9	Appendix N - You Said, We Did (YSWD)																			
	Appendix O - What base buys																			
	Appendix P - Response to July 2021 Floods																			
	Appendix Q - Storm overflows																			
	Appendix R - Delivery of SuDS and nature-based solutions																			
	Appendix S - Partnership opportunities and working																			
	Appendix T - Groundwater quality																			
	Appendix U - Resilience																			
	Appendix V – Customer engagement Part B – Consultation Survey Report																			
Environmental assessments	Appendix K - Strategic environmental assessment (SEA)																			
	Appendix L - Habitats regulations assessment (HRA)																			
Portals and data	Customer portal																			
	Practitioner portal																			
	Data tables																			
	Data tables commentary																			

We welcome your views on our DWMP. Please share them with us by emailing: DWMP@thameswater.co.uk.

This document reflects our DWMP 2025-2050 as published in May 2023.