United Utilities Water

Drainage and Wastewater Management Plan 2023

Technical Appendix 8 - Programme Optimisation

Document Reference: TA8

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United Utilities

Water for the North West

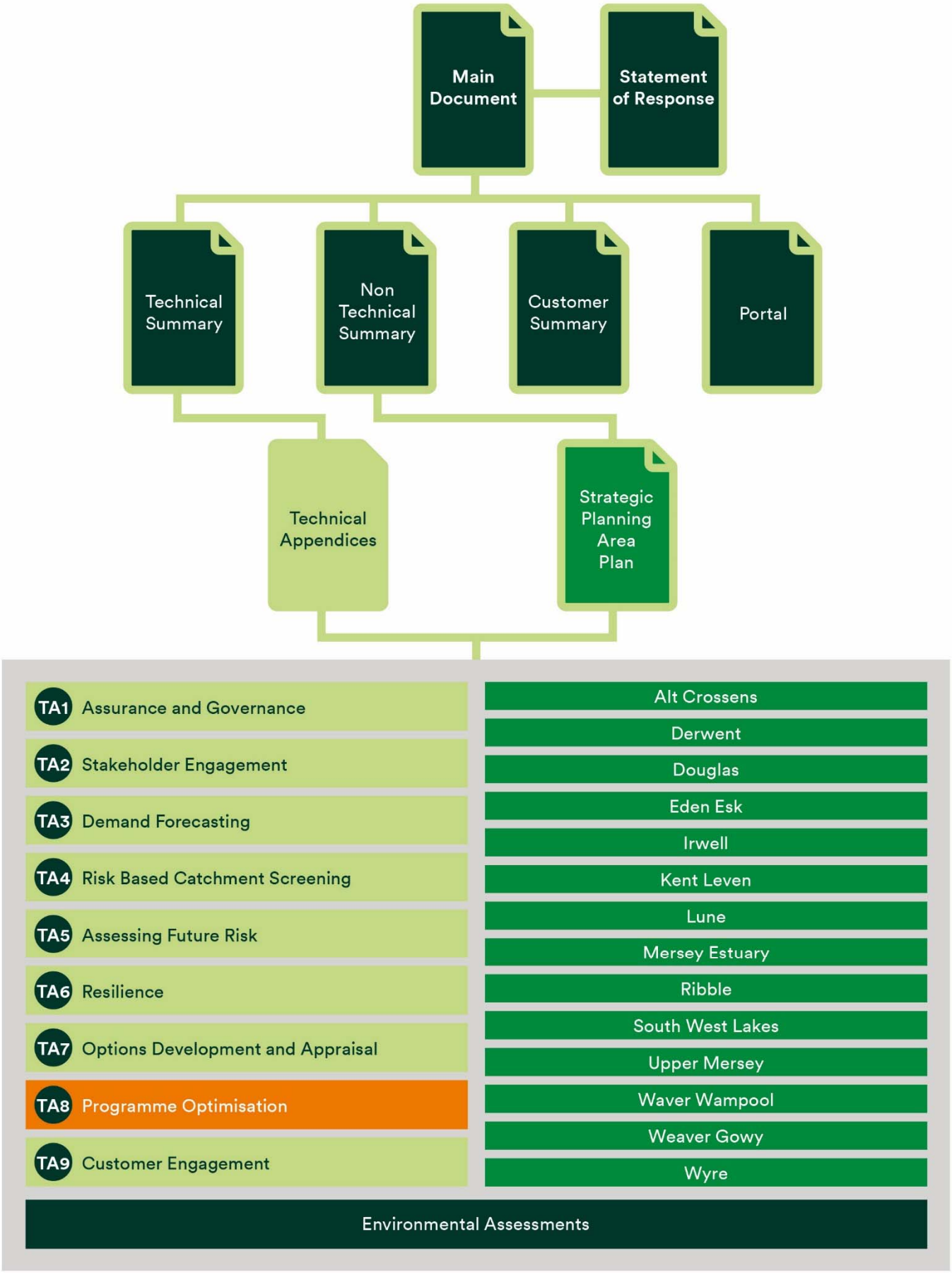
Executive Summary

This report is one of nine Technical Appendix (TA) documents, which accompany the Drainage and Wastewater Management (DMWP) Main Document and provide greater detail on the outputs of the assessments and the mechanisms used to derive the preferred near, medium and long-term plan. The programme optimisation process forms a fundamental part of the DWMP. This TA includes details of:

- United Utilities Water's (UUW) feasible options;
- The approach to measuring cost and benefit of the options;
- How UUW carried out an initial optimisation to determine preferred plans for each strategic planning area;
- How UUW carried out secondary optimisation to determine a regional preferred plan;
- How legal obligations have been accounted for in the preferred plan; and
- A summary of the preferred plan.

This TA is one of a suite of documents that provides information used in the development of the Drainage and Wastewater Management Plan as shown in Figure 1.

Figure 1 DWMP document structure



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For the glossary, refer to document C003.

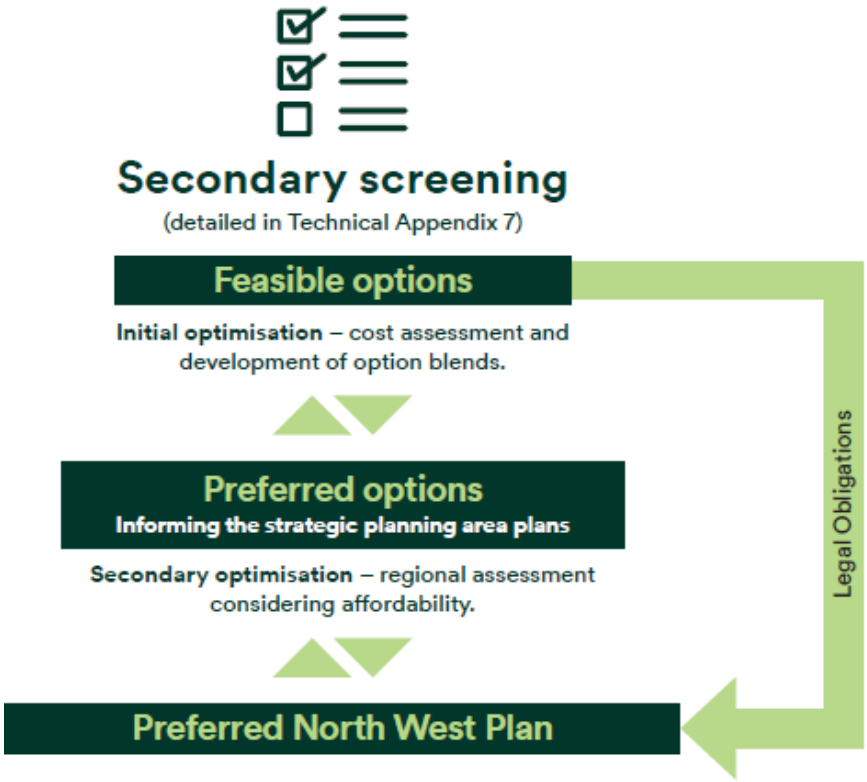
1. Introduction

1.1 Overview

1.1.1 This document provides an overview of the programme appraisal and decision-making stages of Drainage and Wastewater Management Plan (DWMP) options development and appraisal. This incorporates activities from the classification of feasible options, selection of preferred options, through to the testing of scenarios and selection of preferred options to inform the United Utilities Water (UUW) DWMP (Figure 2). This appendix is a direct sequel to Technical Appendix 7 – Options Development and Appraisal (TA7) where the methodology for collating and refining all unconstrained and constrained options is presented.

1.1.2 The programme optimisation stage of the DWMP process aims to identify the most appropriate options to implement in the plan given the cost, performance, wider benefits and impacts of options. The programme is required to manage or resolve the projected risks such sewer collapses, flooding, wastewater treatment works non-compliance, etc. which are exacerbated by growth and climate change identified in the Baseline Risk and Vulnerability Assessments (BRAVA). This is completed using interventions to meet the outlined planning objectives (Figure 3) across the North West of England.

