

United Utilities Water

Drainage and Wastewater Management Plan 2023

Technical Summary

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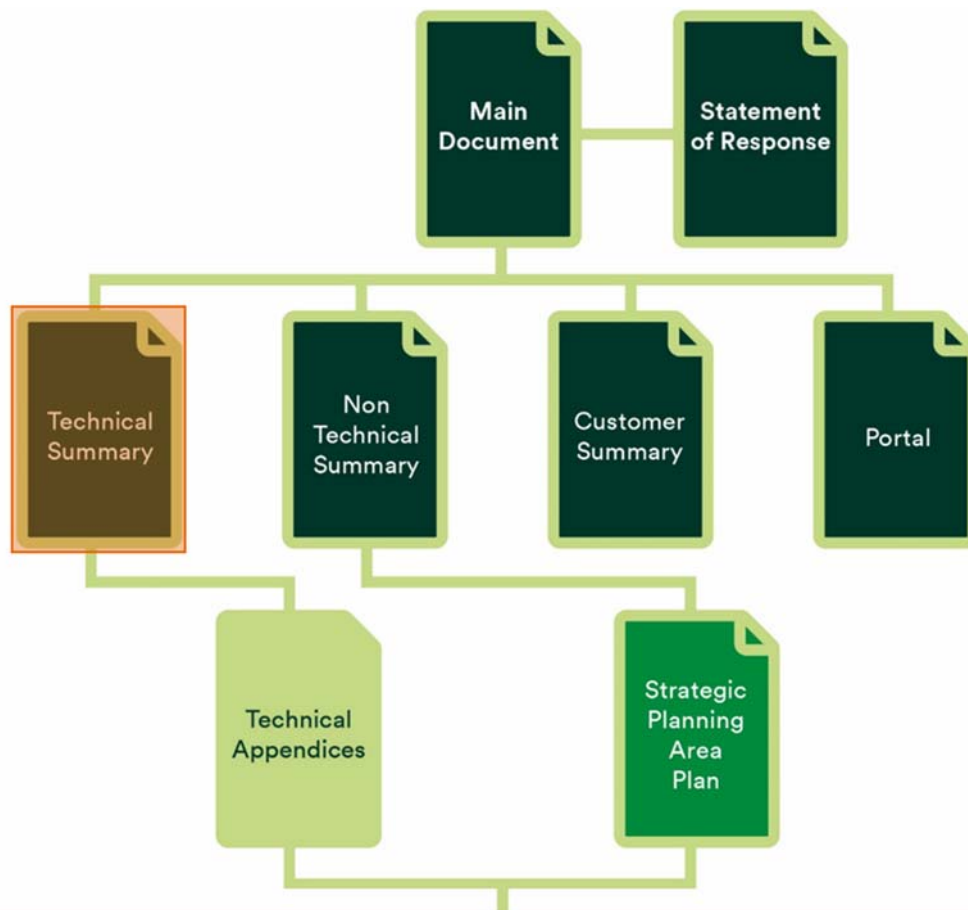
Executive Summary

This report sets out United Utilities Water's (U UW) approach to achieving a long-term drainage and wastewater plan, which offers best value to customers and delivers robust and resilient wastewater services for the North West. The plan accounts for key challenges facing the North West over the next 25 years, including climate change and a growing population. This is U UW's first Drainage and Wastewater Management Plan (DWMP) and the first time such plans have been produced by the whole sector. Under the guidance of the DWMP framework, U UW have developed a range of approaches and tools in order to build the plan – these tools will continue to be refined, developed and re-run as new or better information becomes available. These tools include approaches to forecasting demand, application of climate change uplifts, optimisation of solution blends, and modelling across U UW wastewater network, wastewater treatment and the environment.

The DWMP Main Document (DP1) is the over-arching umbrella document, this Technical Summary goes into more detail around the approaches taken in developing and producing the plan. This includes approaches to uncertainty, scenario planning and adaptive pathways. This document is supplemented by nine standalone Technical Appendix documents (TA1 – TA9), which provide greater detail on the outputs of the assessments and the mechanisms used to derive the final preferred near, medium and long-term plan.

Figure 1 summarises the full suite of documents published as part of the DWMP.

Figure 1 DWMP document structure



TA1 Assurance and Governance	Alt Crossens
TA2 Stakeholder Engagement	Derwent
TA3 Demand Forecasting	Douglas
TA4 Risk Based Catchment Screening	Eden Esk
TA5 Assessing Future Risk	Irwell
TA6 Resilience	Kent Leven
TA7 Options Development and Appraisal	Lune
TA8 Programme Optimisation	Mersey Estuary
TA9 Customer Engagement	Ribble
	South West Lakes
	Upper Mersey
	Waver Wampool
	Weaver Gowy
	Wyre
Environmental Assessments	

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Glossary

For the glossary, refer to document C003.

1. Introduction

1.1 Purpose and importance of the DWMP

1.1.1 With a changing climate and a growing population, the future is uncertain and the pressures on drainage and wastewater assets are magnifying. In order to mitigate impacts on our wastewater services and the experience customers have, the industry is developing a framework to enable a more consistent and collaborative approach to long-term planning. Under this framework, United Utilities Water (Uuw) have developed their first Drainage and Wastewater Management Plan (DWMP). It has been developed in collaboration with a broad range of stakeholders and aims to maintain and improve resilient wastewater and drainage systems, now and in the future.

1.1.2 By developing the DWMP, Uuw has an opportunity to:

- Provide a basis for more integrated planning alongside stakeholders across the North West to tackle shared and interrelated risks relating to drainage, flooding and protecting the environment;
- Strengthen partnership working with all Lead Local Flood Authorities (LLFAs) and other stakeholders to drive integrated investment in the environment and communities;
- Develop a plan that will help address the increasing environmental expectations from customers and stakeholders and work towards the ambitions set out in Defra's 25-year plan;
- Collectively explore innovative solutions such as sustainable drainage systems (SuDS) and nature-based solutions to understand what is best for the North West; and
- Embed Systems Thinking to better understand drainage and environmental interactions, and to maximise the potential for integrated solutions.

1.1.3 The DWMP is a 25-year plan setting out how Uuw intend to maintain robust and resilient drainage and wastewater services. The plan is underpinned by a national framework set out by Water UK. It has been recognised across various organisations such as the government, regulators, local authorities and environmental charities that a step change in joined-up planning approaches is required in order to meet future challenges such as climate change and population growth. Uuw will do this by moving towards a more consistent basis for long-term planning across wastewater and drainage services.

1.1.4 The DWMP aims to:

- Provide a clear, transparent and consistent planning approach with sufficient adaptability to respond to future challenges, drivers and risks;
- Demonstrate how the long-term plans supports economic growth, resilient communities and will protect and enhance the environment;
- Provide a systematic understanding of service and system risks and vulnerabilities;
- Facilitate integrated and partnership working and the co-creation of innovative solutions; and
- Provide greater confidence to our customers, stakeholders and regulators.

1.1.5 Uuw will lead on this plan, but will also be working closely with other organisations, such as the Environment Agency and other Risk Management Authorities (RMAs) such as LLFAs and planning authorities, to encompass all activities relating to drainage, flooding and protecting the environment.

1.1.6 The success of the DWMP will rely upon early, continued and effective engagement, which is why partnership working and collaboration are at the heart of the plan. By working together, we all have the opportunity across the North West to understand how future challenges might impact the region, and what steps we need to take to adapt and mitigate against them.

1.2 Our approach to the DWMP

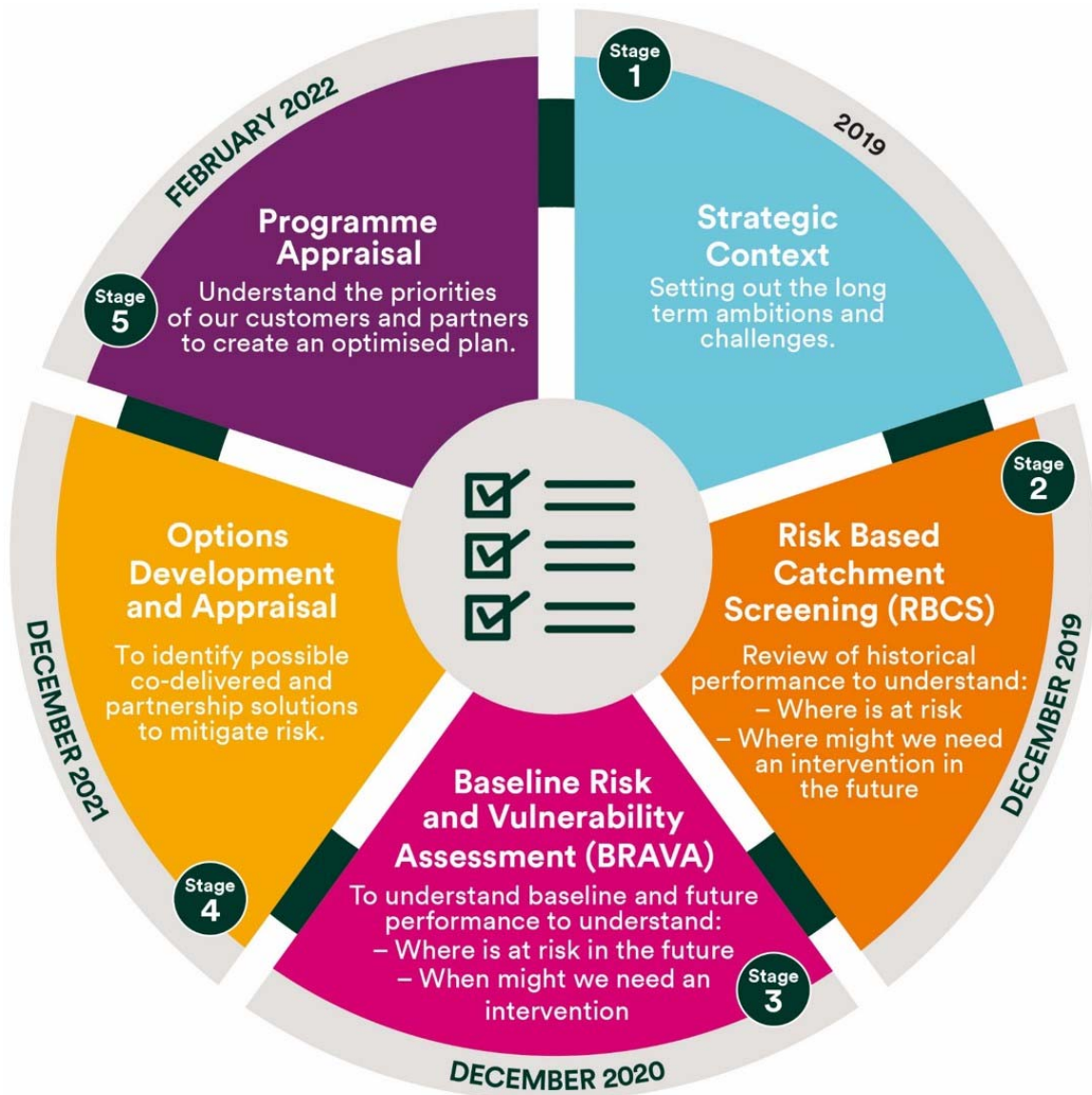
- 1.2.1 UUW has taken a comprehensive approach to the first DWMP, recognising the importance of long-term planning to adapt to climate change and meet the demands of population growth.
- 1.2.2 Across the UUW region there are already numerous strategic management plans (Figure 2) owned by various other organisations with a focus on managing particular risks relating to drainage and wastewater. In order to ensure that this plan has the best chance of success we have worked closely with stakeholders to understand their plans. For example, to ensure alignment between this plan and the Flood Risk Management Plan (FRMP), we have worked closely with the Environment Agency through the ‘Planning Together Group’, first established for the DWMP, with a focus on identifying shared strategic measures and delivering joint communications to stakeholders.
- 1.2.3 We have ensured that the main goals and objectives of Defra’s 25-Year Environment Plan and the Water Industry Strategic Environmental Requirements (WISER) and the Storm Overflow Discharge Reduction Plan (SODRP) are complimented by our submission and that we can continue to meet the ambitions outlined in these plans through delivery of the DWMP.

Figure 2 Strategic management plans



1.2.4 The plan is made up of five main stages (Figure 3), which each contribute to developing the most sustainable and effective future for the North West. These stages include setting out the long-term ambition for the region, identifying risk and understanding the possible interventions and solutions that could be developed.

