United Utilities Water

DRAFT Drainage and Wastewater Management Plan 2023

Technical Summary

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United Utilities

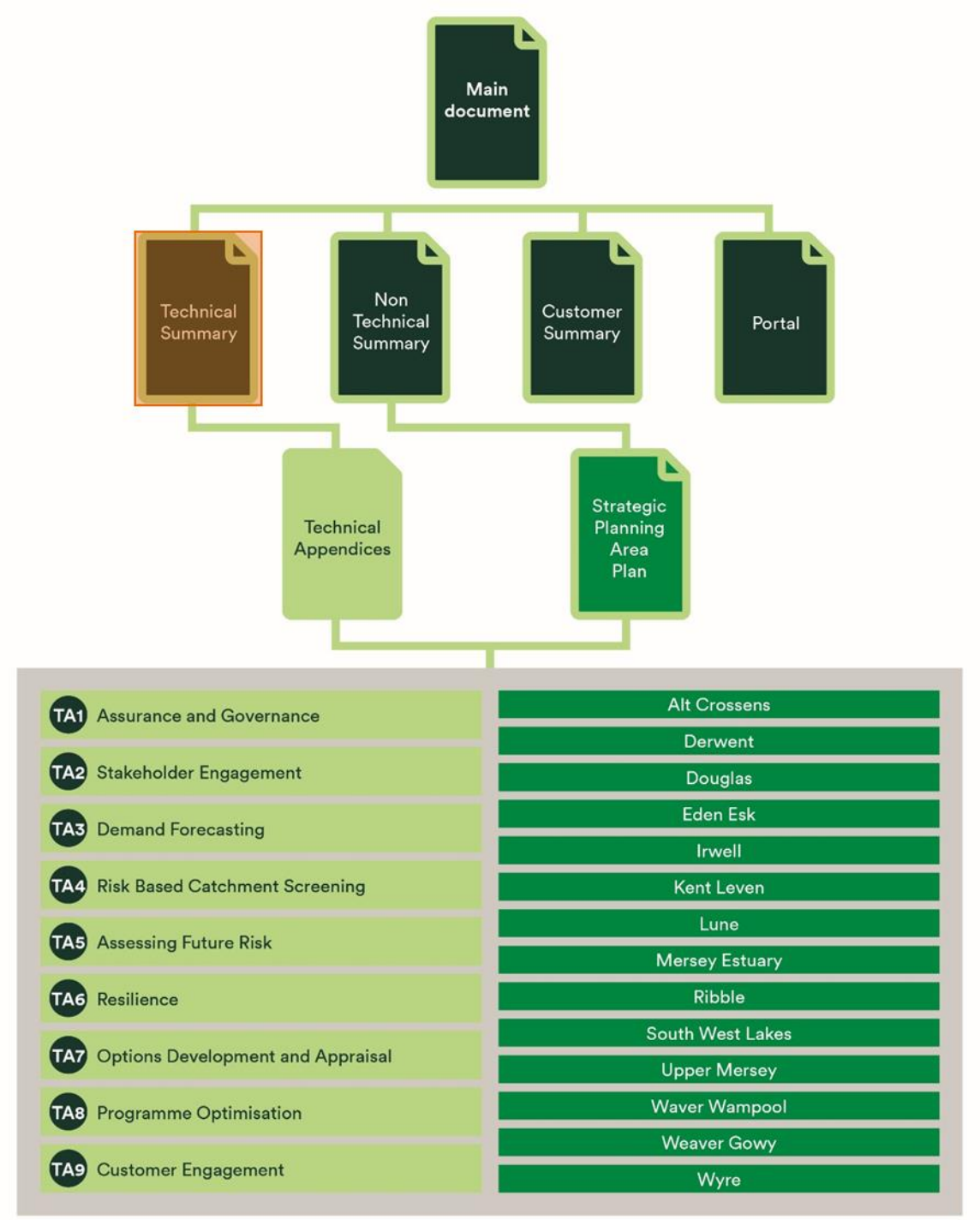
Water for the North West

Executive Summary

This report sets out United Utilities Water's (UUW) 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 UUW'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, UUW 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 UUW wastewater network, wastewater treatment and the environment.

Read in conjunction with the DWMP Main Document (DP1), 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 DWMP document structure



Acronyms

For a list of acronyms, refer to document C0003.

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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.

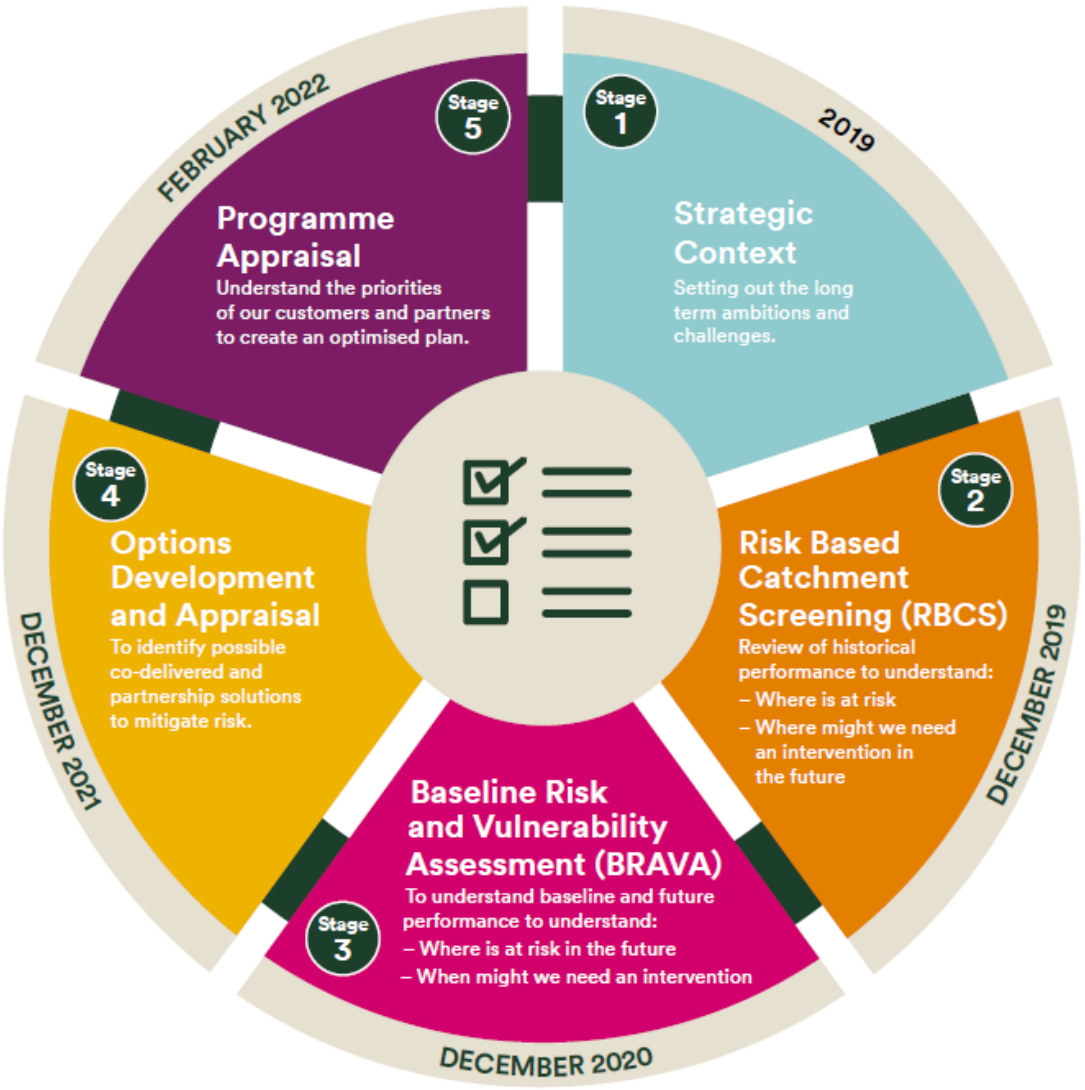
1.2.2 Across the UUW region there are already numerous strategic management plans (Figure 2) owned by various other organisations with a focus on managing particular risks relating to drainage and wastewater. In order to ensure that this plan has the best chance of success we have worked closely with partners to understand their plans. For example, to ensure alignment between this plan and the Flood Risk Management Plan, 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 partners.