Figure 2 Activities undertaken within optimisation, following secondary screening



1.1.3 Options appraisal and programme optimisation activities are critical in developing a preferred programme, these activities have taken into account:

- Regional delivery of performance against planning objective (Figure 3) targets;
- Programme cost and affordability for customers; and
- Wider benefits delivered by different programmes based on the interventions selected.

1.1.4 The Programme Optimisation process was broadly split into two phases:

- Phase 1 – the initial optimisation phase; to determine the prioritised initial strategic planning areas (SPA) plans, focused on the selection of preferred options for each Tactical Planning Unit (TPU). Phase 1 involved taking all potential feasible options and selecting solutions, which in combination, facilitated meeting planning objectives in a cost beneficial manner. The initial prioritised SPA plans were collated to create an initial view of the regional plan. The approach to initial optimisation is detailed in section 3; and
- Phase 2 – the secondary optimisation phase; interventions were prioritised regionally, considering affordability and customer preference in order to deliver a regional best value plan. During this phase, legal obligation activities were accounted for to ensure legal obligations would be met. The approach to secondary optimisation is detailed in section 0.

1.1.5 Engagement with customers through formal research and engagement with stakeholders through Strategic Planning Groups (SPGs) has informed the development of UUW's values framework and the scenarios tested within phase 1 and 2 of optimisation. This has included: prioritisation of planning objectives; feedback on wider benefit categories; prioritisation of service levels; and triangulation to understand affordability. Details of UUW's customer and stakeholder engagement are outlined in Technical Appendices 2 – Stakeholder Engagement (TA2) and Technical Appendices 9 – Customer Engagement (TA9) respectively.

Figure 3 The 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

2. Feasible option selection

2.1 Approach to feasible option selection

2.1.1 The feasible options were derived from the constrained options list following secondary screening. During the development of feasible options, a large number of data had already been gathered and analysed, as described in TA7-Options Development and Appraisal. These data were required to help inform the selection of feasible options, which would be considered in programme appraisal and included:

- Costs (capital expenditure (capex), operational expenditure (opex) and replacement where applicable);
- The scale of benefits against all relevant planning objectives;
- Environmental and social impacts;
- Customer support;
- Assessment of uncertainty; and
- Dependency and mutual exclusivity between options information.

2.2 Determining performance benefit

2.2.1 For every option developed within feasible options, performance data were captured. During this process, the benefit provided by options was reviewed against a full breadth of service areas ensuring the benefit provided by each option was fully captured and that options, which promote multiple planning objectives, are understood. The service areas considered for each high-level solution, or option type, is outlined in Table 1.

Table 1 Performance data gathered for each option type

Option type	Planning objective that the benefit has been quantified against								
	Permit Compliance	WINEP	Storm Overflow Programme	Pollution	Flooding: Internal	Flooding: External	Flooding: Open Spaces	Flooding: 1 in 50-year	Sewer Collapses
Catchment management initiatives	■								
Domestic and business customer education				■	■	■	■		
Enhanced operational maintenance				■	■	■	■		
Greywater treatment and reuse								■	
Increase capacity of existing networks				■	■	■	■	■	
Increase treatment capacity	■								
Dynamic Network Management				■	■	■	■		■

Option type	Planning objective that the benefit has been quantified against								
	Permit Compliance	WINEP	Storm Overflow Programme	Pollution	Flooding: Internal	Flooding: External	Flooding: Open Spaces	Flooding: 1 in 50-year	Sewer Collapses
Modification of WwTW consent/permits	■								
Property Level Resilience (PLR)					■				
Enhanced Sewer maintenance				■	■	■	■		■
Sewer rehabilitation				■	■	■	■		
Surface water source control measures					■	■	■	■	
Treatment works rationalisation	■								
Bespoke WW WINEP programme options	■	■							
Bespoke Storm Overflow Programme options			■						

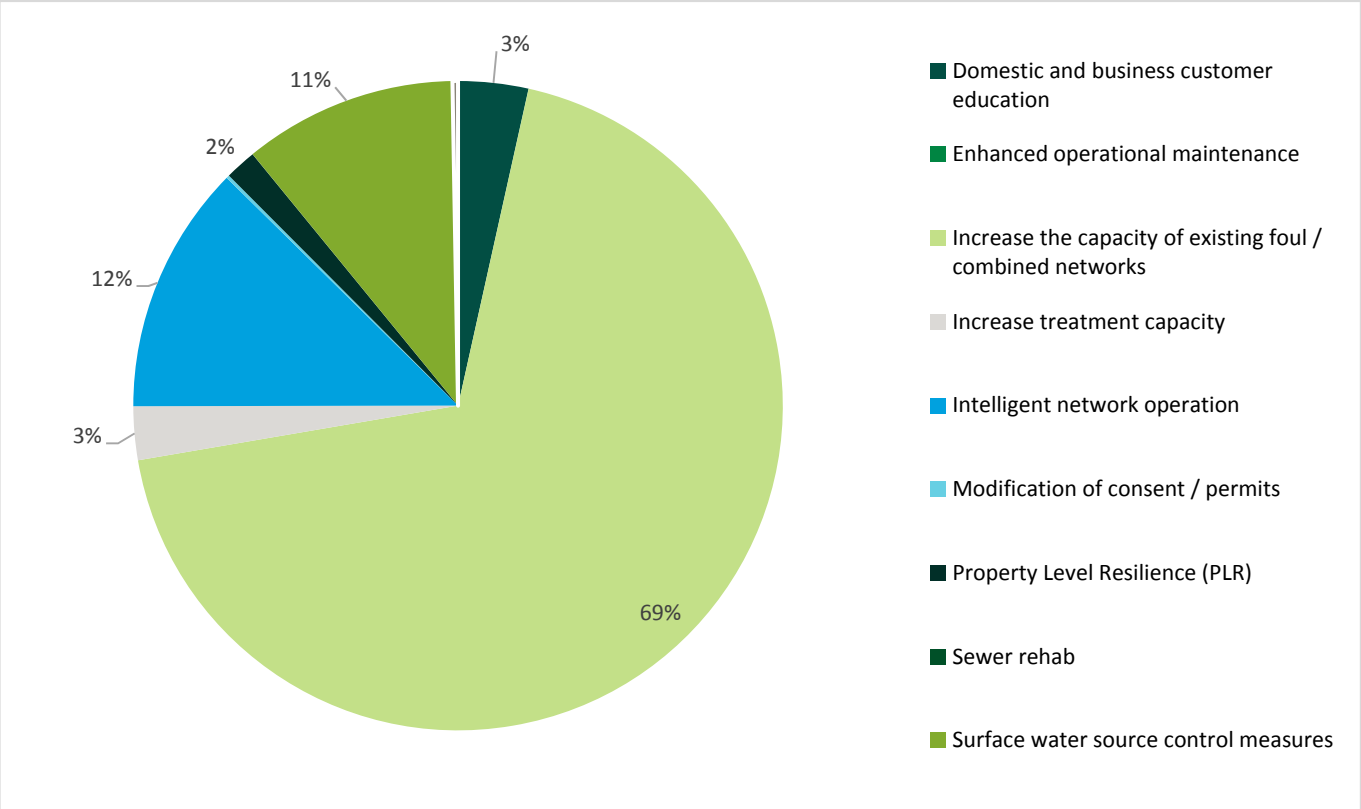
2.2.2 Performance was reviewed in metrics appropriate to each planning objective service area, for example flooding service is measured in annualised flood risk, whereas sewer collapses are measured in number of overall collapses. Where applicable, valuations have been determined from those used in Price Review 2019 (PR19) outcome delivery incentives. Where this information was not available, values were determined based on existing customer values, data and literature.

2.3 Feasible options summary

2.3.1 The outcome of secondary screening concluded with greater than 21000 options remaining. The options contained a range of all categories. A significant proportion (approximately 69 per cent) of unique feasible options relate to construction of new drainage capacity. Sustainable urban drainage systems (SuDS) account for approximately 11 per cent of feasible options. This evidences the need for a blend of conventional engineering solutions alongside nature-based solutions in order to manage the step change in challenges posed by climate change.