Figure 3 Five stages of a DWMP

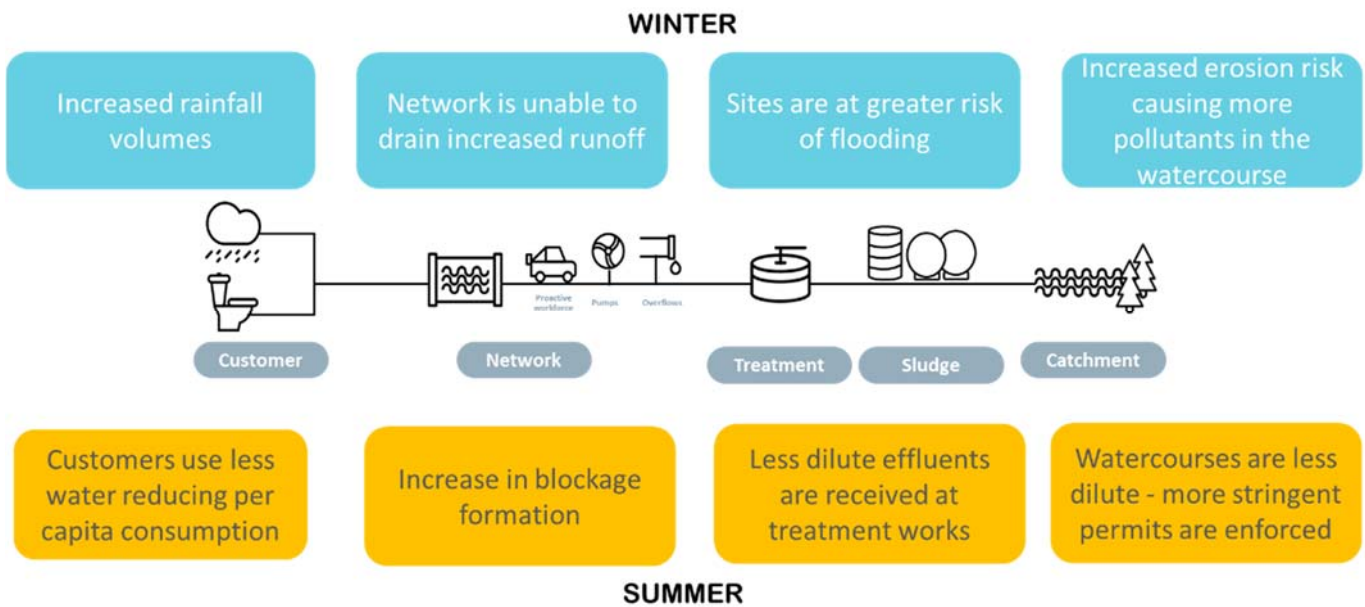


2. Background

2.1 Overview

- 2.1.1 In the North West of England, U UW collects and transports wastewater from over seven million people through over 78,000 kilometres of sewer to 567 wastewater treatment works. With the population across the North West set to increase by 14% by 2050, and climate change resulting in wetter winters and drier summers, U UW drainage and wastewater assets will be under increasing stress (Figure 4) unless we increase our planning for the future and partnership working.
- 2.1.2 Over 50% of the sewers in the North West are combined (and a much higher percentage in some specific locations), a legacy of their Victorian construction, which creates significant challenges for managing rainwater. The success of our plan will be defined by our performance against a series of planning objectives. It is against these planning objectives that current and future performance is to be measured at a company and local planning level. Further details on our planning objectives are given in Section 4.

Figure 4 How could climate change impact the wastewater production line?



3. Planning areas

3.1 Overview

3.1.1 As defined within the DWMP framework, the plan has been established over three levels to maximise the potential for partnership working and for effective engagement between regulators and stakeholders at both company-wide level and more locally. These levels are known as Tactical Planning Units (TPU) and are defined in Figure 5 and Table 1. A TPU comprises the wastewater treatment works and its catchment, while a Strategic Planning Area (SPA) comprises multiple TPUs within the same river basin.

Figure 5 Geographical scales applied for planning and collaboration with the DWMP



Table 1 Geographical scales applied within the DWMP

Geographical scale	Level	Definition	UUW Definition
Company Area	Level 1 (L1)	Overarching area where the company is licensed to provide wastewater services	Regional area
Strategic Planning Area (SPA)	Level 2 (L2)	An aggregation of TPUs which align with river catchments and/or administrative boundaries	River Catchment area
Tactical Planning Unit (TPU)	Level 3 (L3)	A wastewater treatment works, its drainage area and its catchments	Wastewater treatment drainage area
Local Planning Needs	Level 4 (L4)	Sub-catchments of wastewater treatment works catchments	Wastewater treatment sub-drainage areas

3.1.2 The SPAs are shown in Figure 6. Individual summary documents have been produced for each SPA (SPA_01 – SPA_14).

Figure 6 Geographical drainage and catchment boundaries of the U UW area



4. Levels of service

4.1 Overview

- 4.1.1 The DWMP Framework states that a balance needs to be achieved between level of risk, level of service and impact on customers’ bills. The level of service is defined within the planning objectives, which were developed following a series of regional workshops with our stakeholders as set out in Technical Appendix 2 – Stakeholder Engagement (TA2) and Technical Appendix 9 – Customer Engagement (TA9). The objectives have been set to ensure that an appropriate level of service can be provided to customers, while also protecting the environment.
- 4.1.2 There are three planning objectives: providing excellent wastewater services; protecting, restoring and improving the natural environment; and sustainably reducing the risk of sewer flooding. Beneath each of these sit a number of more specific metrics, presented in Figure 7.

Figure 7 Final DWMP planning objectives

Planning objective	 We will provide excellent wastewater services, reducing our impact on the environment	 We will protect, restore and improve the natural environment of the North West through our actions	 We will sustainably reduce the risk of sewer flooding in the North West
Metric	Wastewater Quality Compliance Pollution Incidents	Storm Overflow Performance Environmental Obligations (WINEP)	Internal Flooding External Flooding Flooding of Open Spaces Sewer Collapses Risk of 1:50 Year Storm

- 4.1.3 Planning objectives were finalised following independently facilitated stakeholder workshops which were held across the region. The aim of these workshops was to understand other risk management organisations’ views on the future of the North West in terms of drainage and wastewater management. The strong partnership theme, which runs through the DWMP, meant that it was also key to identify any methods for collaborative and partnership working to develop joint solutions and proposals for co-delivery. This was key to shape the plan and subsequently deliver the agreed DWMP outcomes.
- 4.1.4 Attendees at the collaborative workshops were generally aligned when considering the draft objectives, with the majority believing UuW could be ‘more ambitious’ with its targets concerning reducing the number of pollution incidents and enhancing natural capital of the North West. Enhancing the natural environment was considered to be of most importance to the majority of organisations. Flooding of public spaces was also highlighted as an area of importance.
- 4.1.5 The feedback was then used to inform the final objectives and metrics (as shown in Figure 7), with the main alterations to the draft objectives being the addition of an objective focused on flooding of open spaces and more ambitious targets.

5. Customer and stakeholder engagement

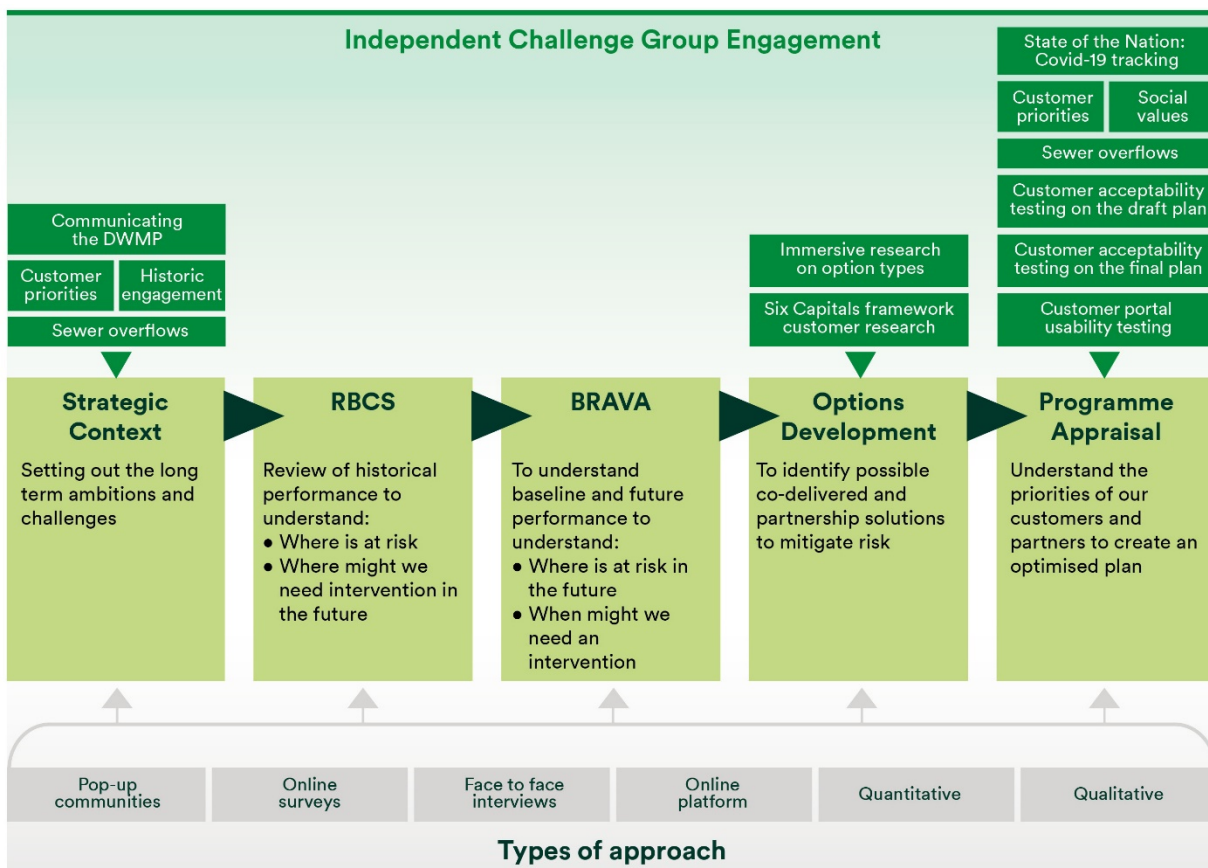
5.1 Overview

- 5.1.1 The number of different interactions between drainage and other systems means that collaboration is key in managing long-term risk. The drainage and wastewater system is an open system. There are multiple points of interaction with other risk management authorities: drainage of rainwater from roads and paved areas often connects to the combined sewer system; storm overflows in combined systems can, in heavy rainfall, discharge to rivers; finally, recycled water from wastewater treatment works is safely returned to lakes, rivers and the sea.
- 5.1.2 As well as the sewer system, other activities taking place across a catchment can have both positive and negative effects on the environment. For example, land management practices can influence flood risk and water quality as a result of diffuse pollution, and local authorities and developers can influence the amount of rainwater entering sewer systems and rivers.
- 5.1.3 In order to plan for the long term effectively, engagement and collaboration with customers, stakeholders and other organisations is key when developing and shaping the DWMP.

5.2 Customer engagement

- 5.2.1 Customers’ priorities and needs are central to our decision-making. Throughout the DWMP process we have engaged with customers across the North West and their feedback allows us to ensure that wastewater services are able to adapt and be resilient to future risks, while meeting the performance expectations of customers, stakeholders and communities today.
- 5.2.2 We have gained endorsement from customers at key milestones through several different channels as summarised in Figure 8.

Figure 8 Overview of DWMP customer engagement



5.3 Stakeholder engagement

- 5.3.1 Due to the interconnected nature of drainage, a successful DWMP requires us to work closely with our strategic stakeholders to develop, design and deliver the plan in partnership. We have engaged with the RMA and strategic stakeholders across the North West to develop an understanding of the opportunity to work in partnership to achieve multiple aims across organisations.
- 5.3.2 Prior to starting to develop the DWMP for the North West, we engaged with our RMA stakeholders; the Environment Agency and LLFAs, to share the main aspects of the DWMP. The main purpose of engaging these groups before developing the plan was to look at where we could align strategic plans across the authorities and plan together, while ensuring that the individual strategic aims and ambitions of each plan complemented the other. In the North West, RMAs recognise the efficiencies that can be made in taking catchment approach to solve multiple issues and in achieving this through a partnership.
- 5.3.3 Developing a futuristic drainage and wastewater plan for the North West needed endorsement and engagement from multiple strategic stakeholders. Although there were many partnerships already in existence, none focused on both water quality and water quantity. To fill the gap, we created 14 Strategic Planning Groups (SPGs), one for each river basin catchment in the North West. The purpose of these groups was to develop the DWMP in partnership by encompassing multiple risks, identifying joint opportunities and consulting on our plan. Members of the SPGs included the Environment Agency, LLFAs, Local Planning Authorities (LPAs) and Catchment Hosts (The Rivers Trust and Groundwork).
- 5.3.4 There has been a continuing cycle of engagement for the DWMP, and this has been delivered through meetings, conferences, reports, workshops and through our online Geospatial Portal (GSP). To ensure we captured the main milestones of the DWMP, we created a framework for engagement as shown in Figure 9.