1.2.3 For our draft submission we have ensured that the main goals and objectives of Defra's 25-Year Environment Plan and the Water Industry Strategic Environmental Requirements (WISER) 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 UUW plan closely follows the framework and includes the five key stages illustrated in Figure 3.

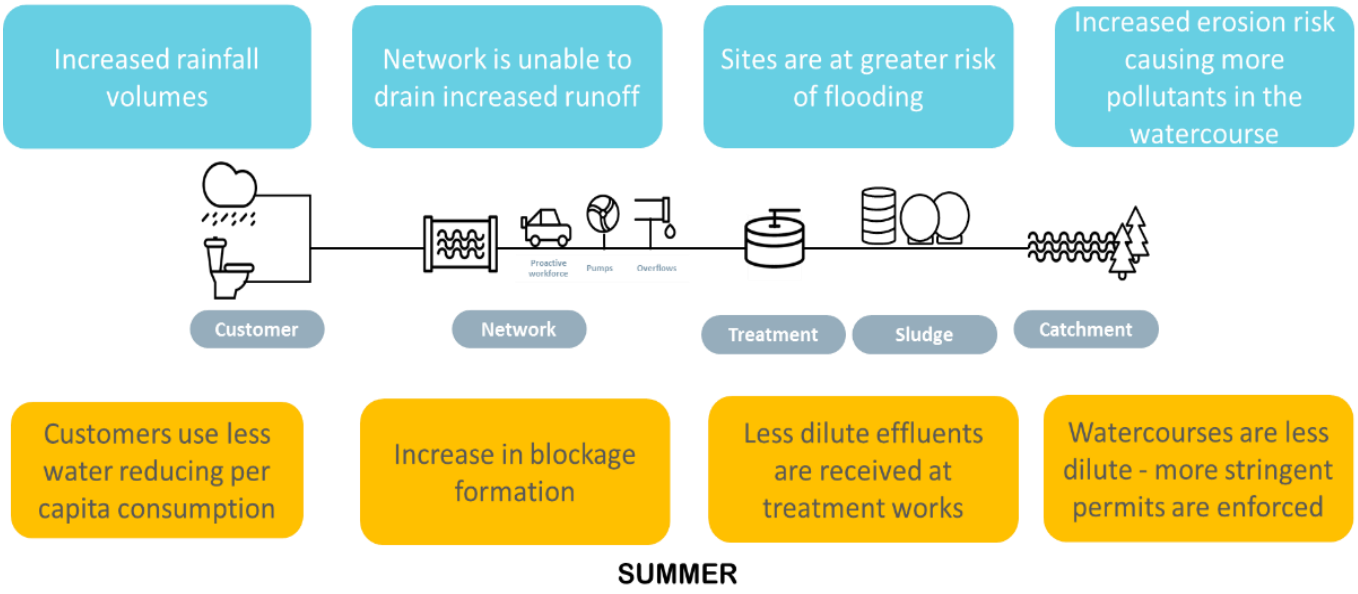
Figure 3 Five stages of a DWMP



2. Background

2.1. In the North West of England, UUW 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, UUW drainage and wastewater assets will be under increasing stress (Figure 4) unless we increase our planning for the future and partnership working. 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. 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 within 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

3.2. 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 UUW area

4. Levels of service

4.1. 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.

4.2. There are three planning objectives: collecting, treating and recycling wastewater; 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

4.3. 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.

4.4. 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.

4.5. 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. Stakeholder engagement

5.1 Overview

5.1.1. Due to the interconnected nature of drainage, a successful DWMP requires us to work closely with our strategic partners to develop, design and deliver the plan in partnership. We have engaged with the RMA and strategic partners across the North West to develop an understanding of the opportunity to work in partnership to achieve multiple aims across organisations.

5.1.2. Prior to starting to develop the DWMP for the North West, we engaged with our RMA partners; 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.

5.1.3. Developing a futuristic drainage and wastewater plan for the North West needed endorsement and engagement from multiple strategic partners. 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).

5.1.4. 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 8.

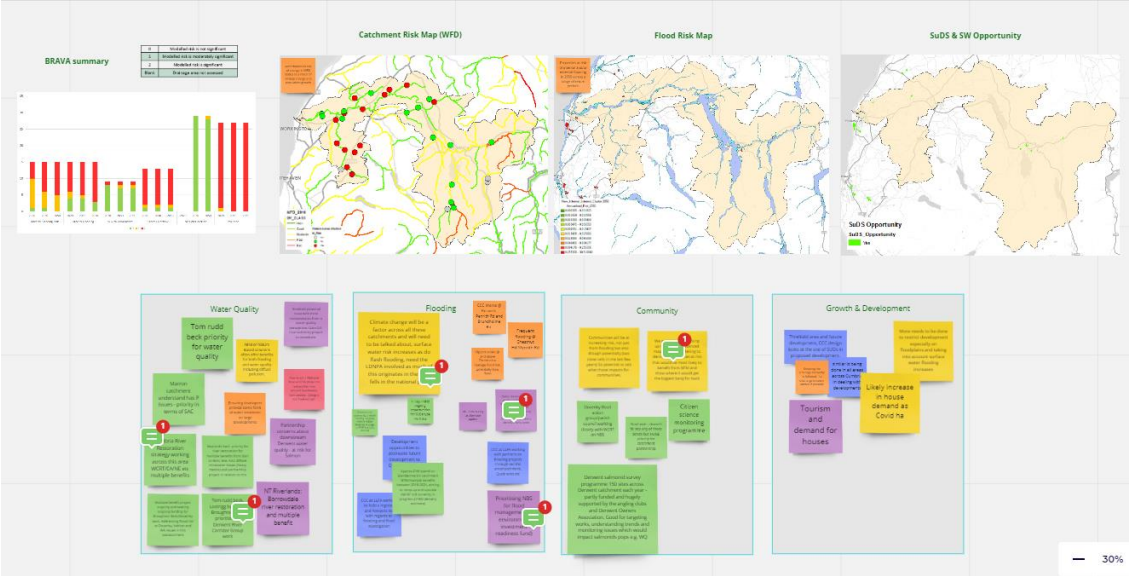
Figure 8 DWMP framework for engagement

5.2 Strategic Planning Groups (SPGs)

5.2.1. 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.

5.2.2. 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 9.