2.3.2 Approximately 3 per cent of options focus on customer side management through education programmes and targeted campaigns to reduce rates of blockage and flooding caused as a result of sewer misuse. This supports the need for customers to play a role in the future of drainage management and evidences the need to work collaboratively with partners to manage issues at the root cause.

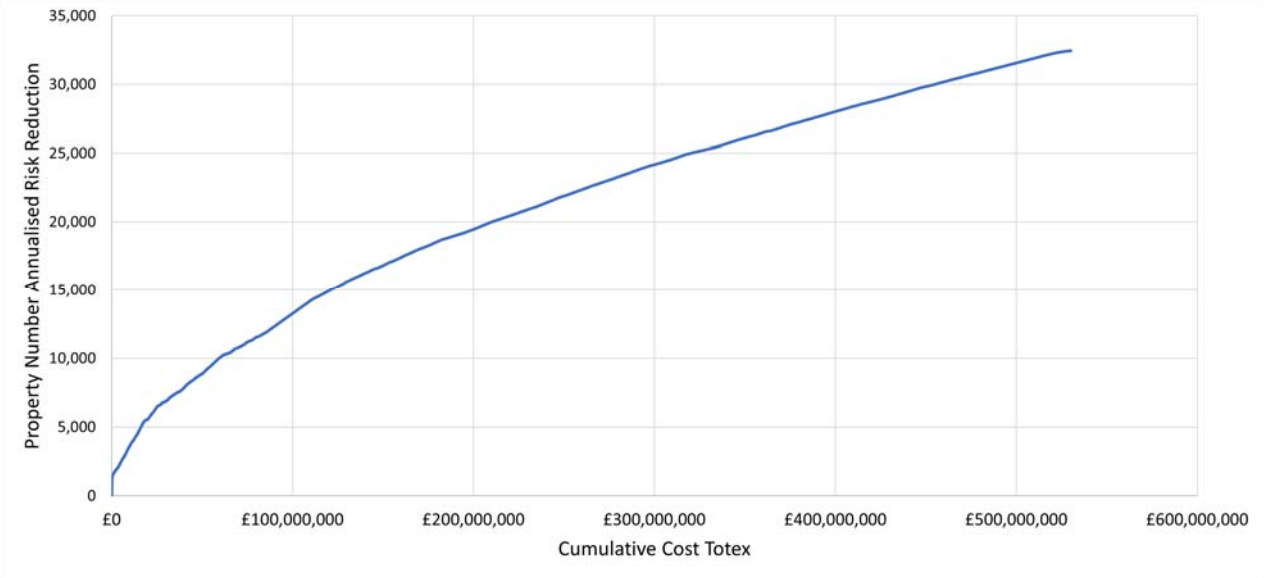
Figure 4 A regional overview of the number of feasible options selected for inclusion in option blends by option type



2.3.3 To determine the level of benefit, which could be delivered through feasible options, analysis was carried out on the costs of delivering different levels of service improvement. During this analysis, options being considered for a planning objective in an area are ordered in descending cost benefit. The example displayed in Figure 5 relates to the '1 in 50-year' flooding risk planning objective. For this objective, expenditure between £0 and £100 million reduces the properties at risk by 14,223, however, spending a further £100 million would decrease properties at risk by only a third of what is achieved in the first £100 million of investment (an additional 5,177 properties). This analysis also assumes the distribution of risk matches the options available perfectly in reality there would be some areas of mismatch with more options than risk to resolve or more risk than can be resolved by the available option types. The analysis evidences that there are diminishing benefits to be derived as the cumulative cost of the options increases. This is demonstrated by the case study in Figure 5.

2.3.4 This approach does not take into account the potential for some of the options to contribute benefit across multiple planning objectives and or potential non-monetary six capitals benefits, which might arise from favouring selection of other options. Also for consideration is the benefit of selecting non-infrastructure, shorter life span options multiple times across the 25 year planning horizon. An external and industry robust decision support tool, Copperleaf Portfolio, was required to enable the development of an integrated, Systems Thinking led view of performance and benefit for a programme of flooding, pollution and collapses. The DWMP WwTw to address permit compliance and WINEP programme and Storm Overflow programme were built bespoke by UUW.

Figure 5 Cumulative cost of options and subsequent monetised benefit provided ordered by ascending cost benefit ratio



3. Phase 1: Initial optimisation

3.1 Overview

3.1.1 This section details the approach to determining the prioritised initial strategic planning areas (SPA) plans and the selection of preferred options for each Tactical Planning Units (TPU).

3.1.2 From an initial review of the feasible options against planning objectives, it was clear that selecting individual options from this list would not necessarily achieve the objectives for a TPU as can be observed in the example tactical planning unit shown in Figure 6. The preferred options for each TPU would need to be comprised of multiple interventions.

3.1.3 Additionally, drainage and water quality issues are complex and often require multiple intervention strategies to ensure robust resolution. In developing options, UUW recognise that a singular solution is not often one that delivers the best outcome for customers, or strategically manages the issues identified. Consequently, we've developed an approach to consider multiple measures to mitigate an issue, these have been termed 'option blends'.

3.1.4 Option blends were not implemented in the development of DWMP WwTW programme as each of the options developed-on the basis of growth and climate change drivers identified in BRAVA- are a package of interventions bespoke to each of the WwTWs and the treatment processes already in place there.

3.1.5 An option blend is a suite of measures developed to mitigate a risk identified through the baseline risk and vulnerability assessment (BRAVA). The blends are made up of multiple option types, combining conventional engineering solutions with working with customers and innovating to better manage UUW's assets and catchments. As option blends are comprised of a range of different option types, all of which contribute towards meeting planning objective targets, this approach enables solutions, which partially contributed towards meeting planning objectives to be considered and encourages a Systems Thinking led approach.

3.1.6 Option blends as place-based strategies deliver multiple benefits:

- Prioritise options which get to the root cause of a problem;
- Enable inclusion of partial solutions – solutions do not need to be the 'whole' solution;
- Secure increased confidence in performance improvement – multiple intervention types – supporting the delivery of more uncertain solutions as part of the whole; and
- Allow adaptation of approach in areas of high uncertainty.

3.1.7 The additional benefit of creating option blends is that it creates an additional level of flexibility and mitigates innate uncertainty, supporting UUW's adaptive approach to long-term planning, allowing interventions to be brought in and out depending on whether risks materialise in the future.

3.1.8 A number of methods were considered for creating preferred option blends, two of these approaches were taken forwards for development and reviewed with customers and stakeholders:

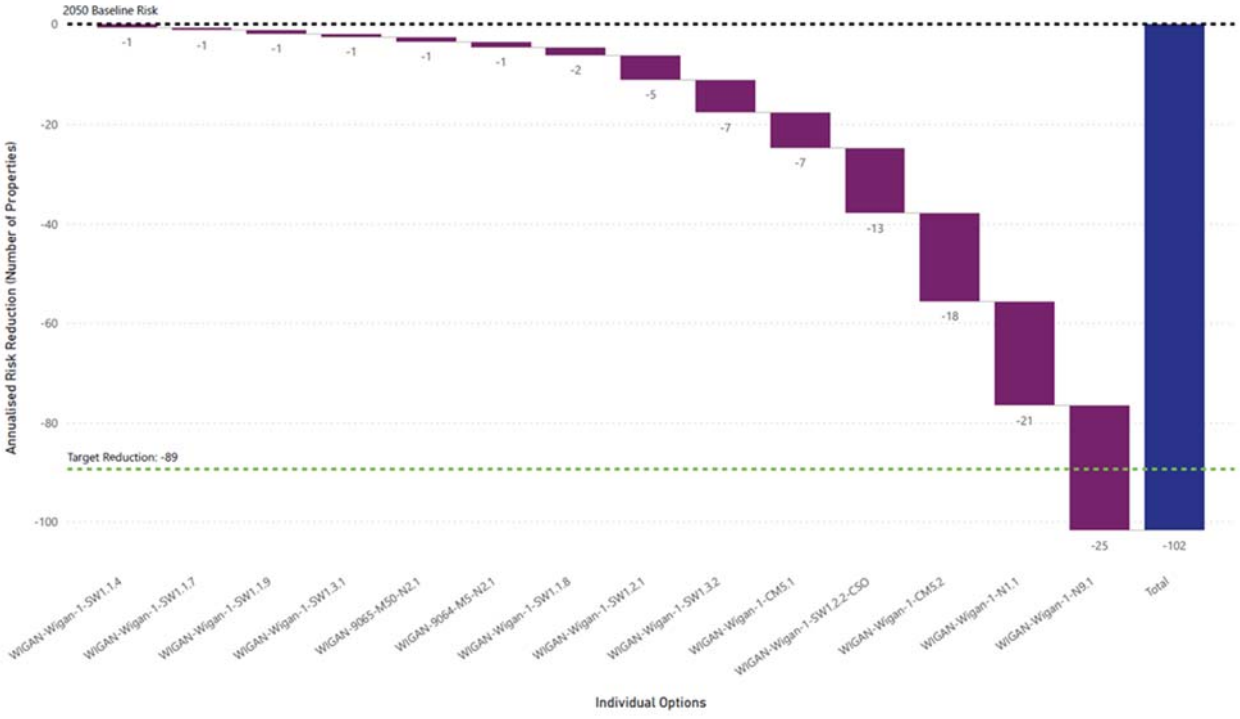
- Most **cost beneficial** options selected to close performance gap selected (outlined in section 3.2); and
- Options selected to close performance gap prioritised using a **solution hierarchy** (outlined in section 3.3).

3.1.9 In both cases, where applicable, a cost benefit threshold was applied to every option, as outlined in section TA7-Options Development and Appraisal Section 5.9.

3.1.10 In some cases, options which did not meet the cost benefit thresholds were reconsidered following optimisation to reflect that certain drivers are not subject to cost benefit e.g. permit compliance. In

these cases, a risk-based approach has been used to constrain the programme, while ensuring legal obligations are met.

Figure 6 Case study: interventions required to meet a planning objective target in a tactical planning unit



3.1.11 Demonstrating a location where single interventions are unable to wholly meet the planning objective target, instead in this location a combination of 14 options are recommended to meet the objective.

3.2 Approach 'A' to creating best value option blend: lowest whole life cost

3.2.1 This section outlines approach 'A' to creating option blends: prioritising the most cost beneficial options to close the forecast performance gaps to deliver a **lowest whole life cost** plan.

3.2.2 Within the first approach to developing option blends, cost benefit alone was used to prioritise solutions selected. Using this approach, the most cost beneficial options were prioritised for inclusion in the preferred option blends.

3.2.3 In this approach, for example, regardless of its position in the hierarchy an option with a higher cost benefit score will be prioritised over an option with a lower score. Using the lowest cost benefit approach, no consideration is made for customer preference as in the options hierarchy approach. In general, this approach delivers a blend, which has a lower whole life cost but with fewer wider six capital benefits.

3.3 Approach 'B' to creating best value option blend: option hierarchy

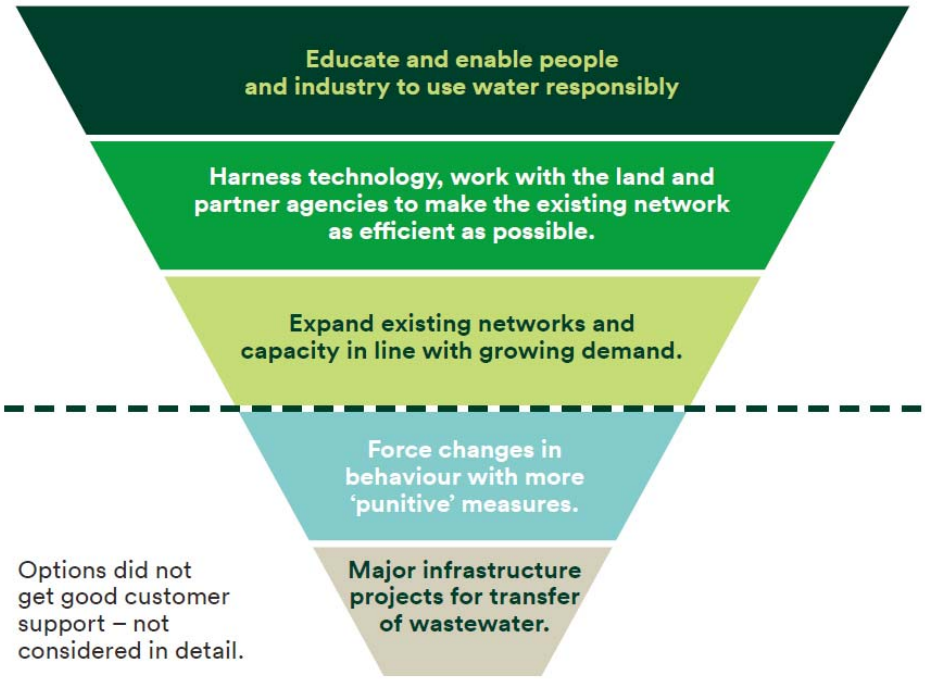
3.3.1 This section outlines approach 'B' to creating option blends: prioritising using a solution hierarchy to close the forecast performance gaps.

3.3.2 Through engaging with customers, UUW understand that the options most supported by customers do not necessarily deliver the full amount of risk reduction to meet the long-term planning objectives.

Customer engagement on options for resolving drainage and wastewater risks identified a pattern of preference, which emerged for meeting long-term challenges.

3.3.3 As outlined in Figure 7, customers in North West England show strong support for approaches which supported communities and industry to help tackle issues discussed. As well as measures, which supported partnerships, utilised new technology and drove efficiencies with existing assets. Conversely, feedback around measures considered as 'forced' behaviour change and major infrastructure projects were met with more caution and should be considered as a last resort. For further information, UUW's customer engagement approach is described fully in TA9.

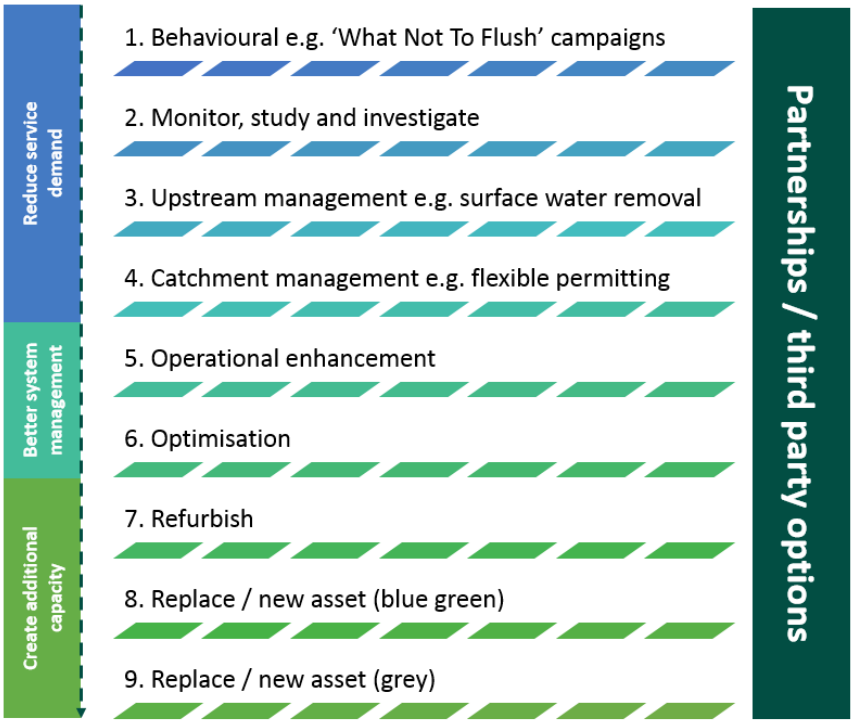
Figure 7 Priorities identified through engagement with customers on potential approaches to managing drainage and wastewater risks



3.3.4 Using the findings of the customer engagement, a hierarchy for prioritising solutions was developed. The hierarchy, (Figure 8), was used to determine the prioritisation of option types to be included in the preferred option blends. Using this approach, options which address a planning objective performance gap that are higher up the hierarchy will be selected over those lower down.