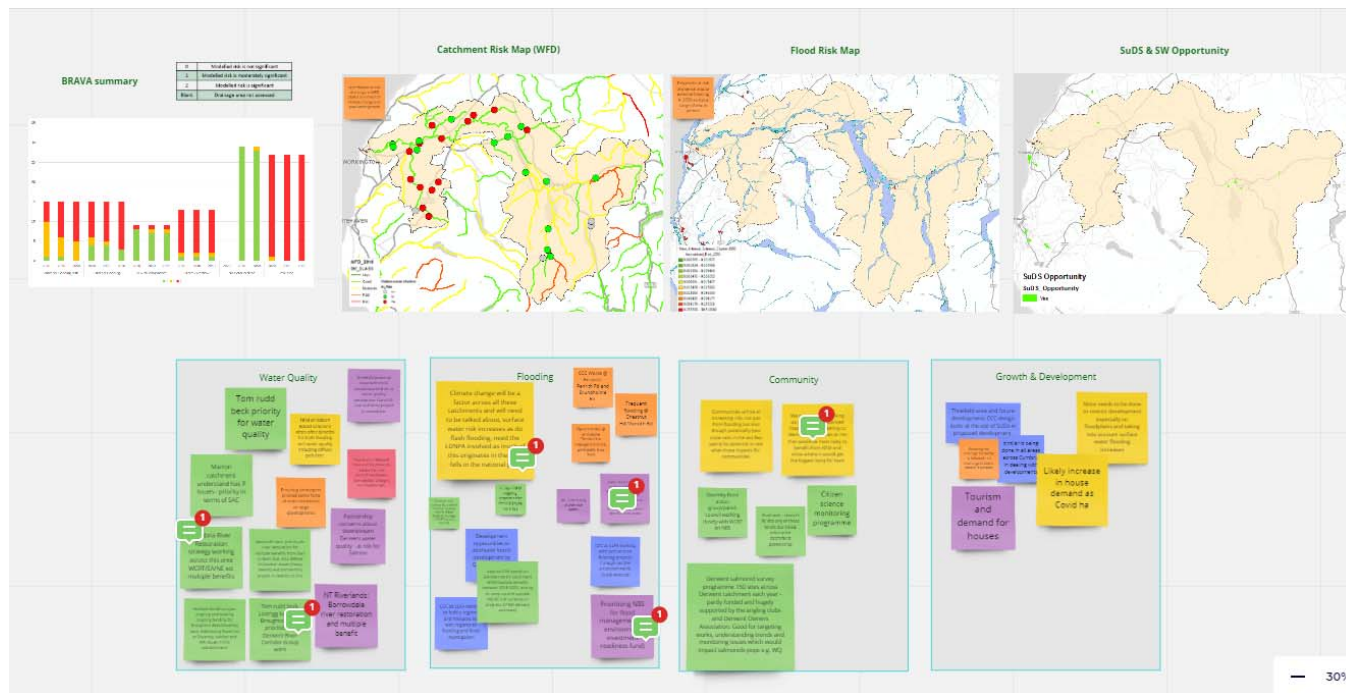
Figure 9 DWMP framework for engagement



5.4 Strategic Planning Groups (SPG)

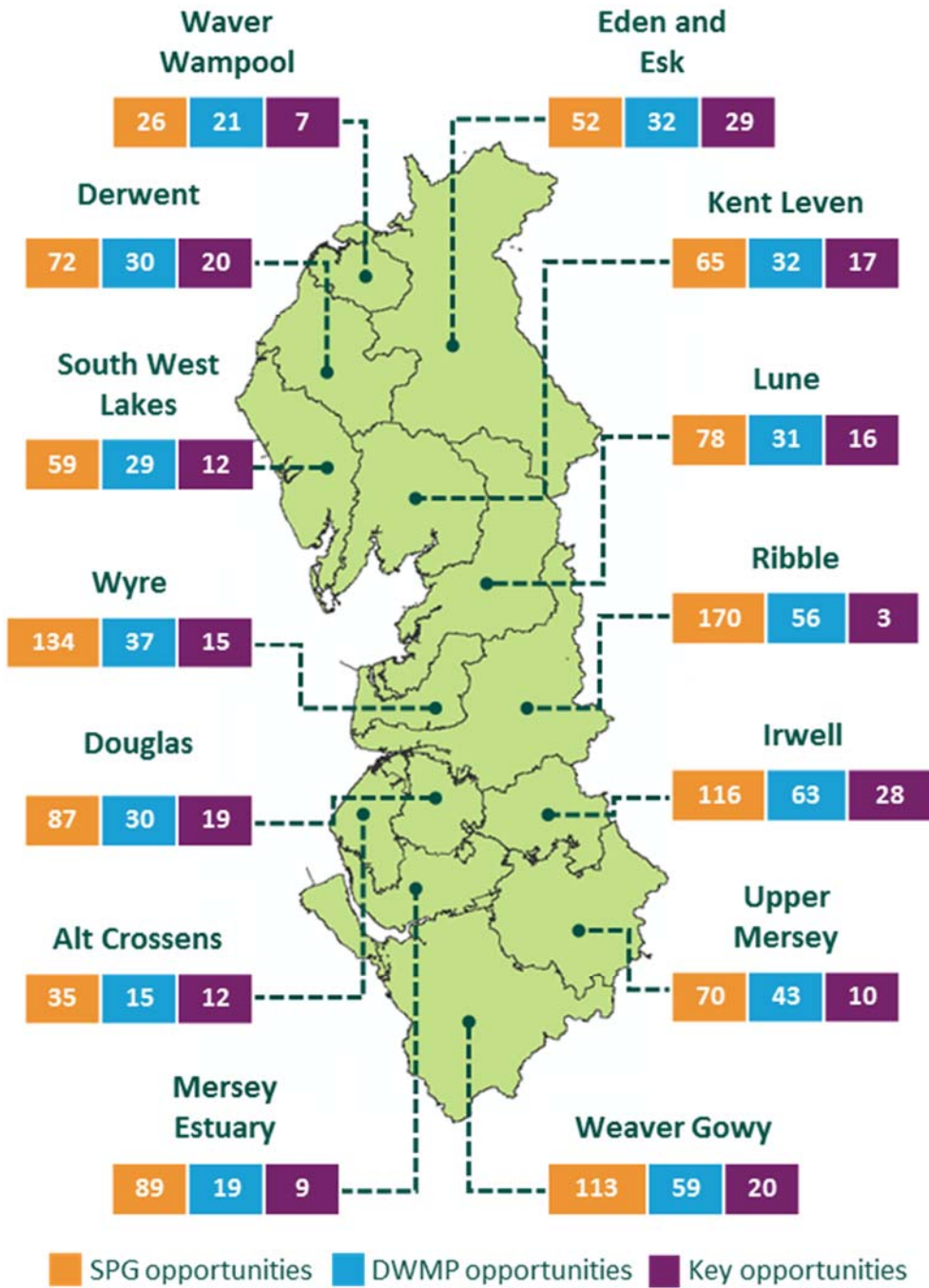
- 5.4.1 SPG workshops were held at key points in plan development. We consulted on the objectives and targets for the next 25 years and adapted these based on feedback around ambition and achievability. We also shared the Baseline Risk and Vulnerability Assessment (BRAVA) results for every catchment with our stakeholders so they could understand our areas of focus over the next 25 years.
- 5.4.2 A continuing theme through every SPG was developing partnership opportunities to investigate, co-deliver and co-fund projects, which could achieve multiple benefits. An example of this output is shown in Figure 10.

Figure 10 Example SPG session output



- 5.4.3 These workshops were used to develop a partnership opportunities pipeline which tracked risks and opportunities that stakeholders raised during or after the SPG sessions. All opportunities were reviewed to understand which had the most potential.
- 5.4.4 The final workshops were aimed at gaining endorsement for developing options and further development of key partnership opportunities (Figure 11). It was critical that stakeholders understood how developing options for DWMP was different to previous strategic programmes in how it will account for wider benefits. As stakeholders, it was also pertinent for them to understand how DWMP options will incorporate a blend of the best, most cost beneficial solutions for any desired solution.

Figure 11 Partnership opportunities pipeline



Through engaging with the SPGs over 1,000 potential opportunities were identified. Following investigations this was narrowed down to approximately 500. Following final review, a number of these have been identified as key opportunities.

5.5 Aligning strategic plans

5.5.1 The Environment Agency in the North West are a fellow regional organisation and governed by similar strategic plans and processes to Water Companies. The Environment Agency are responsible for producing a Flood Risk Management Plan (FRMP) and River Basin Management Plan (RBMP), each of which involve elements of drainage. The first step in the engagement journey was to liaise with the Environment Agency, as a stakeholders and regulator, of the DWMP and also look at the synergies between strategic plans.

- 5.5.2 In April 2019, U UW hosted a workshop with colleagues from the Environment Agency’s flood risk management and environmental teams. The high-level aim of this workshop was ‘to explore how U UW and the Environment Agency can engage with the processes and how we can work in partnership to align the three plans’. Although hosted by U UW, this was a joint workshop with presentations from both the Environment Agency and U UW, where each discussed the scope and timescales involved in the strategic plans.
- 5.5.3 The workshop produced some key learning points; highlighting the complexity around differing operational boundaries and organisational priorities, and similarities with how each were proposing to engage with the same stakeholders.
- 5.5.4 The success of this workshop led to the creation of the ‘Planning Together Group’. This working group was made up of U UW and Environment Agency personnel to align the objectives of the FRMP and DWMP as the workshop identified how the timescales for these plans were similar.

5.6 Opportunities for collaboration

- 5.6.1 Understanding shared areas of risk across the region between stakeholders allowed identification of opportunities that each party did not know existed. In addition to the BRAVA SPGs, a request was made to all LLFAs and the Environment Agency to share any modelling or flood records to develop the partnership opportunities pipeline further. While the return rate for this information was limited, we will continue to engage with all LLFAs to ensure opportunities are developed further. Despite this, through our engagement a number of opportunities were identified (Figure 11).
- 5.6.2 U UW are exploring our approach to co-delivery and co-creation of ongoing and future schemes. For example, Greater Manchester Combined Authority (GMCA) is a strategic partnership consisting of the ten Greater Manchester Local Authorities. U UW has a close working relationship with GMCA and works under a trilateral agreement, which is a signed commitment between the Environment Agency, U UW and GMCA to work collaboratively and in partnership. The Greater Manchester area is a major strategic area for U UW; for investment cycle 2020 – 2025, the Upper Mersey is a catchment that Green Recovery funding is being used to look for green and blue solutions to flood risk as well as being a trial area for Place Based Planning. In addition, acting within the GMCA area is the IGNITION project, which focuses on nature-based solutions in the face of climate change. This is a co-funded project between the strategic stakeholders in the North West, which includes U UW. As a trial area, BRAVA results in their raw format were shared with GMCA and IGNITION to identify where there may be shared opportunity to collaborate on solutions. Through IGNITION an area was identified to target the installation of SuDS in an area, rather than just in one specific location (Figure 12).
- 5.6.3 Further information on the approach taken to stakeholder engagement can be found in Technical Appendix 2 – Stakeholder Engagement (TA2).

Figure 12 Case study of how DWMP is helping to inform partnerships

IGNITION - Walkden SuDS

The IGNITION project is a €5 million EU Urban Innovation Action (UIA) funded project, which is led by the Greater Manchester Combined Authority (GMCA) and is being supported by 11 partners, including United Utilities Water. The project seeks to address the climate-related challenges the city-region faces by developing retrofit programmes of urban green infrastructure and nature-based solutions to combat climate risks.



One of the work packages is looking at ways to identify potential locations for co-investment in SuDS. United Utilities Water along with the Local Highways Authority and the Environment Agency shared data to identify where there were areas of shared risk and potentially where a solution would have shared benefit. As part of this exercise, as well as data showing current and historic risk, United Utilities Water shared the 2020 and 2050 BRAVA results for hydraulic sewer flooding and storm sewer overflow performance. This added another dimension to the partnership project and contributed to the area of Walkden being selected as the pilot study.