Figure 9 Example SPG session output



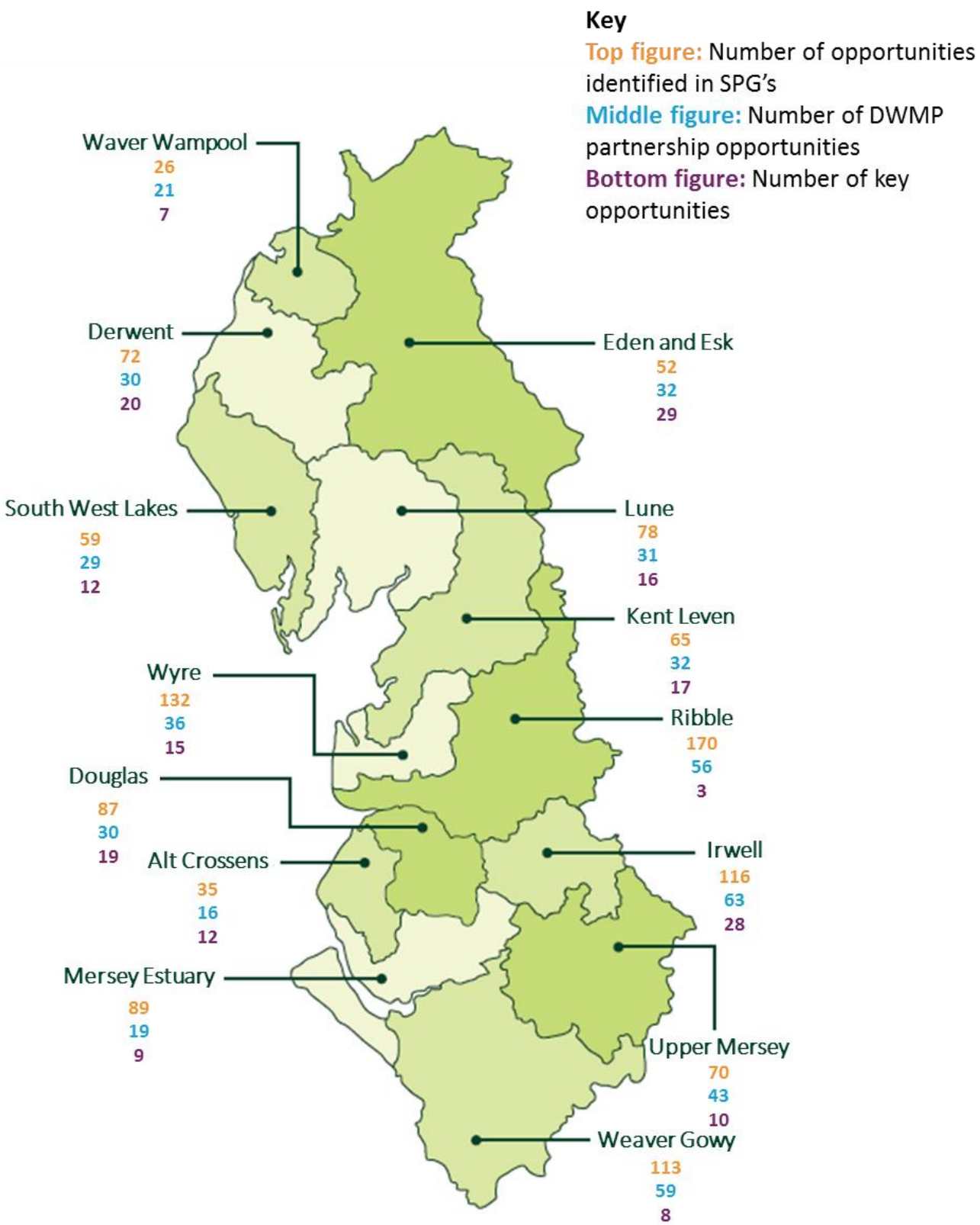
5.2.3. These workshops were used to develop a partnership opportunities pipeline which tracked risks and opportunities that stakeholders raised during or after the SPG sessions. All opportunities were reviewed to understand which had the most potential (Figure 10).

5.2.4. The final workshops were aimed at gaining endorsement for developing options and further development of key partnership opportunities. It was critical that partners understood how developing options for DWMP was different to previous strategic programmes in how it will account for wider benefits. As partners, 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.

5.3 Aligning strategic plans

5.3.1. 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 partner and regulator, of the DWMP and also look at the synergies between strategic plans.

Figure 10 Partnership Opportunities Pipeline



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

5.3.2. In April 2019, UUW 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 UUW and the Environment Agency can engage with the processes and how we can work in partnership to align the three plans'. Although hosted by UUW, this was a joint workshop with presentations from both the Environment Agency and UUW, where each discussed the scope and timescales involved in the strategic plans.

5.3.3. 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.

5.3.4. The success of this workshop led to the creation of the 'Planning Together Group'. This working group was made up of UUW 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.

5.4 Opportunities for collaboration

5.4.1. Understanding shared areas of risk across the region between partners 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 10).

5.4.2. UUW 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. UUW has a close working relationship with GMCA and works under a trilateral agreement, which is a signed commitment between the Environment Agency, UUW and GMCA to work collaboratively and in partnership. The Greater Manchester area is a major strategic area for UUW; 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 partners in the North West, which includes UUW. 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 11).

5.4.3. Further information on the approach taken to stakeholder engagement can be found in Technical Appendix 2 – Stakeholder Engagement (TA2).

Figure 11 Case study of how DWMP is helping to inform partnership

IGNITION - Walkden SuDS

The IGNITION projects 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.

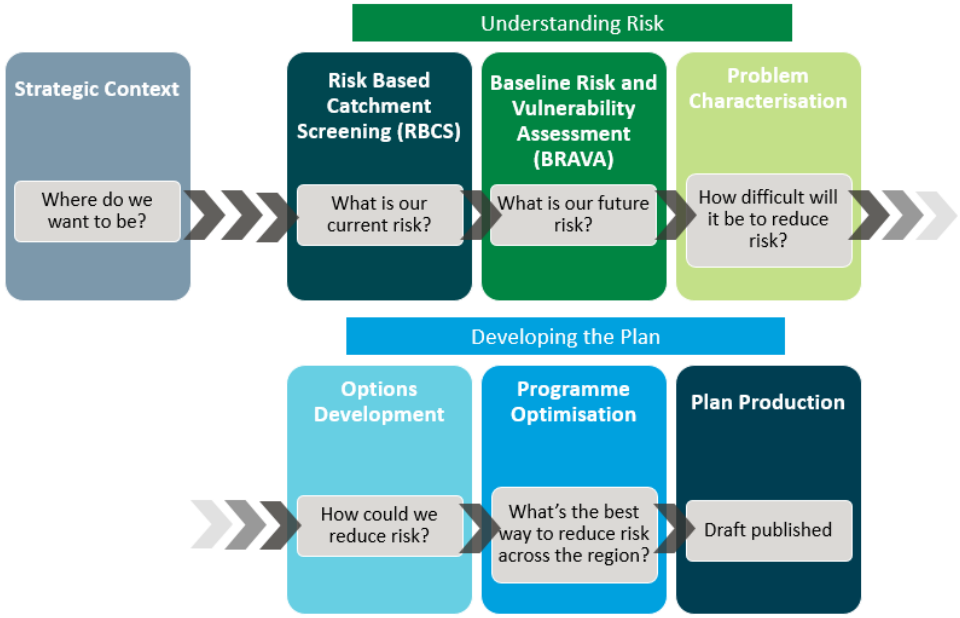
This was the first time that BRAVA results contributed to a partnership project and influenced the outcome. The project is still being finalised with implementation planned for the next 12 months. The current scope includes the retrofitting of SuDS in locations across Walkden in areas that will reduce 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 12. More detail on all sections below can be found in the relevant Technical Appendices.

Figure 12 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 13 and the multiple elements included in the development of the demand forecast are described in Table 2.