3.3.5 Options selected were still required to meet the feasible option cost benefit thresholds as outlined in TA7 section 5.9 but, for example, customer side management options (hierarchy position 1) with a slightly lower cost benefit are prioritised over new asset (hierarchy position 8) with a slightly higher cost benefit. This was optimised by, a decision support tool was used to calculate this allowing the optimal blend to be determined against all planning objectives.

Figure 8 DWMP Options Hierarchy

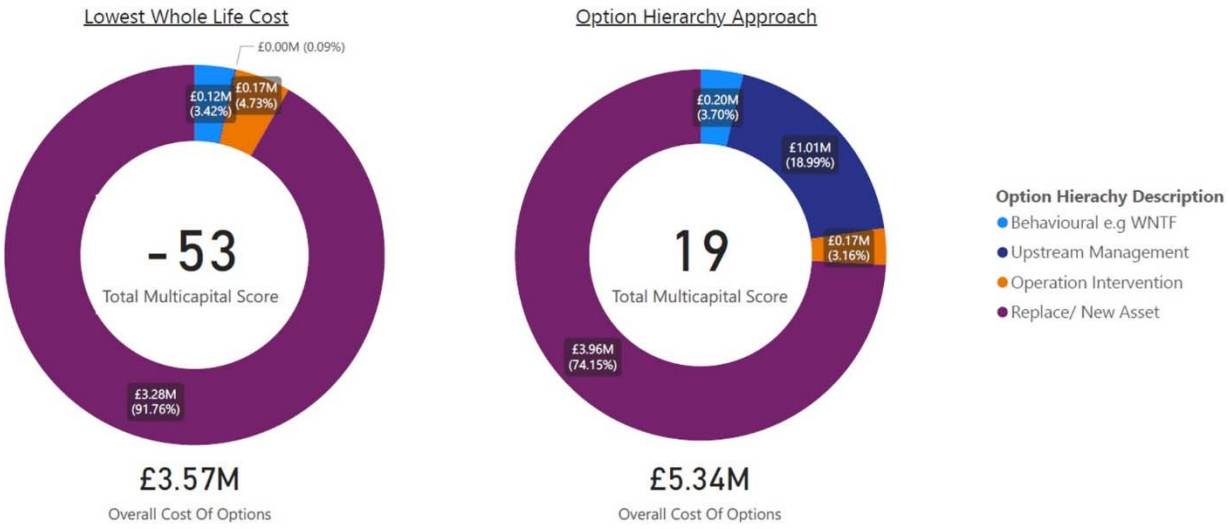


3.4 Worked example

3.4.1 In Figure 9, a comparison of the proposed proportionate expenditure on different option categories in an example tactical planning unit is presented for approach 'A' (lowest whole life cost) and approach 'B' (option hierarchy). These charts are based on outputs from the decision support tool (detailed in section 5).

3.4.2 In the lowest whole life cost scenario, the percentage investment in new assets is greater than the option hierarchy approach (92 per cent to 74 per cent). The options hierarchy approach includes upstream management for 19 per cent of the assigned expenditure, which is not selected using the lowest whole life cost approach. The options hierarchy approach provides a greater six capitals score (greater total benefit for social, intellectual, natural, human and manufactured environments detailed in TA7-Options development and appraisal). The sum benefit against the planning objectives for the two approaches presented below is very similar, but as a result of the preference towards demand reduction using the options hierarchy approach the overall cost of options is higher.

Figure 9 Example comparison of options by cost, selected using both blend approaches in a TPU



3.5 Selection of preferred option blend approach

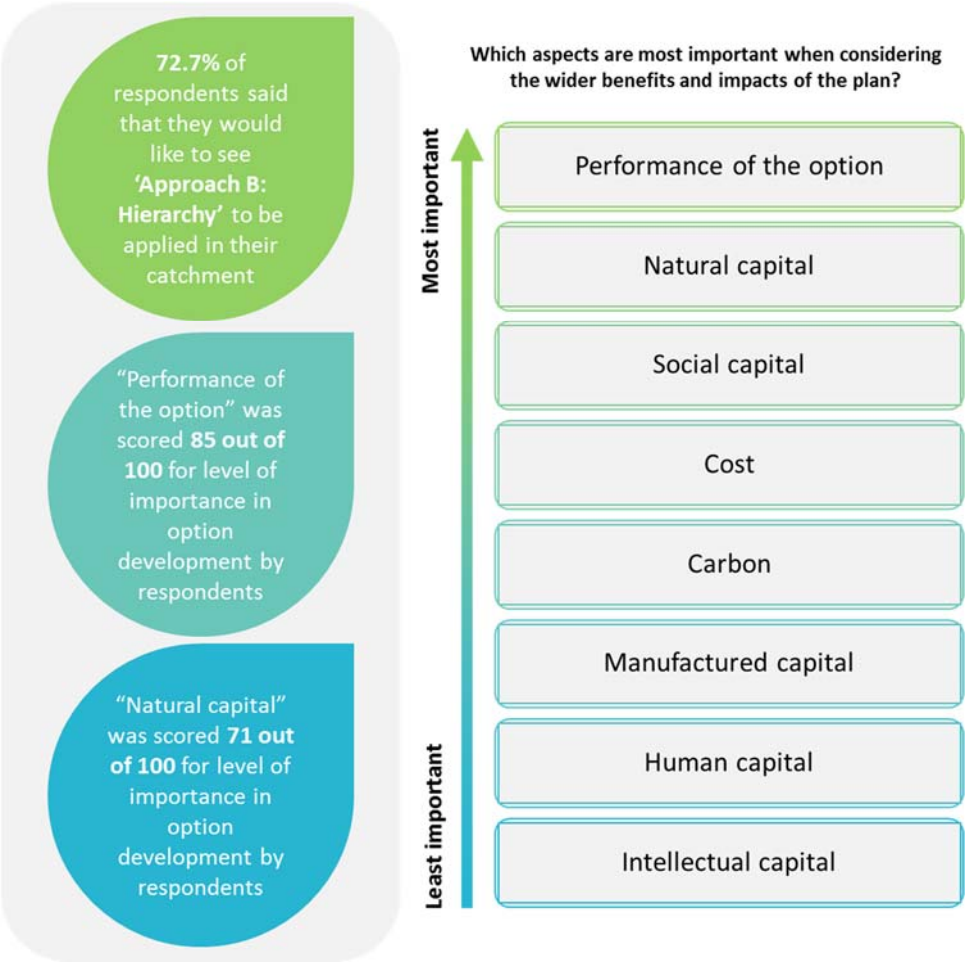
3.5.1 A sub group of UUW's Customer Challenge Group (CCG), 'Your Voice Environmental and Social Capital Sub Group', and UUW's strategic planning groups have been consulted on the best way to select the preferred option blends. The two approaches described in 3.2 and 3.3 were shared with the groups for feedback and endorsement.

3.5.2 The engagement was delivered through a presentation to UUW's CCG 'Your Voice Environmental and Social Capital Sub Group' and feedback was unanimously in support of using the Options Hierarchy approach.

3.5.3 An information brief and survey was sent to members of UUW's strategic planning groups to gain feedback. This outlined the two approaches, the process for selecting preferred options and two worked examples to demonstrate the impact of choosing each approach in both cost, benefit and solution types. Following this engagement:

- 73 per cent of respondents supported the options hierarchy approach;
- The remaining 27 per cent of respondents selected 'other' as their preferred approach;
- The lowest whole life cost approach was not selected by any respondent; and
- Respondents ranked performance of the option, natural capital and social capital as the three most important aspects when considering the wider benefits and impacts of the plan (Figure 10).