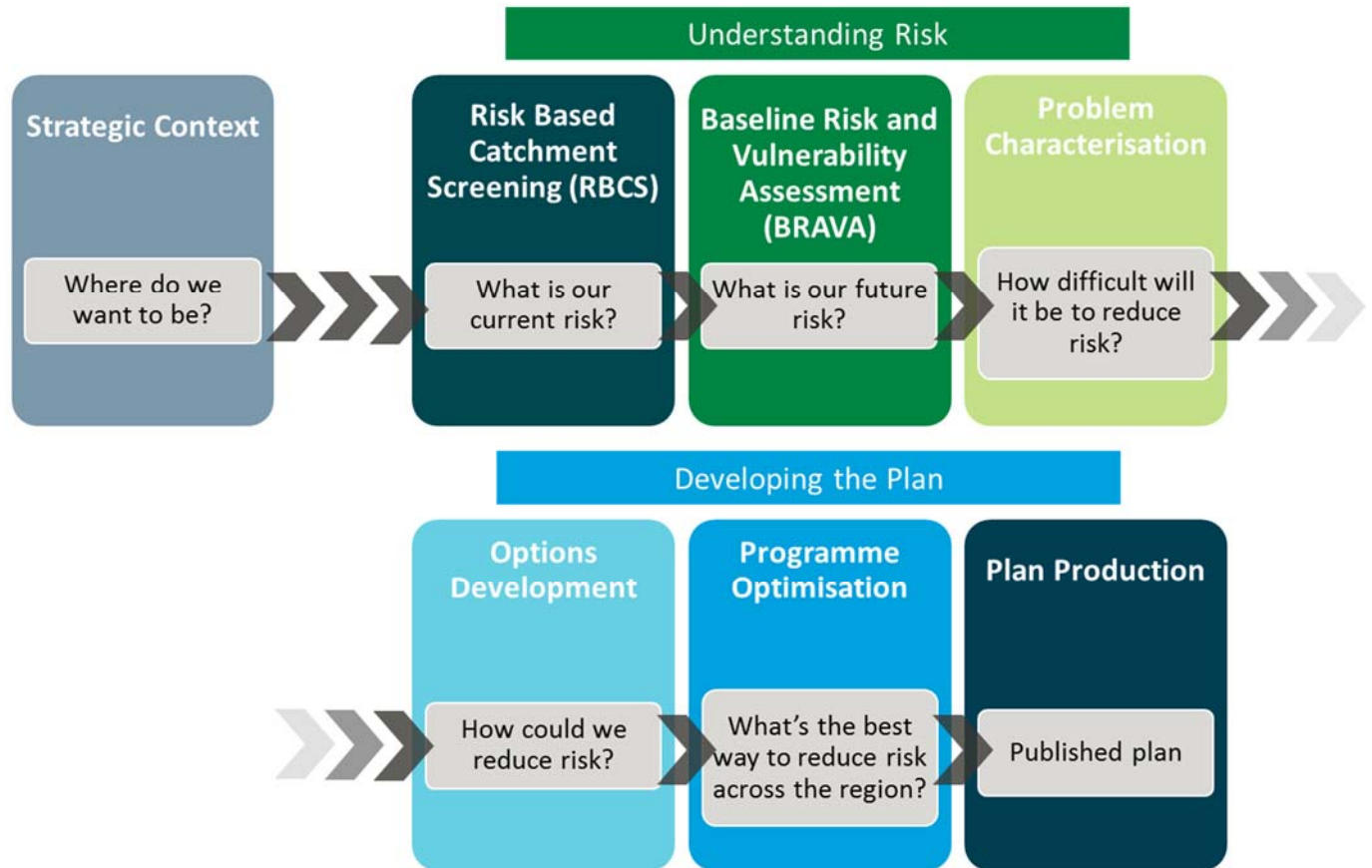
This was the first time that BRAVA results contributed to a partnership project and influenced the outcome. The project is still being finalised with implementation planned for the next 12 months. The current scope includes the retrofitting of SuDS in locations across Walkden in areas that will reduce surface water and sewer flood risk.

6. Plan development

6.1 Overview

6.1.1 This section briefly details the various stages of DWMP development as outlined in Figure 13. More detail on all sections below can be found in the relevant Technical Appendices.

Figure 13 DWMP development stages



6.2 Forecasting demand

6.2.1 The demand forecast was prepared in line with the DWMP framework, using the latest available methods and is in line with assumptions and models used for the Water Resources Management Plan (WRMP) 2019 (and Draft Water Resources Management Plan 2024, where information was available). It covers the planning period for 2020 to 2050. The demand forecast is used for Risk Based Catchment Screening and is a key input into BRAVA. The outputs are also used for option development.

6.2.2 Demand is usually reviewed and assessed for a TPU, but there may be exceptions to this where multiple demand scenarios have been identified that impact on more than one TPU. Sensitivity testing of risk using different demand is applied in these circumstances and more complex options developed to accommodate different levels of risk. The significance of the demand forecast is illustrated in Figure 14 and the multiple elements included in the development of the demand forecast are described in Table 2.

Figure 14 Elements of wastewater demand

Potential changes...

Foul Wastewater (existing and new)

- Household discharge rate and composition
- Visitor discharge rate and composition
- Non-household discharge rate and composition
- Trade effluent discharge rate and composition

Surface Water

- Existing household run off to sewer network
- Urban creep leading to increased run off to sewer network
- Land use changes (development) – leading to increased run off to sewer network
- Climate change leading to increase in rainfall events and intensity



Impacts on...

Wastewater Network Capacity

- Sewer flooding
- overflow spill (volume and frequency)
- Pumping station capacity

Wastewater Treatment Capacity

- Dry weather flow
- Multiple of flow requirement
- Treatment process unit capacity (flow and load)
- Final effluent compliance
- Increase in wastewater sludge

Environmental Deterioration

- River water quality
- Bathing water quality
- Shellfish water quality
- Habitats and Urban Wastewater Treatment Directive (UWWTD)

Table 2 Elements of demand forecast and the application within the plan

Forecast element	Source and summary	Application
Household Population (P)	Based on Local Authority planning information where available, with trend-based forecast beyond the planning timescales	Allocated to a TPU along with the assumptions on PCC and infiltration for calculating future flow and load
Per Capita Consumption (PCC)	From WRMP 2019 - includes the impact of interventions to reduce PCC by 2050	Allocated to all household population with assumption that 95% of consumption discharges to sewer and included in dry weather flow forecast
Visitor Population (p)	Not included in the forecast, but discharge is included in measured baseline flow	Allocated to a TPU. Forecast to be reviewed for next DWMP and will account for any permanent impact of COVID-19 on visitors to drainage areas
Infiltration (I)	New property assumption applied as 55 l/hd and current property assumption dependent on measured flow information Standard assumption (120 l/hd/day) applied where measured flow is not available for existing properties	Included for all TPU assessments that use continuous flow. Wastewater treatment works compliance, DWF and PFF and as an input to the assessment of deterioration. Flows were reconciled to a baseline value

Forecast element	Source and summary	Application
Trade Effluent (E)	Historic trade effluent flow and load data included in baseline and future assumptions unless specific local knowledge on trade increase/decrease is identified	Allocated to a TPU and part of wastewater treatment works continuous discharge flow assumptions as above
Wastewater Treatment Works Discharge	Baseline DWF from measured (Q80) historic data with future PG+I+E calculation	Allocated to individual wastewater treatment works for multiple BRAVAs (DWF, PFF, compliance, capacity and resilience)
Trade and Commercial Flows	Consent Data	Consented flows less than 1 l/s are summed and applied to a TPU. Consented flows greater than 1 l/s are applied to discharge manhole
Development	Developer Impact Assessment Programme	Applied to known discharge manhole (otherwise, assumed based on location and existing assets)
Urban Creep	Impact of Urban Creep on Sewerage Systems, Allitt (2010)	Allocated to a TPU
Climate Change	Rainfall Intensity for Sewer Design, UKWIR 2017, 17/CL/10/17	Applied to a TPU via rainfall uplifts or modification

6.2.3 The demand forecast elements are applied to the models in Table 3 to understand where there is potential risk as part of BRAVA.

Table 3 Models to understand location and extent of difficult risks

Model	Application of output
Hydraulic Network model	Calculation of annual average overflow spill performance and flood risk at baseline (2020) and over time. Converted to annualised risk
PIONEER model	Stable performance scenario used to calculate annualised internal and external flooding risk, blockages, collapses and pollution events. Alternative performance scenarios (fix on fail and committed spend for investment cycle 2020 - 2025) used for sensitivity testing to generate alternative risk outputs.
Wastewater Treatment model(s)	Central forecast (most likely) used to assess impact on current treatment capacity and permit requirements. Additional scenarios applied to some locations to understand potential impact.
Environmental River model(s)	Central forecast (most likely) used to assess the impact of increased final effluent discharges (BOD, ammonia and Phosphorous) from wastewater treatment works to inland water bodies and whether this leads to significant deterioration in WFD quality. Additional analysis on what final effluent permit limits is required to prevent deterioration is applied for solution development.
Sludge model	Sludge forecast (m3 and tDS) used to assess impact of sludge treatment capacity in relation to Service Level Agreement (SLA)

6.2.4 Further detail on demand forecasting can be found in Technical Appendix 3 – Demand Forecasting (TA3).

6.3 Risk based catchment screening

6.3.1 Overview

6.3.1.1 The Risk Based Catchment Screening (RBCS) process was developed as a means of quickly identifying which TPUs are currently experiencing issues relating to the performance of its drainage and wastewater assets, and, therefore, require a detailed risk assessment to understand long-term performance.

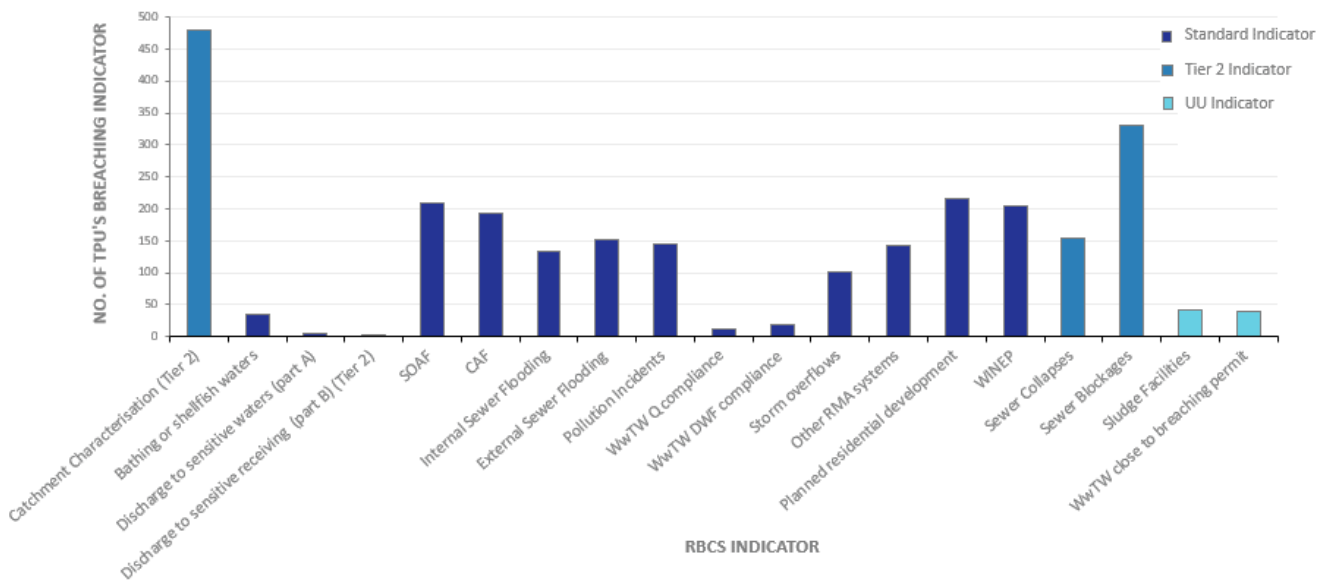
6.3.2 RBCS methodology

6.3.2.1 Each TPU was subject to a high-level risk based review for 17 standard indicators. The indicators are designed to span the key aspects of a wastewater company’s responsibilities: from the network, to the treatment works, to its interaction with the environment. Two bespoke indicators: one to account for potential risk from sludge, and another to give a more forward looking approach to wastewater treatment works compliance. Further detail on assessments and thresholds for breaching an indicator are defined in ‘Table B-1 – Risk based catchment screening indicators and process’ (DWMP Appendix B). A full review of results was conducted with operations to ensure the data reflected latest on-ground knowledge, understand where issues had been addressed and agree base catchment data. The outputs of this pre-BRAVA review were used to inform which BRAVA should be run.

6.3.2.2 For further detail on the methodology applied for each indicator, refer to Section 2 in Technical Appendix 4 – Risk Based Catchment Screening (TA4).

6.3.2.3 RBCS results shown in Figure 15 summarise the number of TPUs breaching each indicator. Out of 567 TPUs assessed, 397 were flagged as requiring BRAVA. Although this is nearly 70% of TPUs proceeding to BRAVA, these sites represent over 99% of the population in the Company. The indicator with the highest number of catchments breached was Catchment Characterisation indicator (479/567). From the group of standard indicators, Planned Residential Development had the highest number of breaches.

Figure 15 Number of TPUs breaching each indicator in financial year 2019



6.3.2.4 The TPU results were consolidated to the Company area level by summing all the Population Equivalent data for all the TPUs where an indicator was breached. The summed data was then represented as a percentage of the population living within the whole Company area. The blue and yellow shading was used to indicate the percentage of the population in the Company Area living in a TPU which breaches each indicator (see key at bottom of Table 4). More than half of the indicators (10/19) have more than two-thirds of the population living in a TPU which breaches that indicator. However, in terms of the impact on the decision to proceed to BRAVA, the most significant indicators are: Storm Overflow Assessment Framework (SOAF), flooding, pollution incidents, planned residential development and Water Industry National Environment Programme (WINEP).