Figure 13 Elements of wastewater demand

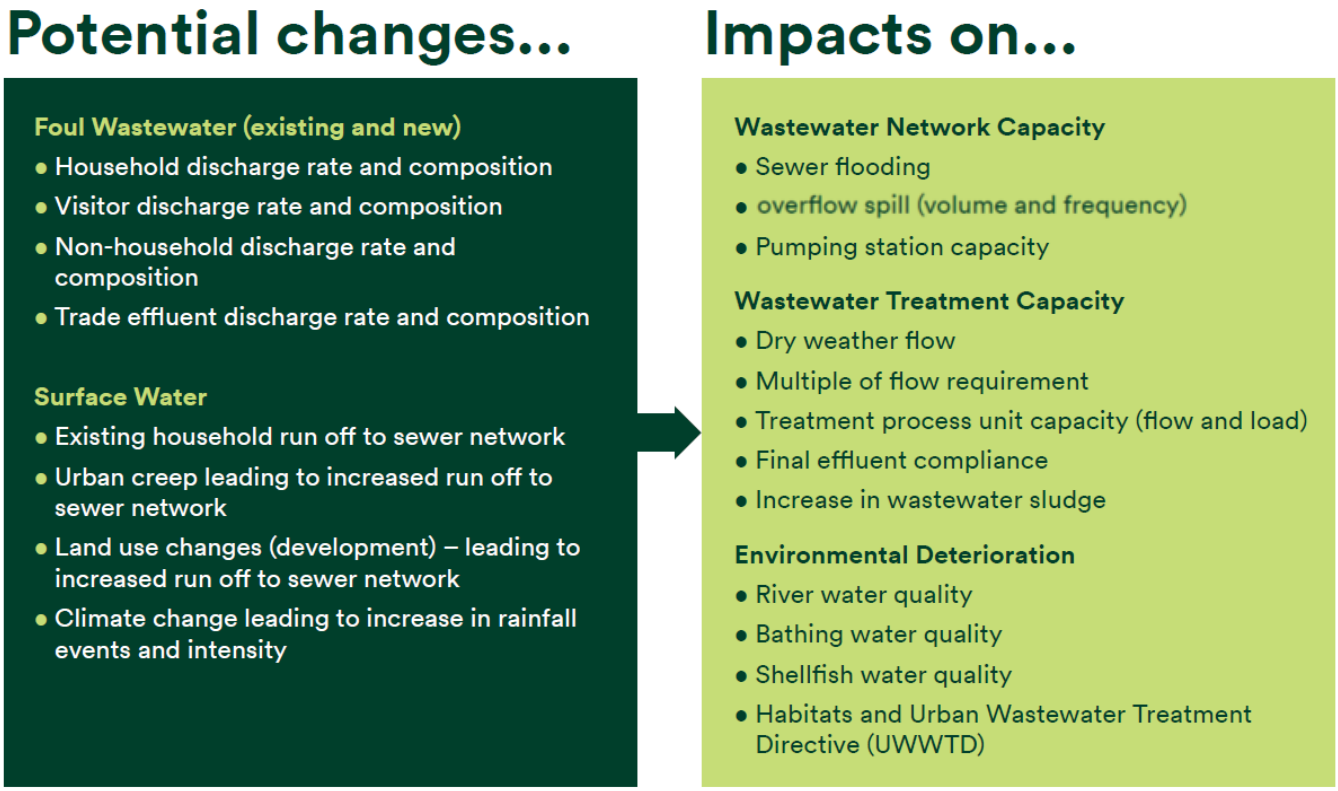


Table 2 Elements of demand forecast and the application within the plan

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

Forecast element	Source and summary	Application
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
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 following models to understand where there is potential risk as part of BRAVA.

Table 3 Models to understand location and extent of different 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 (m^3 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 TPU 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.

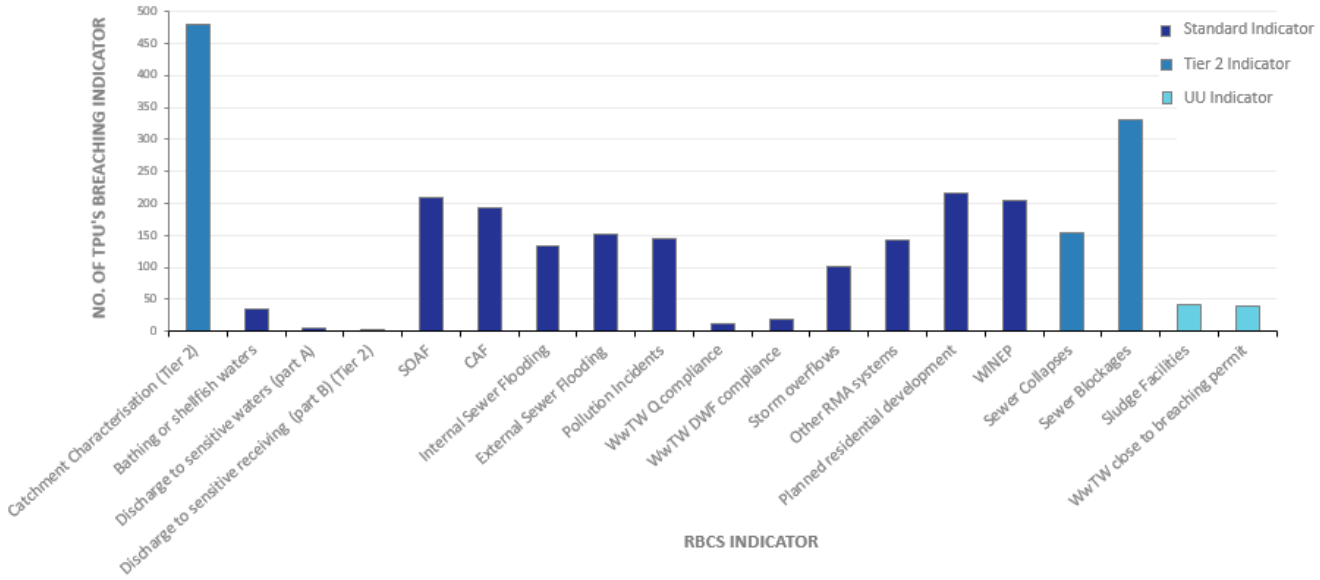
6.3.2 RBCS methodology

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 14 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 14 No. 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 UUW

		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 TPU 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 theses 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:

(1) 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;

(2) 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

(3) the frequency and volume that storm overflows spill is forecast to increase.

6.4.4 Resilience

6.4.4.1. In addition to ensuring 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 to 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;
- response recovery plans;
- 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. 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 will be developed in the run up to price review. 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 Identification and Appraisal (TA7).