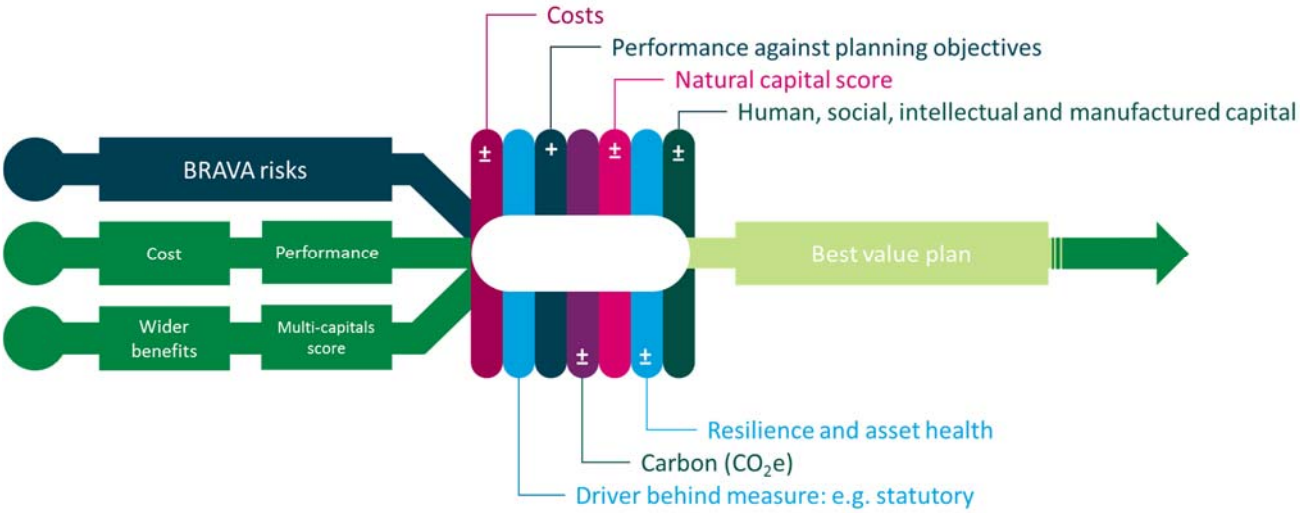
Figure 10 Stakeholder feedback on the process for selecting preferred options



3.6 Decision support approach for 'initial optimisation'

3.6.1 UUW have used an innovative decision support tool, Copperleaf Portfolio, optimise the plan relating to our planning objectives: flooding, pollution and sewer collapses. The tool uses mixed integer linear optimisation algorithms to apply various constraints and prioritise different outcomes. To develop an optimised programme, the tool aims to meet the planning objective targets by using the inputted 'feasible' options. A number of scenarios were tested, for each a different set of rules and constraints was applied to select the best combination of options to meet the planning objectives. Wider benefits delivered by options are considered and reported for each scenario to inform decision-making. The tool considers need and risk over time and proposes an appropriate approach to investment over the period of the plan.

Figure 11 Optimisation Process



3.6.2 A value framework was configured to enable the optimisation tool to run, consider and compare different financial and outcome scenarios. This framework incorporated risk reduction values for each planning objective to allow for monetisation of service provision. In addition, non-monetised benefit was considered for UUW's six capitals assessment in the form of a 'six capitals score'. A number of scenarios were tested in both phase 1 and phase 2 of the optimisation process.

3.6.3 The output of phase 1 of optimisation is the prioritised plan for each SPA. As outlined in 'Appendix D – Options Development and Appraisal' of the Water UK document 'A Framework for the production of Drainage and Wastewater Management Plans' (2018), the prioritised SPA plan should not be seen as a delivery vehicle but as an input into the wider regional assessment required to derive an overall plan to achieve a planning objective given affordability for customers. The regional plan derived through the DWMP will provide information for the business plan for investment cycle 2025–2030. Translation of the DWMP for business plan activities means that wider affordability constraints will have to be considered taking into account wider needs such as maintenance need and investment across water and bioresources price controls.

3.6.4 Analysis of the feasible options determined that over 89 per cent of the options screened through to this stage delivered benefit against more than one planning objective. This highlights the interconnected nature of drainage and wastewater management and the necessity of integrated planning within the DWMP.

4. Phase 2: Secondary optimisation

4.1 Overview

4.1.1 Within secondary optimisation, the same decision support tool, Copperleaf Portfolio, was used to optimise the preferred options. During this phase, interventions were prioritised regionally, considering affordability and customer preference in order to deliver a regional best value plan.

4.1.2 In order to drive the best performance possible, at a regional level, offsetting of performance was allowed for a number of planning objectives including internal flooding, external flooding, open spaces flooding, pollution etc. Offsetting refers to the process in which the decision support tool is able to deliver over performance in some areas and select fewer options in other areas, which could lead to underperformance in some sub-areas. The purpose of offsetting is to try and achieve the best overall regional outcomes in an affordable manner.

4.1.3 Key scenarios run that will be discussed in this document include:

- Scenario 1: Best value approach where only feasible options are considered;
- Scenario 2: Lowest whole life cost where only feasible options are considered; and
- Scenario 3: Low climate change where the effects of climate change and growth were curtailed.

4.1.4 Using the applicable rules, the decision support tool 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 cycle 2025-2030.

4.1.5 Following triangulation of customer research to understand customer affordability, the best value approach where only feasible options are considered was selected.

4.1.6 Consideration has been given to the phasing of this investment, taking into account when issues arise as well as financing and deliverability. This scenario does not include base maintenance to maintain current levels of service (as stable service was assumed in modelling) with more detail on this in TA5-Assessing Future risk (section 3.4).

4.2 Affordability

4.2.1 While it is important to drive long-term performance improvement, it is important to recognise that this needs to be delivered in a way that is affordable to customers. In order to ensure robustness, a number of pieces of research, which have been undertaken over the previous 18 months fed into UUW's affordability assessment.

4.2.2 Our customer research, both as part of DWMP planning and wider on going UUW customer engagement, has demonstrated that bill affordability is a critical priority for customers. Customers' focus on affordability has increased in recent months as wider cost of living factors, such as rising energy and fuel costs, have become more prominent. The time at which UUW service priorities have been tested with customers, affordability is highlighted as a key priority (Table 4). Additionally, between 2020 and 2023 we have seen an increase in the number of customers who express concern about meeting water bills (Table 2). As demonstrated in Table 3, regular water service priorities research undertaken in 2016 found that affordability was ranked as the sixth most important priority out of 11. In 2021, the same research found affordability had increased to the third most important out of 11 priorities. Furthermore, between the two pieces of research a higher proportion of customers agreed that affordability should be a priority for UUW, rising from 64 per cent of customers agreeing in 2016 to 77 per cent in 2021.

Table 2 Engagement with customers to understand concern about meeting water bills – September 2021

	% of customers		
	April 2020	March 2021	September 2021
Concern about meeting water bills	21	21	33

Table 3 Customer feedback on the priority 'working hard to keep the cost of water as affordable as possible'

'Working hard to keep the cost of water as affordable as possible'	2016 survey results	2021 survey results
Rank of priority (out of 11 priorities tested)	6	3
% of customers agreeing this issue is a priority	64	77

4.2.3 The bespoke customer acceptability testing on the DWMP (TA9-Customer Engagement Section 10.3) to understand their views on overall bill changes indicated that whilst acceptability testing was conducted on an early version of the final DWMP, which differed from our final proposed plans in terms of bill impact and service levels, we can nevertheless draw a number of important conclusions as to customers views of the final DWMP.

4.2.4 The results of this acceptability testing have been considered alongside other DWMP customer research projects, including customer acceptability testing of the draft DWMP, six capitals customer research, research supporting options appraisal and customer preference research. Taken together we believe we can safely conclude there is clear support from customers for the service improvements within the final DWMP, with an acceptance of bill increases of the general magnitude required to deliver these improvements.

4.2.5 Additionally, we have regularly sought to understand customers' views on overall bill changes, including as part of our research into customers' priorities. This package of research has consistently indicated that the majority of customers are likely to be supportive of relatively small bill increases (c.1%–2% on current bills) in exchange for service improvement in areas of customer priority. However, there are early indications that bill increases larger than this are more likely to be challenged by many customers. This suggests that, at minimum, gaining support for larger bill increase will require clear demonstration of the benefits of investment.