Table 4 Company area RBCS results for U UW

		Percentage population across the company area living in a tactical planning unit (TPU) which breaches the RBCS indicator					
company area	Total population equivalent	Catchment Characterisation (Tier 2)	Bathing or shellfish waters	Discharge to sensitive waters (part A)	Discharge to sensitive receiving waters (part B) (Tier 2)	SOAF	CAF
United Utilities	8,918,802	100%	24%	4%	0%	95%	62%

		Percentage population across the company area living in a tactical planning unit (TPU) which breaches the RBCS indicator					
company area	Internal Sewer Flooding	External Sewer Flooding	Pollution Incidents	WwTW Q compliance	WwTW DWF compliance	Storm overflows	Other RMA systems
United Utilities	97%	99%	71%	16%	3%	54%	51%

		Percentage population across the company area living in a tactical planning unit (TPU) which breaches the RBCS indicator				
company area	Planned residential development	WINEP	(Sewer Collapses)	(Sewer Blockages)	Sludge Facilities	WwTW close to breaching permit
United Utilities	99%	80%	71%	83%	78%	54%

Grey text	This is a Tier 2 indicator. A breach against a Tier 2 indicator would not trigger BRAVA if it is the only indicator breached.
(Grey text in brackets)	This is an unclassified indicator. A breach against an unclassified indicator will not influence whether a TPU proceeds to BRAVA.

0-33%	0-33% of the population in the company area live in a TPU which breaches this indicator
33-66%	33-66% of the population in the company area live in a TPU which breaches this indicator
66-100%	66-100% of the population in the company area live in a TPU which breaches this indicator

6.4 Baseline risk and vulnerability assessments

6.4.1 Overview

- 6.4.1.1 A BRAVA is undertaken to assess both the baseline and future position of system performance and to understand wider resilience issues within each catchment that could impact on maintaining compliance with planning objectives. BRAVA is undertaken for all TPUs identified during screening, and results aggregated to SPA and company area.
- 6.4.1.2 A BRAVA is designed to develop an understanding of impacts of future changes in catchment on planning objectives. To do this a base year position is established alongside future models. To develop an understanding of wider catchment resilience issues that are not directly linked to system characteristics resilience assessments were also run. In addition to BRAVA, we conducted a horizon scan to identify any potentially significant external threats or opportunities that could impact our analysis and future decision making e.g. potential future inland bathing waters or major infrastructure projects such as HS2.

6.4.2 Risk assessments

- 6.4.2.1 Six common and eight bespoke assessments were developed to help us understand the risks of not achieving our planning objectives (see Table 5). Assessments were conducted to understand baseline (2020), short-term (2030) and long-term (2050) levels of risk.
- 6.4.2.2 Outputs from these assessments are defined as: no concern, potential area of focus or area of focus, with potential area of focus or area of focus TPUs included in option development once they had been verified through a post-BRAVA review process.

6.4.2.3 The results were used to understand locations with high numbers of variable risk, or those where a specific risk is likely to require mitigation. Additional horizon scans supplemented the understanding of each catchment, to enable a full assessment of potential risk to be undertaken.

Table 5 Risk assessments

Common assessments	Bespoke assessments
Internal sewer flooding	Dry weather flow (DWF) compliance
Risk of sewer flooding in a storm (1 in 50-year)	Multiples of flow treated compliance
Sewer collapses	External (curtilage) sewer flooding
Wastewater treatment works compliance	Sewer flooding of open spaces
Pollution	Sewer blockages
Storm overflows	Sludge treatment capacity
	No deterioration
	Bathing and shellfish

6.4.3 BRAVA results

6.4.3.1 Detailed results from BRAVA can be found in Technical Appendix 5 – Assessing Future Risk (TA5). Within the same document are detailed descriptions of the individual assessments undertaken and the thresholds used for assessing whether a TPU were deemed to be of no concern, potential area of focus or area of focus. The level of risk was assessed against the confidence in data (baseline measured data and forecast growth), and where the confidence was lower, additional assessment scenarios were undertaken to understand the range of potential risk before progression to solution development.

6.4.3.2 Significant results from BRAVA included:

- Due to climate change, the amount of rainfall is due to increase over the next 25 years. This contributes to an increase in surface water, which enters the drainage network and in turn increases flood risk;
- Over the next 25 years, risk of internal flooding will increase as well as the number of properties at risk of flooding in an extreme weather event; and
- The frequency and volume that storm overflows spill is forecast to increase.

6.4.4 Resilience

6.4.4.1 In addition we must ensure that we are resilient to challenges such as population growth and climate change so that we are able to cope with, and recover from disruptions, and can anticipate trends and variability in order to maintain services for people and protect the natural environment. This is why we need to have robust plans to allow us to effectively adapt and mitigate.

6.4.4.2 Through the DWMP, we have run a comprehensive suite of assessments across the whole of the North West to develop a robust understanding of wider catchment resilience issues that are not directly linked to systems characteristics. Our focus for this DWMP has been to assess what we believe to be the most significant risks:

- Fluvial and/or coastal flooding of wastewater treatment works and major pumping stations;
- Power outages;
- Outages to remote communications;
- First flush and low flows;
- Coastal/river erosion and land stability;

- Changes in the water quality of rivers as a result of climate change;
- Changes in catchment contributions as a result of climate change; and
- Outfall locking.

6.4.4.3 The whole of the North West was assessed, and the results showed that the region is least resilient to the risk posed from third-party power outage (60% catchments), and is most resilient to the risk of remote communications outages (76% catchments).

6.4.4.4 Combined sewer outfalls are a critical flood risk asset for a wastewater company. They operate only when sewers are full and need to drain to minimise flood risk to property and our customers. Our modelling has shown that over the next 25 years rising river levels will submerge these outfalls more frequently, reducing their ability to offer flood relief to properties in the North West.

6.4.4.5 The results from the assessment have been incorporated into the options development and programme appraisal stage of the DWMP and specific schemes are being developed to support the business plan for the next investment cycle. A combination of approaches have been taken from incorporating the assessments into generic high-level solutions to bespoke optioneering, which will be used to inform the best solution for the particular issue across the region. These assessments will inform the next business plan for 2025-2030, and our long-term delivery strategies, to ensure that the North West is as best prepared for the future as possible.

6.4.4.6 Further detail on resilience can be found in Technical Appendix 6 – Resilience (TA6).

6.4.5 Horizon scanning

6.4.5.1 Alongside BRAVA, a number of horizon scans were completed to understand additional risk or opportunities that could inform future investment. The scans were developed to include additional risks that were not captured as part of individual BRAVAs. The results were then reviewed alongside BRAVA results to develop options. They were useful in identifying locations where specific option types would be required or are beneficial, such as surface water removal at locations with high constant infiltration. A full list of the horizon scans can be found in Technical Appendix 5 – Assessing Future Risk (TA5).

6.4.6 Problem characterisation and identification of catchments which require strategic optioneering

6.4.6.1 The level of risk across all TPUs was assessed against the confidence in data (baseline measured data and forecasted growth) and where the confidence was lower these areas were identified as complex.

6.4.6.2 Additionally, a number of catchments were identified through opportunity workshops that require more analysis. These catchments were those with high growth, a high number of risks and multiple potential scenarios.

6.4.6.3 Different bespoke scenarios were considered for these catchments based on the needs and drivers of the catchments to understand the variability of risk as a first step for optioneering, so that the range of options developed can mitigate a different range of scenarios. More detail on how options are developed for these locations is in Technical Appendix 7 – Options Development and Appraisal (TA7).

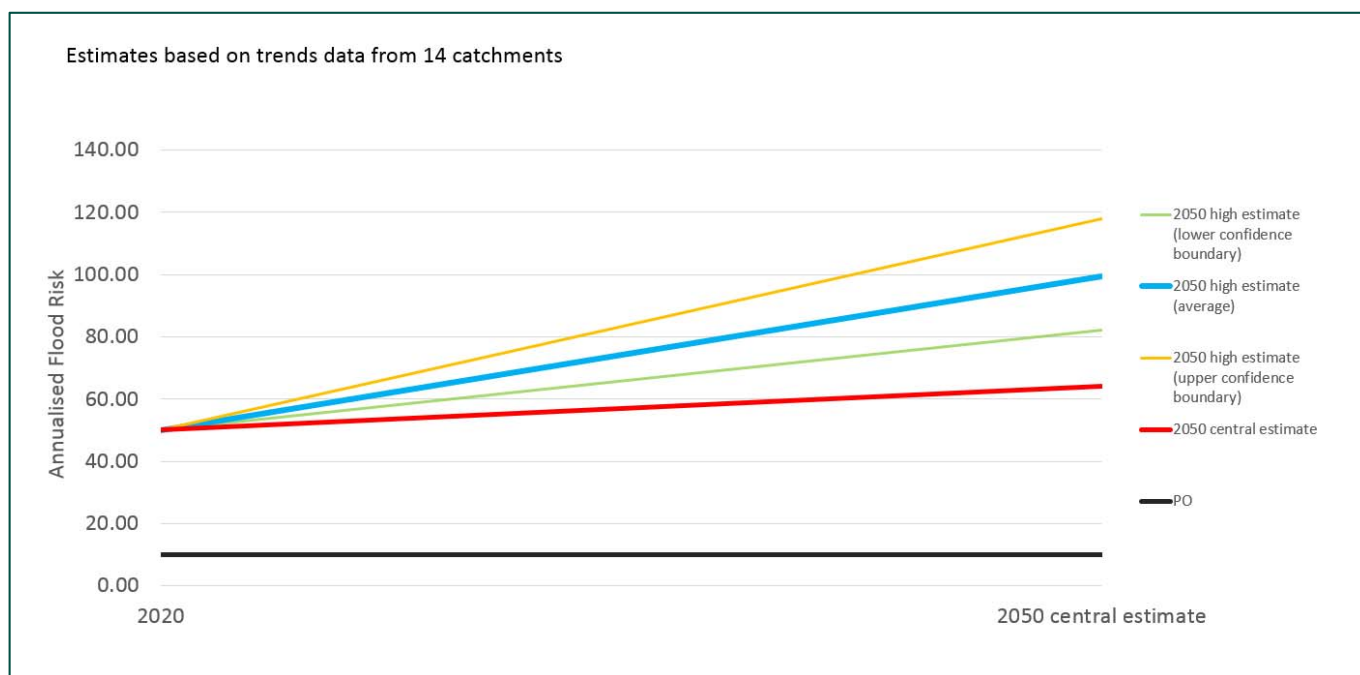
6.4.7 Sensitivity testing

6.4.7.1 Some TPUs required a more detailed or varied review of risk, depending on the complexity and uncertainty of the risk identified. The approaches undertaken depended on whether the risk was seen to be in the wastewater network or treatment works:

- **Network**
 - Results were generated by applying 2050 high estimate and 2080 central estimate design rainfall to the 2050 model for 14 TPUs to assess the impact on flooding and spills. Trend analysis from the results were applied to other locations identified as requiring extended or complex assessments.

- An example of the trend analysis is shown in Figure 16.
- **Wastewater treatment works**
 - Complex BRAVA results were generated using alternative scenarios based on scenarios developed as part of visionary work included in the development of Strategic Context.
 - The scenarios identified were Climate Chaos; Green Guardianship and Centralise control with a 2050 planning horizon and assumptions on population growth, consumption rates, infiltration and trade effluent applied to DWF, PFF, no deterioration models and were used for sensitivity testing of results.
 - Results can be found in Technical Appendix 5 – Assessing Future Risk (TA5).