6.4.7 Sensitivity testing

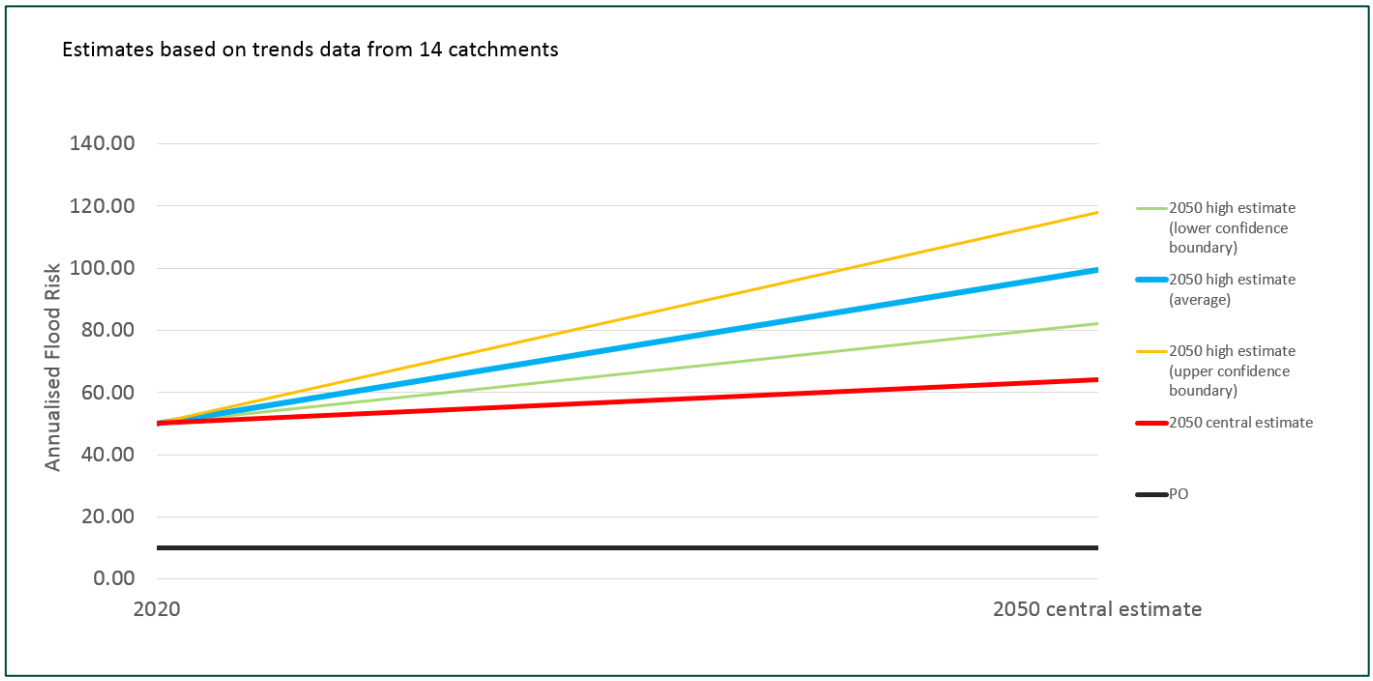
6.4.7.1. Some TPUs required a more detailed or varied review of risk, depending on the complexity and uncertainty of the risk identified. The approaches undertaken depended on whether the risk was seen to be in the wastewater network or treatment works.

6.4.7.2 Network

6.4.7.2.1. 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.

6.4.7.2.2. An example of the trend analysis is shown in Figure 15.

Figure 15 Example trend analysis on internal flooding



6.4.7.3 Wastewater treatment works

6.4.7.3.1. Complex BRAVA results were generated using alternative scenarios based on scenarios developed as part of visionary work included in the development of Strategic Context.

6.4.7.3.2. 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.

6.4.7.3.3. Results can be found in Technical Appendix 5 – Assessing Future Risk (TA5).

6.5 Option development and appraisal

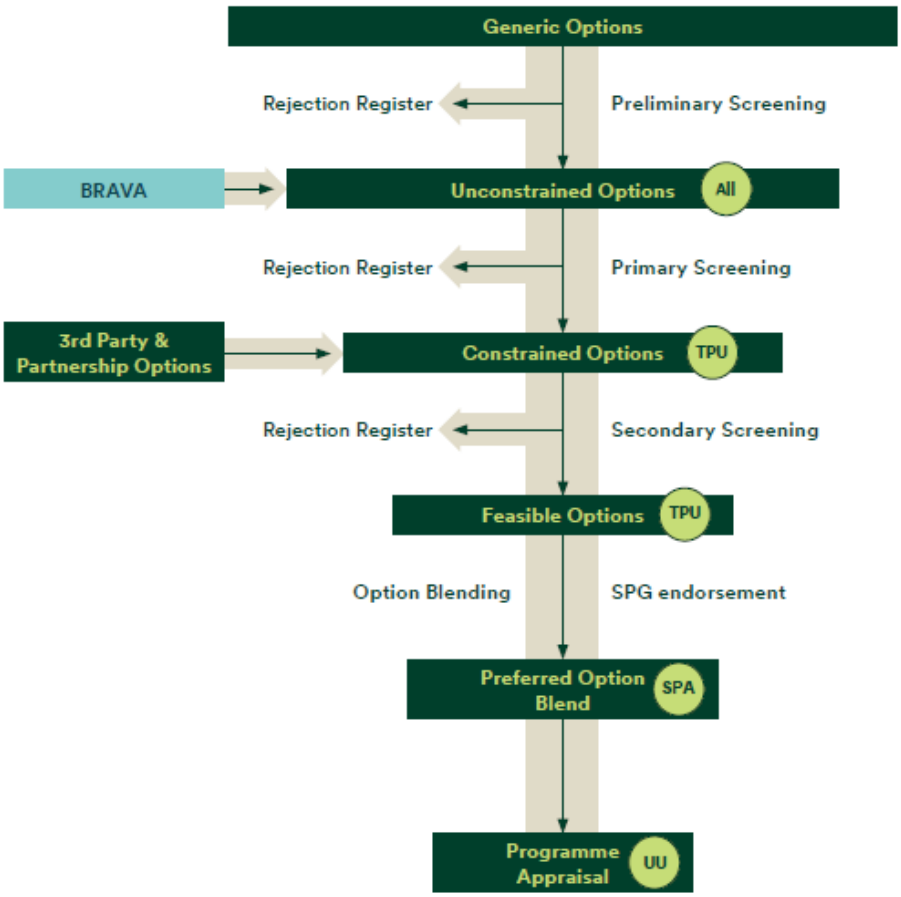
6.5.1 Overview

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 16 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 Identification and Appraisal (TA7).

Figure 16 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:

- be comprehensive and cover operational, capital maintenance and 'new' totex spend;
- consider innovation and new approaches or technologies; and
- 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 and partners 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 17. From this process 30 generic options were identified, with a further 99 generic sub options. Fourteen generic sub options 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 17 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 to contribute to reducing risk *to some extent*.

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.
- 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. Our 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 assessment scoring >=0,
- CBA > 0.5 plus a qualitative assessment scoring >=1.

6.5.4.7. The benefit provided by the remaining feasible options was not sufficient in all cases to meet planning objective targets for 2050. Therefore, some options, which did not meet cost benefit thresholds set out above, have been included in the preferred options as these areas are not subject to cost benefit.

6.5.5 Feasible options

6.5.5.1. Following secondary screening, over 5,000 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.

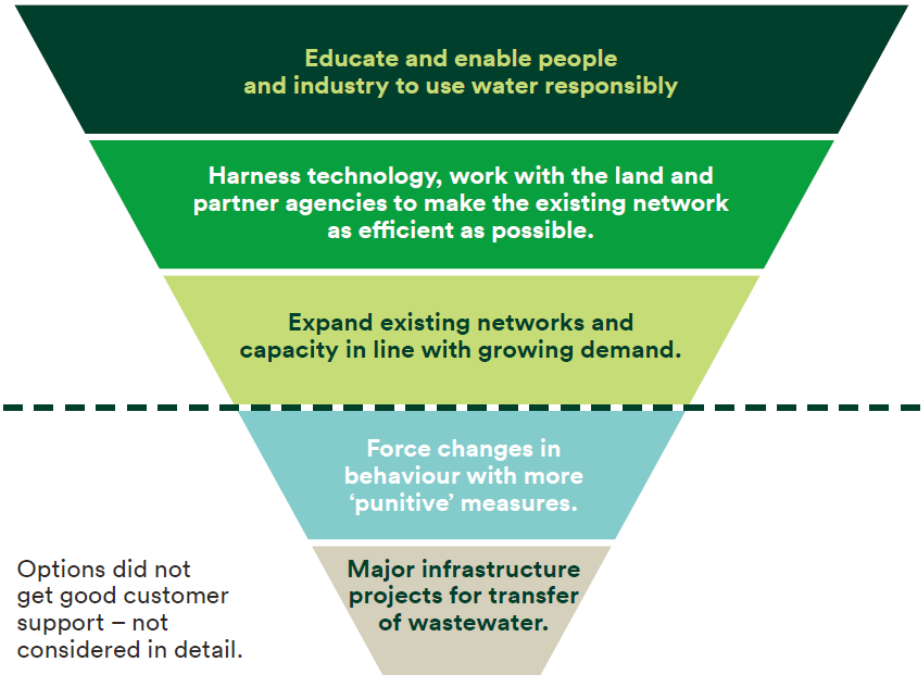
6.5.5.2. There are multiple approaches that can be taken to creating a preferred option blend. Two different blends were created to provide choice.