4.2.6 It is notable that customers from households categorised as low income are generally more likely to be sensitive to bill increases, consistently preferring lower bill options, even if this results in forgoing opportunities for service improvements. Given proposed investment profiles and associated bill impacts we anticipate that it will be necessary to consider how best to handle bill impacts for lower income households. This will likely form part of future Price Review and operational planning, and may require engagement with government and regulators.

4.2.7 Due to future uncertainty in increased risk from the impacts of climate change and growth, an adaptive approach is necessary to minimise impact on customer bills. An adaptive approach to implementing solutions will allow us to balance affordability with ambition for improvement. One major area of concern is the disproportionate impact on customers in the North of England, where there is higher rainfall and propensity for storms, and a consequently higher proportion of combined sewers and storm overflows activations.

4.3 Service levels

4.3.1 In addition to understanding programme affordability, customer research has also provided insight into customer priorities for wastewater service levels. November 2021 research exploring prioritisation of services across water and wastewater highlighted protecting the environment and utilising sustainable solutions as high priorities (Table 7). Priorities relating to the DWMP are highlighted green.

Table 4 Ranked priorities of service levels determined by November 2021 research into customer priorities, a low number indicates a high rank (i.e. 1 is high)

Rank	Priority
1	Safe water to drink
=2	Protecting the environment
=2	Meeting future challenges through sustainable solutions
=2	Supporting customers with low incomes/in vulnerable circumstances
3	Reliable supply of water now and in the future
=4	Reducing leakage
=4	Reducing flooding
=5	Limiting the odour, flies and noise caused by United Utilities Water operations
=5	Avoiding disruption to travel
=5	A better digital experience

4.3.2 The relatively high priority given to the environment is consistent with the outcome of our State of the Nation research, which showed that the top two concerns were the environment and climate change. The results from the priorities research gives a value showing the proportional importance of each priority. The scores relevant to wastewater are outlined in Table 8.

Table 5 Proportional importance of wastewater priorities, a high score is positive

Priority	Score
Play our part in protecting the environment (e.g. reducing carbon footprint)	6
Meet future challenges through investing in sustainable solutions	5
Preventing pollution to the environment	4
Removing and treating wastewater in a way that protects the environment	4
Reduce wastewater flooding	1
Reduce wastewater blockages	1

4.3.3 Customer feedback on service levels has informed prioritisation of planning objectives within the decision support tool. For planning objectives driving environmental performance including WINEP, storm overflows and permit compliance UUW have included a ‘must deliver’ rule into the options appraisal process.

4.3.4 Meeting future challenges by investing in sustainable solutions was also highlighted as a high priority. This priority does not align directly to one of UUW’s planning objectives but rather an approach to options development, this is reflected in UUW’s options hierarchy and inclusion of hybrid green den grey engineering solutions for the WINEP relating to storm overflows for AMP 8 and beyond. Risk management at source is prioritised (reducing service demand), followed by options to optimise the

system and finally creation of additional capacity. The options, which are prioritised earlier within the options hierarchy, have lower carbon and are generally scalable and offer low regrets options supporting adaptation to future uncertainty.

4.4 Considering alternative plans

4.4.1 A preferred and alternative approach selecting options in the decision support tool were considered. These consisted of a best value and lowest whole life cost scenario.

4.4.2 Best Value

4.4.2.1 The best value approach follows the hierarchy approach detailed in TA7-Option Development and Appraisal, which, as outlined in section 4.3, was developed based on customer research and endorsed as a best value approach by the Your Voice environmental sub group. Options from the list were selected using this hierarchy.

4.4.3 Lowest whole life cost

4.4.3.1 As described in section 3.2, the lowest whole life cost approach, the decision support tool 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.

4.4.4 Chosen scenario

4.4.4.1 High level comparison of these two approaches (Table 7) shows differences in overall expenditure and the types of investment selected, the performance against our planning objectives is similar (Table 6). A wide scale monitoring programme would be required whichever scenario to enable the delivery of an adaptive approach.

Table 6 Best value vs. lowest whole life cost projected benefits

DWMP Planning objective	Scenario 1: Best value (% reduction)	Scenario 2: Lowest whole life cost (% reduction)
Pollution	57	56
Internal flooding	62	63
External flooding	28	28
Open space flooding	27	27
Sewer collapses	36	36

4.4.4.2 While the best value approach is more expensive overall, it also offers greater opportunity for six-capital benefits (six capitals score for best value approach compared to six capitals score for lowest whole life cost approach) and broadly similar performance improvements.

4.4.4.3 The two approaches were tested with stakeholders, as detailed in Section 3.5 and ultimately the best value approach based on the option hierarchy was selected.

Table 7 Best Value vs. Lowest Whole Life Cost (WLC) Projected Investment (totex)

Option Hierarchy	Scenario 1 Best Value		Scenario 2 Lowest WLC	
	Cost (£m)	Six capitals score	Cost (£m)	Six capitals score
Behavioural	80.86	45971	14.83	7389
Upstream Management	290.09	5618	103.31	4065
Operational Interventions	395.23	9585	394.57	9434
Refurbishment	0.08	-45	0.08	-45
Replace/New Asset (blue green)	16.46	72	14.30	56
Replace/New Asset (conventional)	946.55	-10118	1172.35	-10189
Total	**1729.27**	**51083**	**1699.44**	**10710**

5. Determining our preferred plan

5.1 Overview

5.1.1 UUW have generated a number of scenarios based on different prioritisation, considering different levels of service provision and timing, as well as risk appetite. Delivery of the preferred plan sets out a pathway and direction of travel to meet UUW's long-term planning objectives. It must, however, be continually reviewed as part of an adaptive approach given the levels of uncertainty regarding factors out of UUW control such as climate change and policy changes.

5.1.2 Other factors, which must be considered when selecting the preferred plan include:

- **Impact on customer bills:** as outlined in section 4.2 affordability of bills is of increasing concern for customers, UUW's best value plan must consider value delivered collectively with affordability rather than as separate entities.
- **Intergenerational equity:** UUW recognise the need to ensure investment is in low-regrets interventions and investment is only made where there is high confidence in the need for that investment, however, UUW must also consider the risk of unnecessarily deferred investment causing a bow wave of investment need for future generations. Sustainable investment decisions taking into account long-term needs and balancing spend across investment cycles is key to preventing intergenerational inequality to ensure services in the future meet the needs of the future.
- **Need for flexibility/adaptation:** The DWMP process innately supports an adaptive planning approach with five year cyclical reviews, which will allow us to monitor delivery of interventions; track uncertainty in exogenous factors such as climate change and growth; and update UUW's approach to ensure UUW are using the best available data and tools.

5.1.3 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. 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.

5.1.4 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 (Table 8):

(1) Wastewater treatment – 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) Storm overflows – investment associated with meeting the targets within the Storm Overflows Discharge Reduction Plan.

Table 8 Preferred Plan (totex) for 2025-2050 summary

Component	Area	Price base assumption (Financial Year, FY)	Cost £m (2025–2050)
Legal obligations	Wastewater Treatment (inc. AMP 8 WINEP)	FY21	6,107
Legal obligations	Storm Overflows (inc. AMP 8 WINEP)	FY21	18,119
Performance improvements	Optimised activity	FY21	1,729
	Total: Legal obligations + Performance improvements + Future requirements		**25,955**

5.1.5 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. 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.

5.1.6 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.

5.1.7 Phasing for this investment can be seen in Table 9.

Table 9 Phasing of investment

	Totex (£m) per investment cycle					
Investment Category	**2025 – 2030**	**2030 - 2035**	**2035-2040**	**2040 - 2045**	**2045 - 2050**	**Total**
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**

5.1.8 In the development of the phasing of investment for permit compliance, UUW has assumed an even distribution of investment for AMP10 to AMP12, 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 2025 – 2035 (as WINEP development by regulators can only reasonably look 10 years or two cycles ahead).