Figure 16 Example trend analysis on internal flooding

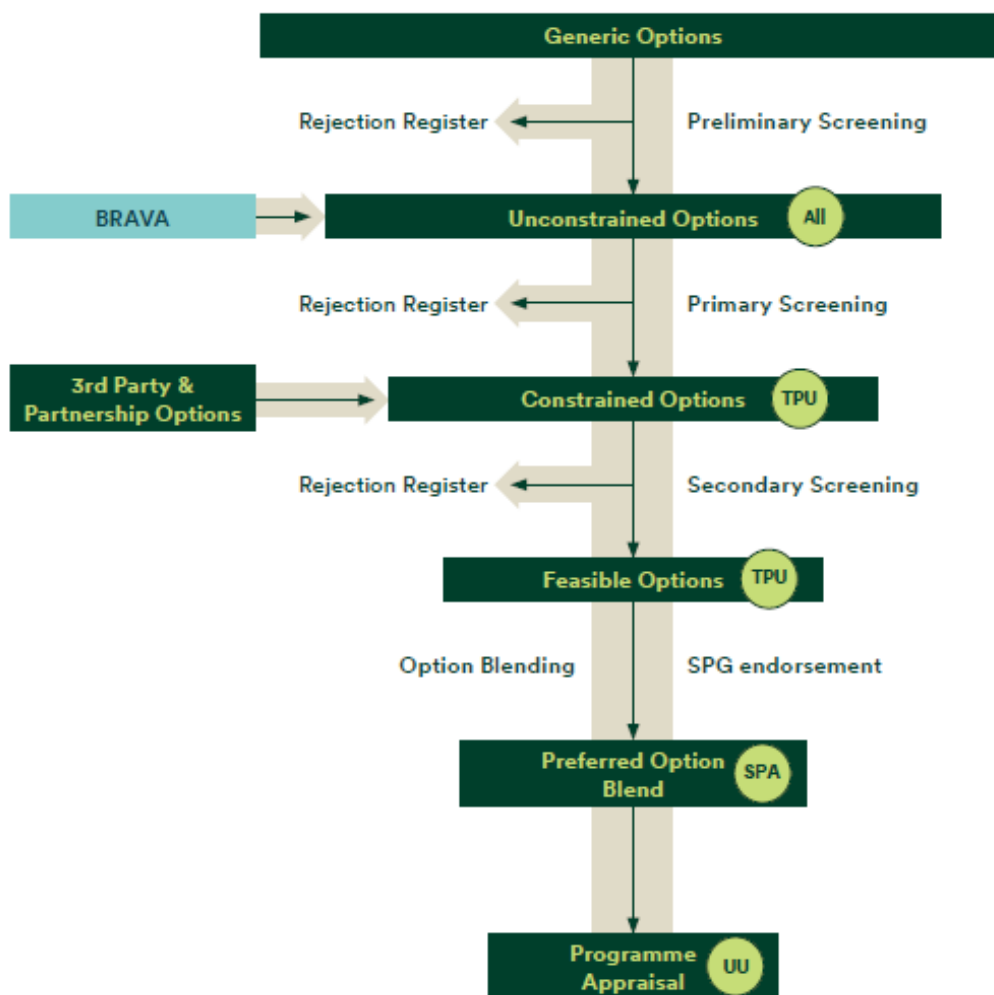


6.5 Option development and appraisal

6.5.1 Overview

- 6.5.1.1 This section provides an overview of the options identification and appraisal process from the identification of generic options through to the selection of preferred options. It includes detail of our screening stages, how we identified options and considered options from others, decision-making criteria and how these have been applied.
- 6.5.1.2 The options development process is a fundamental part of the DWMP and ensures that appropriate, plausible, and innovative options are considered in the planning process to deliver robust and resilient drainage up to 2050 and beyond. Options development and Appraisal has been carried out in accordance with the DWMP Framework Appendix D (Water UK, 2018).
- 6.5.1.3 Options development has followed an iterative approach, with multiple stages of screening to narrow down and reject ‘unfeasible’ options. Figure 17 outlines the overall options development process. Further details on the below approaches are summarised in the following sections, however, more information can be found within document Technical Appendix 7 – Options Development and Appraisal (TA7).

Figure 17 Options development process



6.5.2 Generic options

6.5.2.1 UuW developed a list of generic options, which comprise a range of approaches to address exceedances through the management of demand on, or capacity of the system.

6.5.2.2 We have developed our generic options with the following aims:

- To be comprehensive and cover operational, capital maintenance and ‘new’ totex spend;
- To consider innovation and new approaches or technologies; and
- To apply engineering judgement to ensure options are practical.

6.5.2.3 Our initial list of generic options was based on the Water UK ‘DWMP Options Task and Finish Group (TFG)’ developed generic option list. In developing this list further, we have considered our own options as well as those options from the market (termed third-party options) through a process of market engagement.

6.5.2.4 We have also engaged with a wide range of stakeholders in the North West to drive understanding of where there may be opportunity to work collaboratively or deliver more benefit for customers. Our stakeholder engagement approach is set out in Technical Appendix 2 – Stakeholder Engagement (TA2).

6.5.2.5 Six categories (termed management areas) have been considered when compiling the generic options. Four of the categories are referenced in the DWMP Framework (Appendix D). An additional management area (Indirect Measures) was agreed by the Water UK Options TFG and a final management area (Bioresources) has been added to our plan. The management areas are outlined in Table 6. The various sources utilised to develop our generic options are outlined in Figure 18.

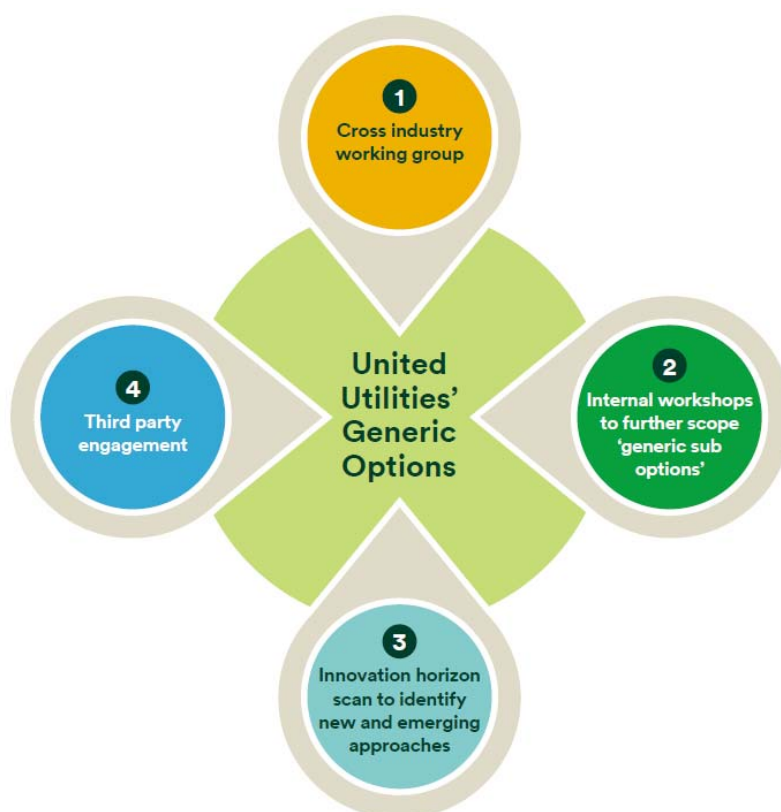
6.5.2.6 From this process 30 generic options were identified, with a further 99 generic sub options. Fourteen

generic sub options were rejected on the basis of their technical feasibility with the remaining options passing through to unconstrained options.

Table 6 Option management areas for defining the generic options

Management area	Examples of option types
Customer-side management	Water efficiency, metering, customer engagement
Surface water management	Rainwater management (infiltration sustainable drainage systems (SuDS), surface water separation), surface water attenuation
Combined and foul sewer networks	Storage, optimisation, dynamic network management
Wastewater treatment	Additional treatment capacity, optimisation, catchment and nature-based solutions
Indirect measures	Influencing policy
Bioresources management	Strategic options considering future uncertainties in the management of sludge produced

Figure 18 Approach to sourcing options for the generic options list



6.5.3 Unconstrained options

6.5.3.1 In order to determine which of the unconstrained options were applicable in each TPU a number of steps were undertaken:

- Unconstrained options were categorised depending on the scale of their application: company area (regional), SPA (catchment scale), TPU (drainage area) and at the issue level;
- Company area options (i.e. those which would be rolled out as a regional programme of work) were automatically screened 'in' at this stage, these options must be assessed on their merit when utilised across areas and consequently can't be assessed on a site by site basis; and

- SPA, TPU and issue level options were mapped against the relevant BRAVA assessment. This allowed options to be considered in each TPU based on the exceedances identified through BRAVA – at this stage the option needed

6.5.3.2 This approach ensured that a range of options were considered for the exceedances identified. During primary screening, TPU reviews were undertaken with operations, engineering and strategy to identify where bespoke approaches may be required. This identified 7 strategic areas.

6.5.3.3 We identified a need to carry out a series of Options Opportunities Workshops to support the development of our unconstrained options. The aim of the workshops was to inform an optioneering strategy for each SPA and complete the primary screening of the unconstrained options. The workshops ensured that risks were considered strategically and not in isolation – the outputs identified integrated solution opportunities and areas where we need to develop an adaptive approach to managing risk. The unconstrained options were further assessed to understand the feasibility in each TPU, this formed our primary screening.

6.5.4 Constrained options

6.5.4.1 Following primary screening, over 65,000 constrained options remained.

6.5.4.2 In order to reduce this down to a set of feasible options a further screening stage, secondary screening, was required.

6.5.4.3 The aim of the secondary screening process is to:

- Determine the wider feasibility and potential risks of each constrained option within the spatial unit in which it is being considered;
- Determine the viability of the technology, constructability, cost and benefits of the option within the spatial unit in which it is being considered;
- Determine if the option achieves benefit against performance objectives, whether it's adaptable, has interdependencies and whether it provides resilience against future pressures;
- Determine wider capital benefits/impacts of an option qualitatively against a five-tier rating system; and
- Compile a list of options to take forwards to feasible options assessment for the region, for each river catchment and each TPU, demonstrating how each option/spatial unit contributes to the overall plan.

6.5.4.4 UuW's approach to secondary screening was informed by the DWMP framework, Strategic Environmental Assessment (SEA) approach and engagement with the SPGs.

6.5.4.5 The following principles were applied to the secondary screen:

- Any options which did not have broad customer support such as tariff changes were rejected immediately, and no further information gathered at a TPU level. These options were only revisited at the TPU level for complex and strategic areas where appropriate. Further detail on the options which did not have broad customer support can be found in Technical Appendix 9 – Customer Engagement (TA9).
- For remaining options, the following information was quantified:
 - Financial cost (capex and opex);
 - Performance benefits against planning objectives;
 - Carbon (operational and embodied); and
 - Dependency and exclusivity constraints.
- In addition, a qualitative assessment was carried out for each option on:

- Resilience impact;
- Asset health impact;
- Constructability;
- Multi Capital impact (Natural, Social, Human, Intellectual and Manufactured); and
- A consideration was then made for options where an opportunity for partnership had been identified through our engagement with the SPGs and further analysis undertaken.

6.5.4.6 Information was then collated and an initial ‘cost benefit assessment’ (CBA) calculated. This was considered alongside the qualitative assessment options screened out if they did not meet one of the following criteria:

- CBA >1,
- CBA > 0.75 plus a qualitative six capitals assessment scoring >=0.
- CBA > 0.5 plus a qualitative six capitals assessment scoring >0.

6.5.5 Feasible options

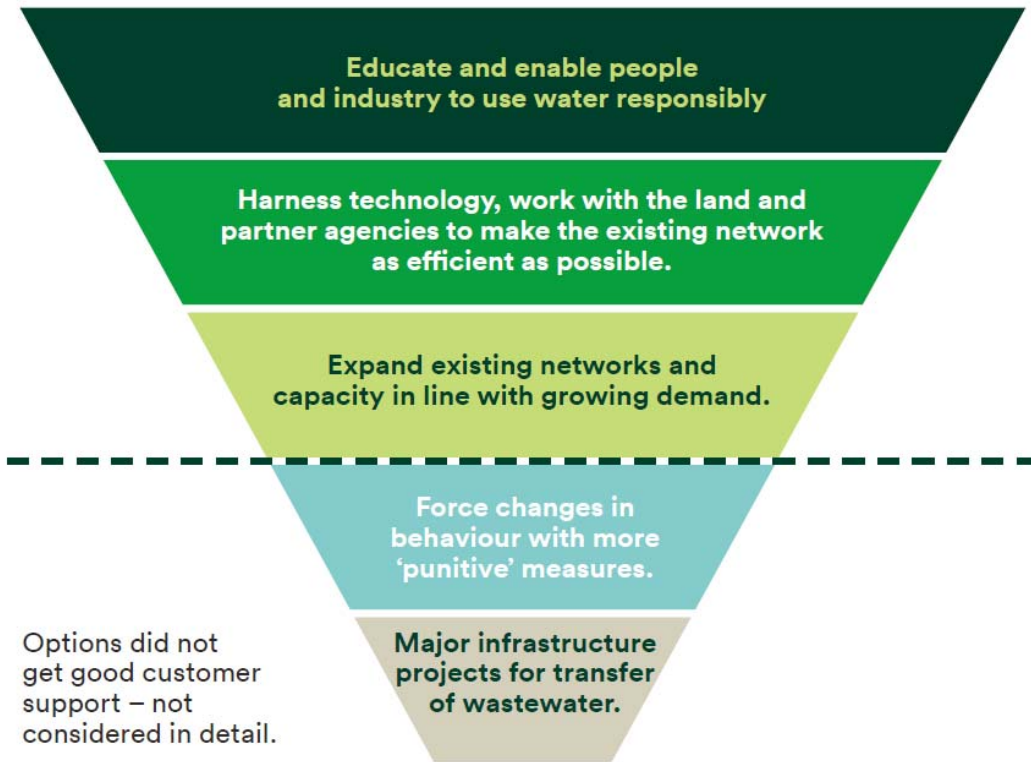
6.5.5.1 Following secondary screening, over 20,000 feasible options remained which were deemed suitable for further consideration to form part of the preferred options. A wide variety of option types still remained at this stage. However, from an initial review of the feasible options against planning objectives, it was clear that selecting individual options from this list would not achieve the outcomes for a TPU. The preferred options for each TPU would need to be comprised of multiple interventions. Therefore, an approach to developing option blends needed to be developed that would help create the best value preferred options. The additional benefit of creating option blends is that it creates an additional level of flexibility and mitigates innate uncertainty, for example options that are dependent on third parties. An option blend is a suite of measures developed to mitigate a strategic risk identified through BRAVA. The blends are made up of multiple option types, combining traditional engineering solutions with working with customers and innovating to better manage our assets and catchments.