(1) option hierarchy approach; and

(2) most cost-beneficial approach.

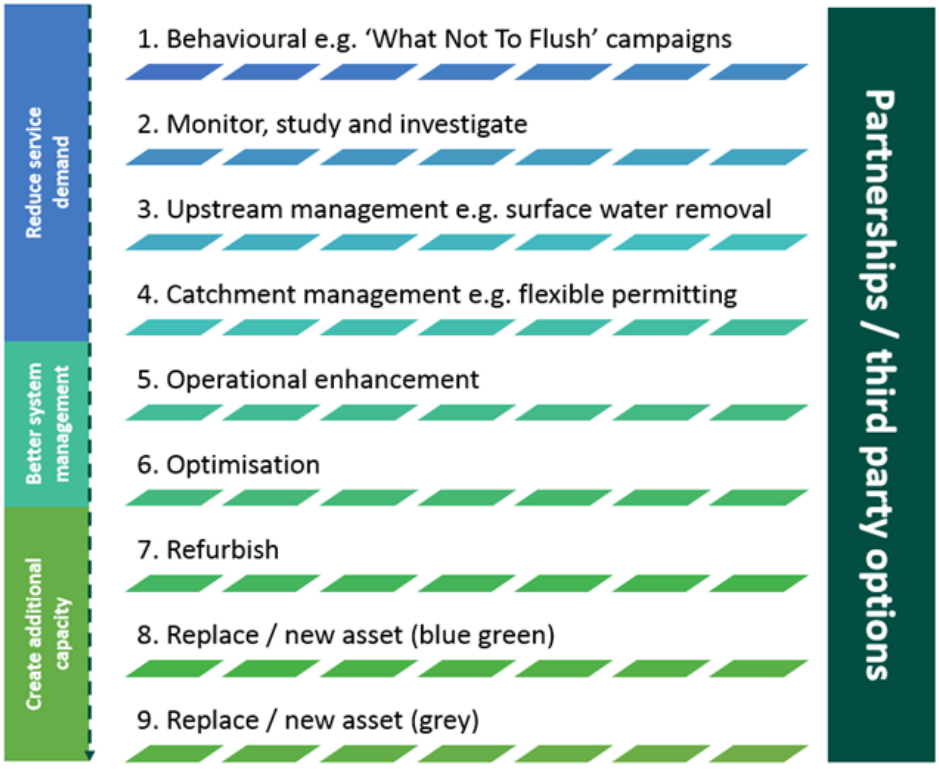
6.5.5.3. The hierarchy approach was developed based upon findings from customer engagement (Figure 18, outlined fully in Technical Appendix 9 – Customer Engagement (TA9)); then selected as the best approach to use following engagement with Your Voice Customer Challenge Group (CCG) and SPGs.

Figure 18 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 19), 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 19 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 Plan identification

6.6.1 Preferred options

6.6.6.1. 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.

6.6.6.2. The remaining types of options included in the preferred options list were:

(1) Surface water source control measures;

(2) Sewer maintenance;

(3) Intelligent network operation;

(4) Increase treatment capacity;

(5) Increase the capacity of existing foul/combined sewers;

(6) Domestic and business customer education;

(7) Modification of consent/permits;

(8) Treatment works rationalisation;

(9) Enhanced operational maintenance;

(10) Catchment management initiatives; and

(11) Sewer rehabilitation.

6.6.6.3. The optimisation process is described in Sections 7 and 8 of this document.

7. Programme Appraisal

7.1 Overview

7.1.1. In order to determine the best programme an innovative decision support tool (or Optimizer) '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.

7.1.2. A range of scenarios were considered to reflect the current uncertainty around certain outcomes, particularly storm overflows and investment driven by WINEP where it is unclear whether cost-benefit will apply. 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.

7.1.3. 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.

7.1.4. 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. However, there are some clear activities that appear in all scenarios and these are the "no regrets" activities that will be the focus of investment for 2025 - 2030.

7.1.5. Following triangulation of customer research to understand customer affordability the best value approach where only feasible options are considered was selected as the most appropriate in the absence of further guidance on WINEP and storm overflows.

7.1.6. This preferred approach scenario projects an overall expenditure of £1,016m over the next 25 years. Consideration has been given to the phasing of this investment, taking into account when issues arise as well as financing and deliverability.

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 Cost (WLC) Projected Investment

Option hierarchy	Scenario 1: Best value		Scenario 2: Lowest WLC	
	Cost (£m)	Six Capital Score	Cost (£m)	Six Capital Score
Behavioural	81.2	16368	46.3	4719
Upstream Management	290.5	14158	277.9	13775
Catchment Management	15.6	174	15.8	168
Operational Interventions	151.0	2837	151.0	2937
Refurbishment	161.0	117	169.0	455
Replace/New asset (blue green)	17.4	1967	12.0	1940
Replace/New asset (conventional)	299.2	-7954	157.3	-3460
Total	**1016.0**	**27667**	**829.3**	**20434**

7.2.5. Table 8 demonstrates that both scenarios project a significant improvement in performance against the planning objectives. All figures demonstrate the projected percentage reduction in incidents following completion of programme investment.

7.2.6. Ultimately the best value approach was selected as the preferred scenario. The potential bill impact of the optimised activities is estimated to be £3 per year by 2030 for the average household, excluding the impact of inflation. The anticipated 2050 bill impact is estimated to be £6 for the average household, excluding the impact of inflation.

Table 8 Best Value vs. Lowest Whole Life (WLC) Cost Projected Benefits

	Scenario 1 Best Value (% reduction)	Scenario 2 Lowest WLC (% reduction)
Pollution	88	88
Internal Flooding	68	68
External Flooding	39	38
Open Space Flooding	56	32
Sewer Collapses	72	76

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. There are elements of our planning where we have reasonable clarity of planning objectives and future drivers for change. Where we have clarity we have assessed best value options to achieve these objectives, along with likely permit driven requirements that we must do in response to growth.

8.1.2. There are however other areas where uncertainty remains. A key uncertainty relates to storm overflow improvements, as this is subject to the Government's Storm Overflows Discharge Reduction Plan consultation (March 2022).