6.5.5.2 There are multiple approaches that can be taken to creating a preferred option blend. Two different blends were created to provide choice:

- Option hierarchy approach; and
- Most cost-beneficial approach.

6.5.5.3 The hierarchy approach was developed based upon findings from customer engagement (Figure 19, outlined fully in Technical Appendix 9 – Customer Engagement (TA9)); then selected as the best approach to use following engagement with the Independent Customer Challenge Group (ICG), YourVoice, and SPGs.

Figure 19 Priorities identified through customer engagement on drainage and wastewater options



6.5.5.4 In order to prioritise which option types should be included in our blends, we have developed an options hierarchy (Figure 20), informed by this customer engagement. Using this approach, options which address a planning objective performance gap that are higher up the hierarchy will be selected over those lower down.

Figure 20 DWMP options hierarchy



- 6.5.5.5 In order to ensure that we could present choice we also created blends where the most cost beneficial options were selected to form the preferred options. The cost benefit used was from the data gathered for secondary screening. In this approach, regardless of its position in the hierarchy, an option with a higher cost benefit score will be prioritised over an option with a lower cost benefit score.
- 6.5.5.6 Using this approach, no consideration is made for customer and stakeholder preference as in the previous approach. In general, this approach delivers a blend, which has a lower whole life cost with fewer multi-capital benefits.
- 6.5.5.7 Following engagement with stakeholders and YourVoice Environmental and Social Capital sub group (ESCG), options hierarchy was selected as the best approach.

6.6 Options identification

6.6.1 Preferred options

- 6.6.1.1 Following the screening process described in the above sections, a resulting set of preferred options were arrived at. These were then put forward for use in an optimisation process that identified possible solution scenarios across the different planning areas of the UUW region in order to meet our short and long-term planning objectives.
- 6.6.1.2 The remaining types of options included in the preferred options list were:
- Surface water source control measures;
 - Enhanced sewer maintenance;
 - Intelligent network operation;
 - Increase treatment capacity;
 - Increase the capacity of existing foul/combined sewers;
 - Domestic and business customer education;
 - Modification of consent/permits;
 - Treatment works rationalisation;
 - Enhanced operational maintenance;
 - Catchment management initiatives; and
 - Sewer rehabilitation.
- 6.6.1.3 The optimisation process is described in Sections 7 and 8 of this document.

7. Programme appraisal

7.1 Overview

- 7.1.1 Due to the statutory nature and thus legal requirements relating to both wastewater treatment and storm overflows, these planning objectives were not included within the scenario testing undertaken to determine our preferred plan. The remaining planning objectives of flooding, pollution and sewer collapse were however included within iterative scenario testing in order to derive the best value combined solution based on the cost beneficial interventions derived as detailed in Section 6.
- 7.1.2 During this stage, many possible combinations of solution blends were tested to understand how different intervention types should be prioritised across the three levels of the plan given different constraints. This informed the selection of options within our final plan for the North West and considered, more broadly, issues of affordability and acceptable levels of risk and performance. The range of factors considered included cost, customer acceptability, wider six capitals benefits, and carbon before a scenario was chosen for the final plan.
- 7.1.3 In order to determine the best programme an innovative decision support tool (or Optimiser) 'Copperleaf Portfolio' was used to optimise the preferred options. The cost, benefit and multi capital assessment data from options development was fed into the optimiser and a range of scenarios and constraints applied. Copperleaf Portfolio is an industry leading asset management tool used across a number of sectors around the world.
- 7.1.4 Using the applicable rules the optimiser determined what the best combination of interventions is for the region for each scenario. The resulting costs and benefits of each programme vary according to the outputs of the decision support tool.
- 7.1.5 Key scenarios run that will be discussed in this document include:
- Scenario 1: Best value approach where only feasible options are considered; and
 - Scenario 2: Lowest whole life cost where only feasible options are considered.
- 7.1.6 Using the applicable rules, the optimiser determined what the optimal combination of interventions is for the region for each scenario. The resulting costs and benefits of each programme vary according to the outputs of the decision support tool.

7.2 Lowest whole life cost vs best value

- 7.2.1 Two main approaches to how the optimiser would select options at a programme level were considered. These were best value and lowest whole life cost.
- 7.2.2 The best value approach follows the hierarchy approach (Figure 19) which was developed based on customer research and endorsed as a best value approach by the Your Voice ESCG. Options from the list were selected using this hierarchy.
- 7.2.3 In the lowest whole life cost approach, the optimiser selects the lowest whole life cost option from the available option list. The multi-capital benefits of options were considered in the creation of this option list with a lower screening threshold for secondary screening for options with additional benefits.
- 7.2.4 A high level comparison (Table 7) of these two approaches demonstrates that both scenarios project a significant improvement in performance against the planning objectives. The best value approach seems to be more expensive, however it offers greater opportunity for multi-capital benefits. A wide scale monitoring programme would be required whichever scenario to enable the delivery of an adaptive approach.

Table 7 Best value vs Lowest Whole Life Costs (LWLC) projected investment

Option hierarchy	Scenario 1: Best value		Scenario 2: LWLC	
	Expenditure (£m)	Six capital score	Expenditure (£m)	Six capital score
Behavioural	80.9	45,971	14.8	7,389
Upstream Management	290.1	5,618	103.3	4,065
Operational Interventions	395.2	9,585	394.6	9,434
Refurbishment	0.1	-45	0.1	-45
Replace/New asset (blue green)	16.5	72	14.3	56
Replace/New asset (conventional)	946.6	-10,118	1,172	-10,189
Total	1729.3	51,083	1,699.4	10,710

7.2.5 Table 8 demonstrates that both scenarios project a significant improvement in performance against the DWMP planning objectives. All figures demonstrate the projected percentage reduction in incidents following completion of proposed investment, taking into account performance improvements within the current investment period of 2020-2025.

7.2.6 Ultimately the best value approach was selected as the preferred scenario to determine the preferred plan.

Table 8 Best value vs LWLC projected benefits

	Scenario 1 Best Value (% reduction)	Scenario 2 Lowest WLC (% reduction)
Pollution	57	56
Internal Flooding	62	63
External Flooding	28	28
Open Space Flooding	27	27
Sewer Collapses	36	36

7.2.7 Further details on the suite of scenarios assessed for the DWMP can be found within Technical Appendix 8 - Programme Optimisation (TA8).

8. Summary of programme outputs

8.1 Overview

- 8.1.1 This section sets out the key components which make up our preferred plan, dividing this into two key areas: activities which have been selected as part of the optimised plan, and activities which are mandated (storm overflows and wastewater treatment compliance).
- 8.1.2 The processes and approaches outlined in the preceding sections of this document describe the data and evidence that has been developed and collated throughout the DWMP. The data and evidence developed during BRAVA and Options Development alongside assumptions outlined in supporting technical appendices have informed our decision support processes in order to determine the preferred plan.
- 8.1.3 The preferred plan selects a range of interventions to mitigate the long-term risks identified through BRAVA. It sets out a pathway and direction of travel to meet our long-term planning objectives (Figure 21). It must, however, be continually reviewed as part of an adaptive approach given the levels of uncertainty regarding factors outside of management control such as climate change and policy changes.

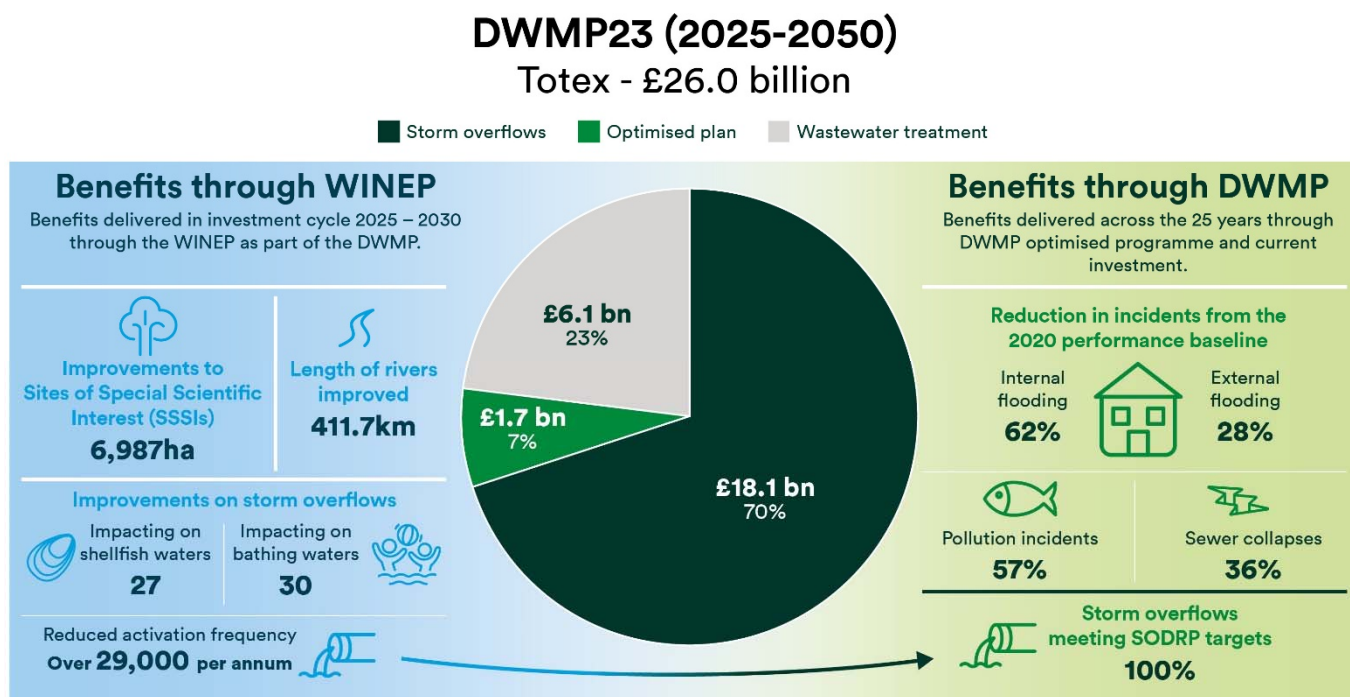
Figure 21 How activities in the plan ensure achievement of planning objectives

Planning objective	 We will provide excellent wastewater services, reducing our impact on the environment	 We will protect, restore and improve the natural environment of the North West through our actions	 We will sustainably reduce the risk of sewer flooding in the North West
Metric	Wastewater Quality Compliance Pollution Incidents	Storm Overflow Performance Environmental Obligations (WINEP)	Internal Flooding External Flooding Flooding of Open Spaces Sewer Collapses Risk of 1:50 Year Storm
Addressed by	Legal Obligations: Permit Compliance Performance Improvements	Legal Obligations: WINEP	Performance Improvements

- 8.1.4 To provide a more complete picture of the potential long-term investment requirements we considered a range of components. We are setting out our plan through three core components:
 - Wastewater treatment – activities that are mandated by legislation or are required to maintain compliance with discharge permits;
 - Storm overflows – investment associated with meeting the targets within the SODRP; and
 - Performance improvements – optimised outputs of the non-mandated aspects of the plan e.g. to meet internal flooding planning objective.

- 8.1.5 Our current core plan is focused on the areas where we have greatest certainty, with a risk-based approach being taken for those areas of greater uncertainty, which are inherently higher risk.
- 8.1.6 In total, we forecast £26 billion of total investment (totex) is required for our planning objectives from 2025–2050. As shown in Figure 22, this is comprised of:
 - £18.1 billion required to meet the SODRP requirements;
 - £6.1 billion for wastewater treatment works upgrades to meet statutory WINEP drivers, and maintain 100% compliance where growth triggers new permits; and
 - £1.7 billion for the DWMP planning objectives, such as reducing the number of flooding incidents and pollutions.

Figure 22 Forecasted 25 year investment (totex) for the DWMP

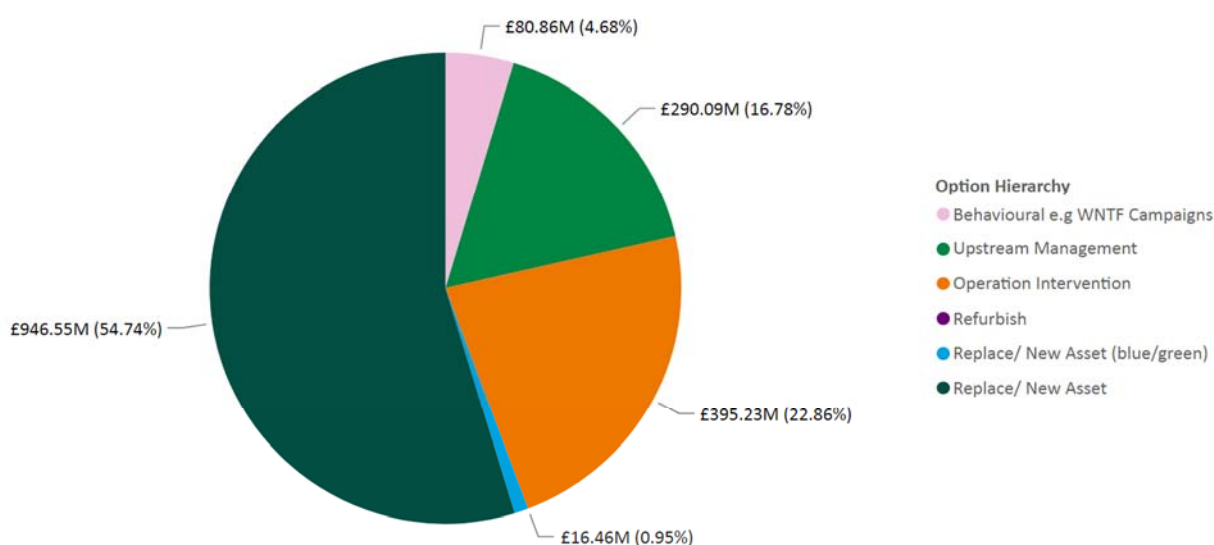


- 8.1.7 This plan reflects our commitment to innovation by considering the benefits that new approaches and technologies could deliver. For example, we are proposing over £3.5 billion (capex) of investment in green infrastructure and other nature-based solutions over the 25 years of the DWMP.
- 8.1.8 Another key option selected in this plan is a wider role out of our Dynamic Network Management (DNM) strategy, which was highlighted as a key initiative in the business plan submission for investment cycle 2020–2025. This uses artificial intelligence across the sewer network to enable proactive targeting and performance improvements; something which would not have been possible just ten years ago.
- 8.1.9 The potential bill impact of the plan is estimated to be £61.87 per year by 2030 for the average household, excluding the impact of inflation. The anticipated 2050 bill impact is estimated to be £239.46 for the average household, excluding the impact of inflation.
- 8.1.10 A more detailed breakdown of the components of the preferred plan are in Sections 8.2 to 8.4, with additional detail within the Main Document (DP1).
- 8.1.11 Accompanying documents are also available for each SPA (SPA_01 to SPA_14) which detail the background of the SPA, the risk assessments undertaken and the preferred options in the short, medium and long-term.

8.2 Optimised activity to deliver performance improvements

- 8.2.1 In many areas of our plan, such as flooding, we have a good level of certainty around ambitions and flexibility in how these targets could be achieved. We tested a range of approaches and scenarios and this has allowed us to understand the best set of activities at a regional level for meeting the planning objectives set out in this document.
- 8.2.2 Two approaches were tested with stakeholders and ultimately the best value approach based on the option hierarchy set out in Section 7.1 was selected. This approach has, therefore, been used to identify the best set of options to meet planning objectives.
- 8.2.3 Following this optimisation, £1,729 million of interventions (totex over 25 years) have been identified across 512 TPUs. This includes a wide variety of different option types including significant amount of surface water management activities (Figure 23).

Figure 23 Regional view of optimised activities investment (totex) by option hierarchy



- 8.2.4 At a regional level, new assets, operational interventions (e.g. Dynamic Network Management) and upstream management (e.g. SuDS) make up the largest proportion of investment (Figure 21). This is generally in the form of both conventional and blue/green storage options, which are implemented to manage remaining capacity gaps in the sewer system caused by climate change; and sustainable drainage options to manage rainwater entering the sewer system.
- 8.2.5 SuDS options gained significant support from customers, owing to perceived additional benefits and getting to the ‘root cause’ of a problem. As such, UUW is looking to accelerate no regrets interventions such as SuDS through multiple streams of investment such as our rainwater management enhancement case for the investment period 2025-2030.
- 8.2.6 The optimised set of interventions would provide multiple benefits as set out in Table 9. This includes significant improvement to flood performance, which is one of the key planning objectives for this plan.

Table 9 Potential risk reduction associated with the delivery of the optimised plan

Regional % reduction in risk achieved through optimised activities	
Internal flooding	62%
External flooding	28%
Pollution	57%
Open space flooding	27%
Sewer collapses	36%

8.3 Storm overflows

- 8.3.1 Since the development of this plan began in September 2018, there have been a number of changes in government requirements and other areas of considerable uncertainty. The most substantial of these is the SODRP which was published in August 2022. This requires a significant step change in ambition and performance across the water industry to address the legacy of storm overflows.
- 8.3.1.1 With 54 percent of the existing sewer system of the North West being combined compared to an industry average of 33 percent, and high levels of rainfall in key urban areas such as Greater Manchester and East Lancashire, the scale of work we must deliver to meet the standards set out in the Storm Overflow Discharge Reduction Plan is significant. It is also significantly larger investment than other water companies, and the 25 year plan discussed in this section is likely to represent the largest such plan in the sector.
- 8.3.2 As part of the WINEP submission in January 2023, U UW undertook extensive analysis to categorise all 2,182 of our permitted storm overflows in line with the criteria in the SODRP, and reviewed this with the Environment Agency and Natural England. Our storm overflow plans meet the Defra trajectory targets within the SODRP. We believe this investment is right and needed.
- 8.3.3 Over £18 billion of investment (totex over 25 years) has been identified across the North West to address the regions storm overflows in line with SODRP. This includes conventional storage solutions plus a significant amount of surface water management activities.

8.4 Wastewater treatment

- 8.4.1 Although certain areas of this plan are discretionary and we have been able to optimise proposed investment as described in Section 8.2, it is not appropriate to do so for all investment drivers.
- 8.4.2 Maintaining permit compliance, while accommodating growth or complying with new environmental drivers set out in the WINEP are legal requirements. Therefore, a cost benefit screened approach is not appropriate. This means that these activities must be considered independently from the decision support tool optimisations, as using a cost benefit screen may not fully capture the activities required to meet legal obligations.
- 8.4.3 In total, £6,107 million (totex) of investment has been identified to meet these mandatory activities for the period 2025–2050. This is associated with known regulatory requirements. Future needs driven by new and yet unknown, legislation has not been included.
- 8.4.4 Legal obligations have been included for 334 TPUs, along with several WINEP derived schemes which are intended for investment across multiple catchments rather than site specific options. However, significant potential expenditure has been identified through this process across the North West as a whole.
- 8.4.5 The requirement for these have been identified through the BRAVA process or by following the WINEP driver guidance issued by the Environment Agency.

8.5 Manging uncertainty

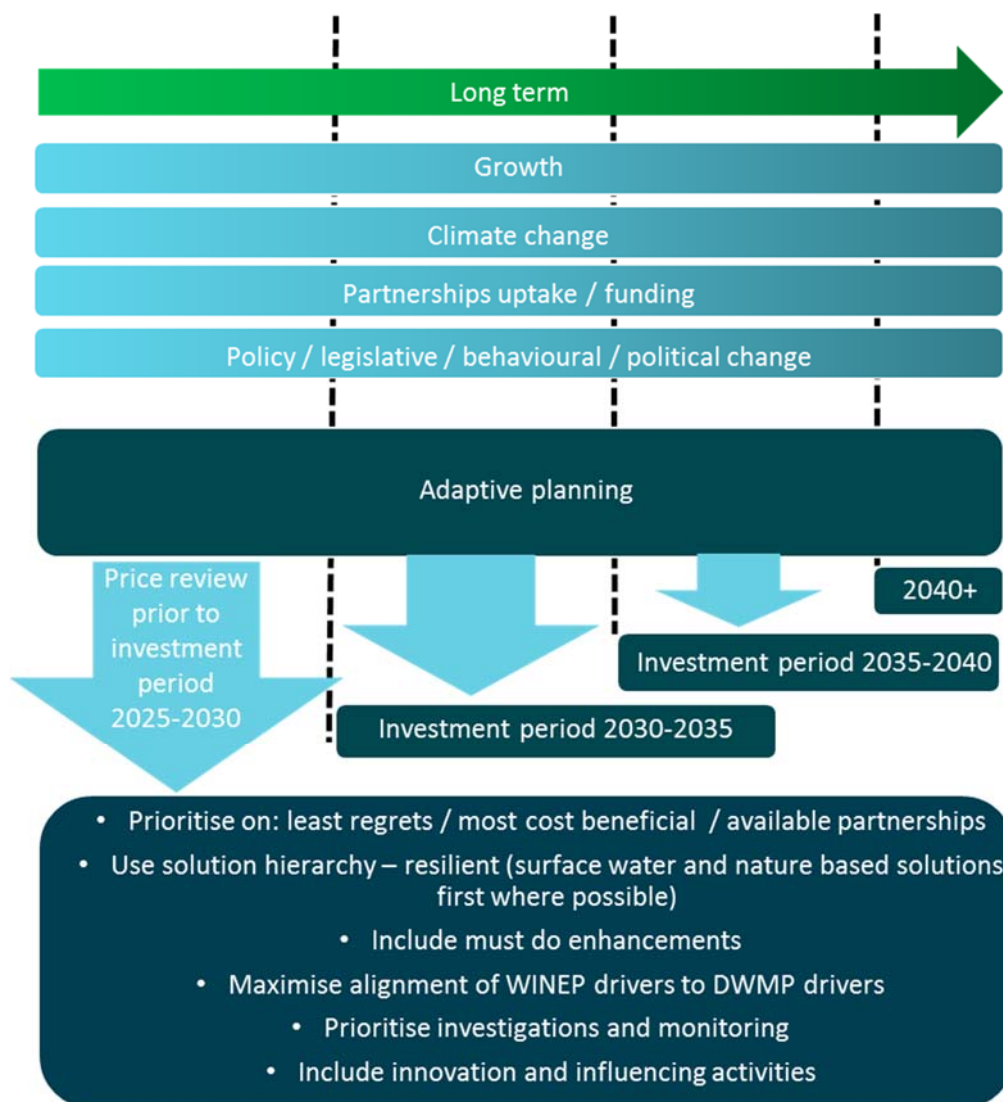
- 8.5.1 Due to the high degree of uncertainty associated with key elements of the plan, it is key that we use an adaptive approach to manage this risk as it emerges. Therefore, there is greater certainty in proposed investment in the short term than the long term. Phasing for this investment can be seen in Table 10.
- 8.5.2 In the development of the phasing of investment for permit compliance, UUW has assumed an even distribution of investment, with the exception of where a site has also been identified as requiring investment associated with WINEP. In these cases, it has been assumed that permit compliance activities required will be aligned with WINEP investment, which is predominantly between 2025 – 2035 (as WINEP development by regulators can only reasonably look 10 years or two cycles ahead).

Table 10 Phasing of investment

Investment Category	Totex (£m) per investment cycle					Total
	2025 – 2030	2030 - 2035	2035-2040	2040 - 2045	2045 - 2050	
Wastewater Treatment	2,473	1,340	732	767	796	6,107
Storm Overflows	2,253	3,771	3,879	4,044	4,171	18,119
Performance Improvements	206	389	369	382	383	1,729
Total	4,932	5,500	4,980	5,193	5,350	25,955

- 8.5.3 UUW is supportive of the ambition to more explicitly embed long-term planning into business planning cycles. The key principles of adaptive planning have been considered within the first DWMP and this is an area we will build on.
- 8.5.4 Within the DWMP, we have:
- Considered ambitions over the next 25 years;
 - Developed potential future scenarios and applied these within risk forecasts; and
 - Built an options development process which enables a strategy to be developed, is flexible to cope with changes over time and optimises the timing of key interventions.
- 8.5.5 In order to deliver resilient and improved services over the long term we need to optimise the delivery of interventions in a timely and affordable way. Over time, understanding of changes will be better understood and become more certain. Additionally, the understanding of the costs, benefits and timescales of delivered interventions will improve. It is, therefore, essential that the DWMP is iterative and continues to evolve through later planning plans. The DWMP is a key tool in developing the 2025–2030 and future business plan submissions.
- 8.5.6 As part of business as usual activities within future cycles of the DWMP, regular reviews will be undertaken of performance and benefits realisation to allow for assessment of the impact of interventions as and when they are implemented but also the changing picture of risk within the region as growth and climate change occur. Figure 24 is an example of how adaptive planning can be used for the long term.

Figure 24 Example adaptive approach for long term planning



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