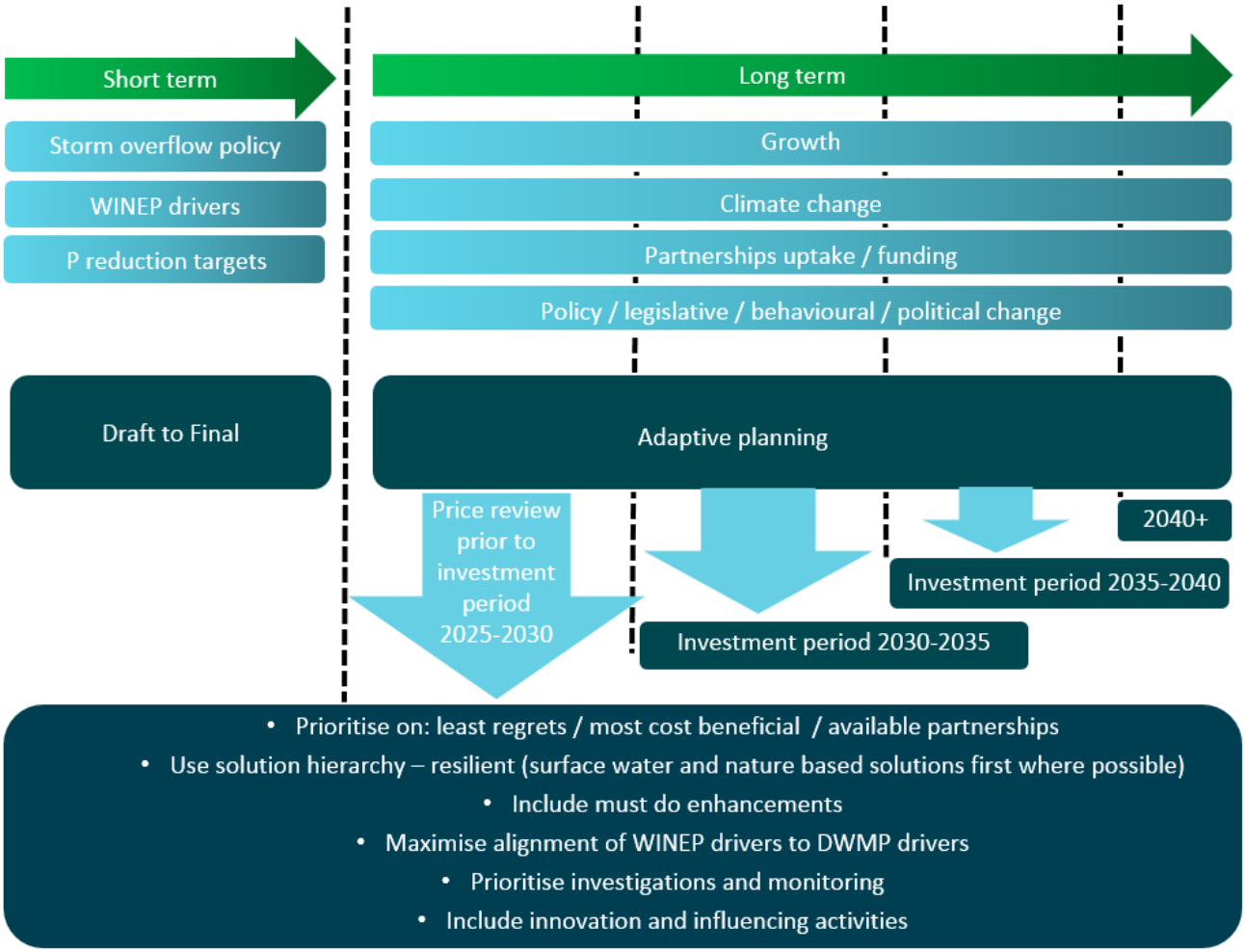
8.1.3. Targets and interventions for storm overflows are intrinsically linked to the performance of the system, and have a domino effects on other service levels such as flooding, flows to works and pollution. Consequently, optimisation of the plan as described in Section 1.

8.1.4. Programme Appraisal, has been undertaken with a number of assumptions and, ahead of any investment, further work will be required.

8.2 Managing Uncertainty

8.2.1. The anticipated storm overflow policy update will run in parallel to the DWMP progressing from draft to final submission. Additionally not all guidance was available in time to inform options development, including the WINEP and storm overflow guidance. We have set out short and long term uncertainties impacting on decision making in this in Figure 20 below.

Figure 20 Example adaptive approach for long term planning



8.2.1.1 Further clarity on key short term uncertainties, such as expectations for storm overflows, is expected by autumn 2022. Therefore we anticipate that work to incorporate an updated view on these uncertainties will be undertaken between draft and final DWMP publication. Further details on how we have managed the uncertainty around storm overflow expectations can be found in the DWMP Main Document (DP1).

8.3 Determining our preferred plan

8.3.1. The preferred plan selects a range of interventions to mitigate the long term risks identified through BRAVA. The preferred plan sets out a pathway and direction of travel to meet our long term planning objectives. It must however be continually reviewed as part of an adaptive approach given the levels of uncertainty regarding factors such as climate change and factors outside of management control such as policy changes. All options will need further options development ahead of inclusion in an investment plan.

8.3.2. We have tested a range of scenarios and, whilst we have accommodated uncertainty, the preferred plan detailed is unlikely to be the full picture of potential long term investment. To provide a more robust picture of the potential long term investment needs for wastewater we need to consider potential components beyond those that we have greatest certainty. As such we are setting out our plan through a number of components:

(1) Legal Obligations - Must do activities that are mandated by legislation or are required to maintain compliance with discharge permits;

(2) Performance Improvements - Optimised outputs of the non-mandated aspects of the plan e.g. to meet internal flooding planning objective; and

(3) Future requirements - Investment associated with uncertain regulatory guidance e.g. objectives around storm overflows.

8.4 Preferred Plan Summary

8.4.1 Overview

8.4.1.1. A central view of the investment associated with each of the core components listed above are summarised in Table 9 and detailed in UUW DWMP Main Document (DP1). The current core plan is focused on the areas where there exists greatest certainty, with a risk based approach being taken for those areas of greater uncertainty, which are inherently higher risk.

8.4.1.2. We have tested a range of scenarios and combinations of these three investment components. The extent to which each of these components are included can alter costs significantly; in particular for those areas associated with uncertain regulatory guidance. This includes investment on storm overflows and to meet certain environmental drivers where guidance has not yet been finalised. The understanding of investment driven by emerging legislation will continue to evolve over the duration of the plan and better inform future DWMPs.

Table 9 Preferred Plan for 2025-2050 summary

Component	Area	Price base assumption (Financial Year, FY)	Cost £m (2025–2050)
Legal obligations	Permit compliance	FY21	709
Legal obligations	WINEP	FY21	1,898
Performance improvements	Optimised activity	FY21	1,016
	Total: Legal obligations + Performance improvements		**3,623**
Future requirements	Overflows (Ecology)	FY21	1,039
Future requirements	Overflows (10 spills)	FY21	15,387
Future requirements	Overflows (Bathing Waters)	FY21	1,417
Future requirements	Overflows (screening)	FY21	455
	Total: Legal obligations + Performance improvements + Future requirements		**21,920**

8.4.1.3. The preferred plan includes a range of interventions to ensure delivery of the planning objectives (Figure 21). This is done by mitigating the long term risks identified through BRAVA. These risks vary from drainage area to drainage area. A summary of the options selected for the regional preferred plan is outlined below. Further detail for each SPA is included in the SPA Plans (SPA_01 – SPA_14).

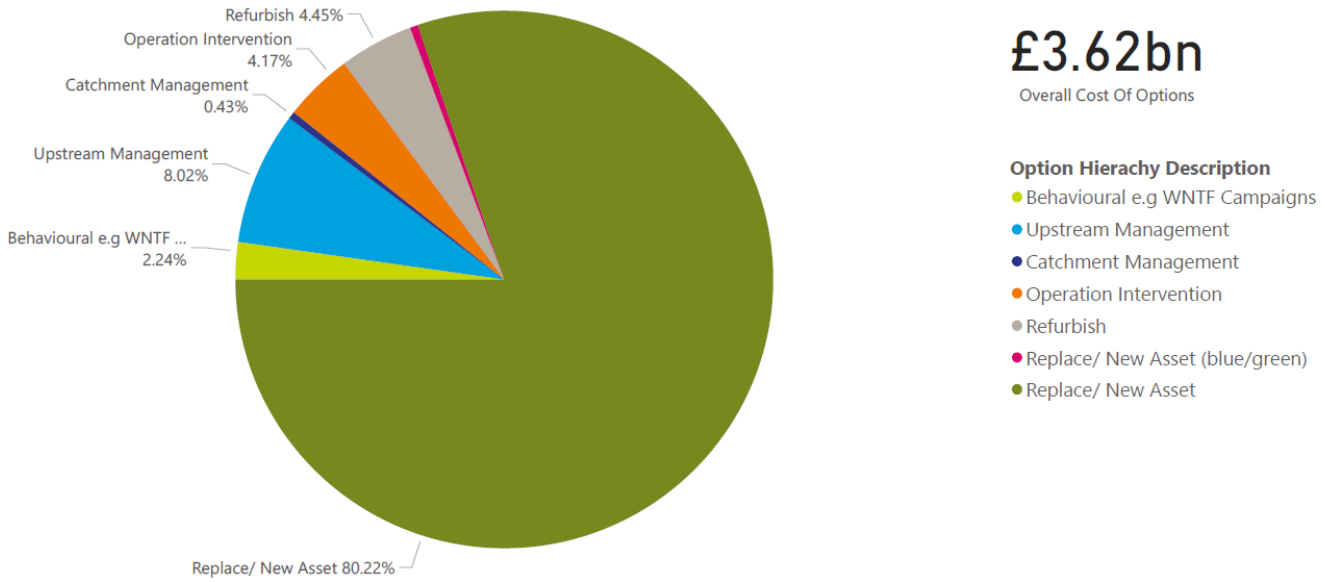
Figure 21 How activities in the plan ensure achievement against planning objectives

8.4.2 Types of option included in the plan

8.4.2.1 Our options hierarchy prioritises customer led change and sustainable natural processes. However, due to the scale of change needed the biggest investment that will be required is in new assets. This is predominantly due to the scale of investment required to meet legal obligations set out in the WINEP. The majority of the investment identified is associated with meeting new permit conditions. In order to provide certainty in compliance with these standards this almost always requires construction of additional treatment capacity and capability. Over the coming months, UUW will continue to work with the Environment Agency to ensure an optimised programme is developed and opportunities for the application of the catchment based approach are considered.

8.4.2.2 Requirements for storm overflows will be integrated in the preferred plan once details are clear. These requirements will be optimised with the other interventions in the preferred plan (Figure 22) as there will likely be synergistic benefits between the overflow interventions and wider planning objectives. For the time being the potential storm overflow investment requirements have been identified separately. Our provisional view is that a potential further £18bn may be needed to meet the Government's Storm Overflow Discharge Reduction Plan requirements, based on our understanding of them as they are currently set out in the consultation.

Figure 22 Proposed breakdown of investment by options hierarchy of likely statutory requirements and optimised activities to meet planning objectives



8.4.2.3 Interventions associated with legal obligations for the WINEP predominantly requires new assets to meet new permit conditions. A more detailed view of the types of options selected for legal obligations for permit compliance and optimised activities are detailed in Table 10. For most areas a blend made up of a number of different options has been selected. Option types ranked as a priority in our options hierarchy (namely, school education, customer engagement and upstream management) are each selected in over 200 TPUs. These types of interventions are all delivered more efficiently when run as wider programmes targeted as high priority TPUs. These are also areas which have strong opportunities for partnership from the work developing the partnership opportunities pipeline.

Table 10 Intervention type breakdown for legal obligations - permit compliance and optimised activities to deliver performance improvements

Intervention type	Generic Sub-Option Reference	Description	Number of TPUs where the option is selected
School education	CM5.1	Schools programme covering issues such as the water cycle, wastewater treatment and water efficiency	211
Customer engagement	CM5.2	Targeted "what not to flush" marketing to high risk areas	241
Dynamic network management	N1.1	Implement widespread sewer and pumping station monitoring, live network modelling linked to operational responses	280
Increase drainage capacity	N2.1	Provide additional sewer or offline storage capacity	174
Sewer separation	N2.2b	Separation of existing combined sewers into foul and surface water sewer	2
Enhanced maintenance	N7.1	Pro-active and targeted maintenance programmes (including inspection – eg. high consequence sewers)	14
Targeted sewer repair & rehab	N9.1	Targeted repair and rehabilitation of sewers	39
Upstream management (Surface water management)	SW	Surface water source control and pathway interception measures such as SuDS	256
Wastewater treatment works upgrades (blue/ green)	W2.6	Additional green process streams such as reed beds	4
Wastewater treatment works upgrades	W2.n	Additional conventional process streams such as primary treatment, chemical dosing or tertiary treatment or monitoring	203
Wastewater treatment works transfers	W4.1	Replace existing treatment works and transfer flows to another treatment works (additional upgrades may be required at receiving site)	4
Permitting	W6.6	Apply to the Environment Agency for a change in permit eg. DWF	31
Overflow treatment	W7.4	Treatment of overflow discharges to the environment eg. reed bed	36

8.4.3 Summary of potential overflow investment

8.4.3.1 In summary, it is anticipated that the costs to meet the expectations set out in the Government's Storm Overflow Discharge Reduction Plan consultation are detailed in Table 11.

8.4.3.2 The expenditure would not be evenly distributed across the region with the majority of expenditure in the Upper Mersey, Mersey Estuary and Irwell SPAs which cover the major urban conurbations of Manchester and Liverpool.

8.4.3.3 The phasing of the expenditure would not be evenly distributed either. Using the timescales indicated in the consultation and the expectations for high priority sites an indicative phasing of the investment can be seen in Table 12.

Table 11 Potential overflow expenditure to meet expectations in the Government's Storm Overflow Discharge Reduction Plan consultation

	Cost (£m)
Ecology sub-target	1,039
Bathing Waters sub-target	1,417
Other minimum requirements – 10 spills	15,387
Other minimum requirement – screening	455
Total	**18,297**

Table 12 Proposed phasing of overflow investment to meet objectives set out in consultation

	Investment cycle				
	2025 - 2030	2030 - 2035	2035 - 2040	2040 - 2045	2045 - 2050
Future requirements – Storm overflows (£m)	6,287	5,130	3,802	2,783	295

8.4.3.4 The costs detailed in Table 11 and Table 12 are based on individual storage solutions as the consultation was published after programme optimisation. This is unlikely to be the best value solution following optimisation. By using some of the cost unconstrained scenarios that were tested UUW has explored the potential costs of a hybrid solution to storm overflows of SuDS and storage. This could increase the investment required from £18.3 billion to £25.9 billion but would deliver additional natural and social capital benefits alongside increased resilience.

8.4.3.5 Between draft and final UUW will also explore the additional system costs due to the impact of upgrading multiple overflows within one TPU. Significant storage within the drainage system can have knock on implications downstream which can further increase costs as the system needs draining after a rainfall event e.g. the receiving wastewater treatment works has to be upsized to treat more flows. To understand the potential cost implications of this we have calculated a drain down factor based upon additional storage at the treatment works to manage the returning flows from new storage in the network. When applied across the region the potential costs at wastewater treatment works to drain down the additional storage is in the region of £1.8 billion in addition to the costs in Table 11.

8.4.3.6 Further detail on the preferred plan can be found within the Main Document (DP1) and 14 SPA Plans (SPA_01 – SPA_14) as detailed in Figure 1 at the beginning of this document.

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