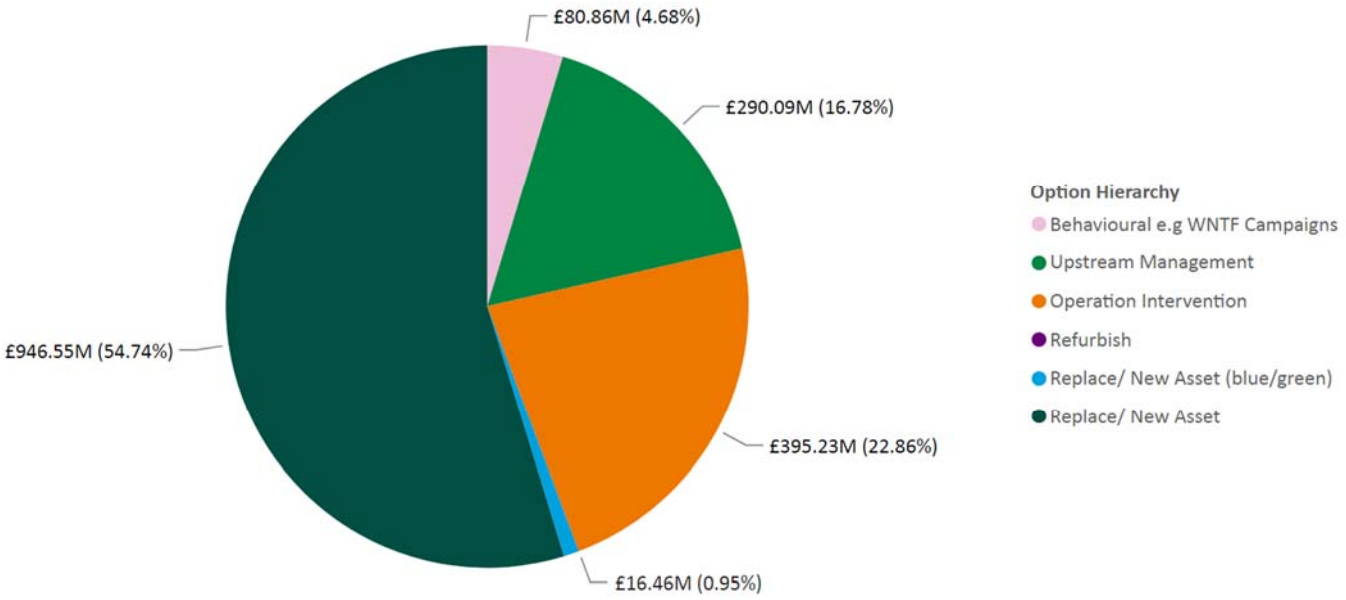
5.2 Optimised activities to deliver performance improvements

5.2.1 Overview of activities

5.2.1.1 Following the best value approach, the decision support tool was used to select the best combination of options to meet the long-term planning objectives across the region. A wide variety of different option types were selected (Figure 12). This was carried out before the publication of the overflow consultation.

5.2.1.2 Within the optimised outputs to deliver performance improvements, significant investment of £1,729million (totex) is forecast to be required over the 25-year period (2025–2050). The investment is distributed between a range of option types and across 512 TPUs and the 14 SPAs (Figure 13). Full detail of investment per SPA can be found in the SPA Plans (SPA_01 to SPA_14).

Figure 12 Regional view of optimised activities investment (totex) by option hierarchy

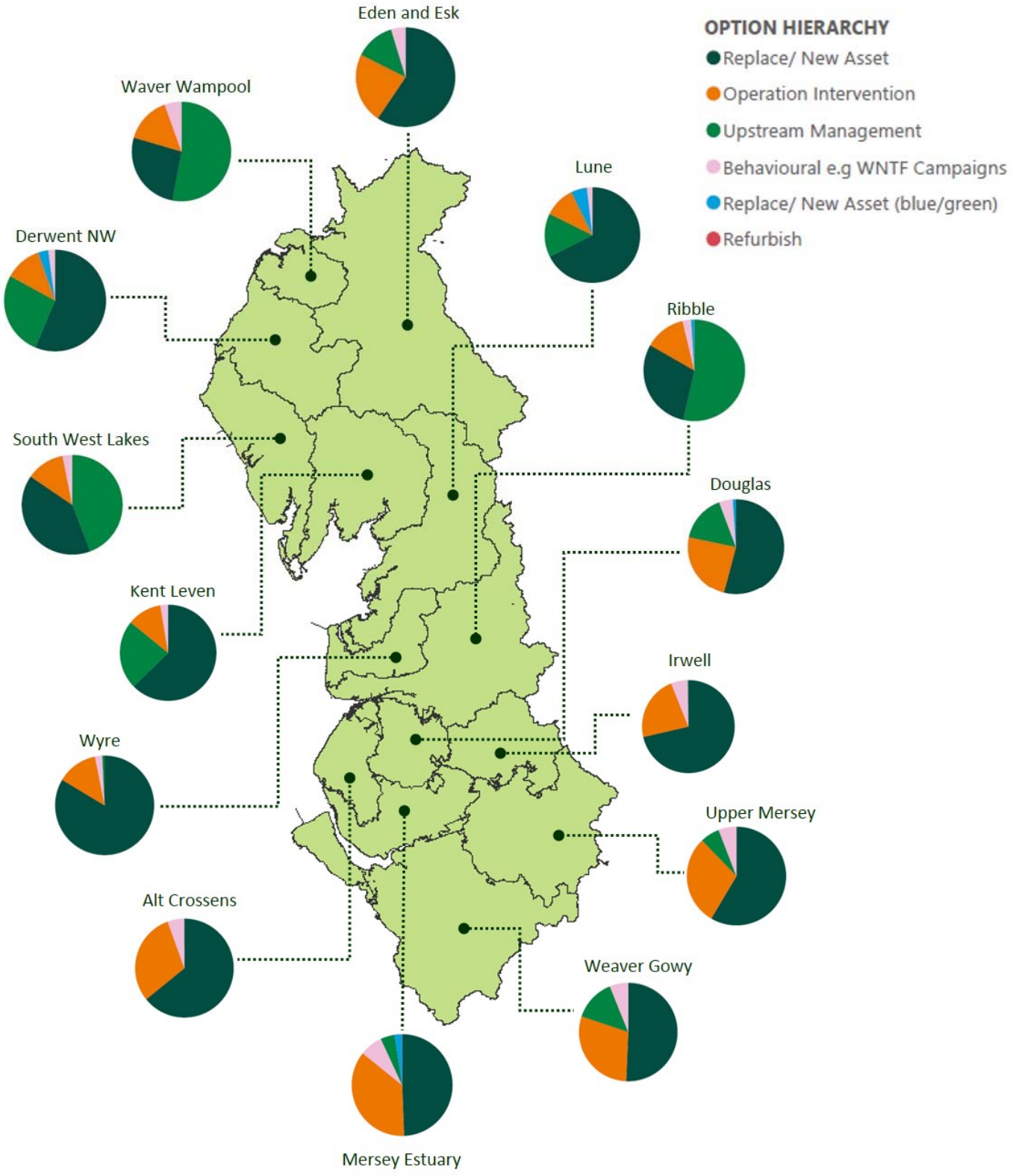


5.2.1.3 At a regional level, new assets and upstream management (e.g. SuDS) and Operations Interventions (which comprises primarily of dynamic network management) make up the largest proportion of investment (Figure 12). Due to the scale of the enhancement required there the majority of the investment in the creation of new assets.

5.2.1.4 This is generally in the form of 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 and SuDS options gained significant support from customers, owing to perceived additional benefits and getting to the 'root cause' of a problem. UUW are focused on delivering a rainwater management strategy recognising the challenge posed by climate change to the heavily combined systems in the North West.

5.2.1.5 Additional significant investment is found in operational interventions and refurbishment of existing assets. This investment includes activities to utilise innovative dynamic network management technologies and manage the wastewater and drainage systems using remote monitoring and artificial intelligence.

Figure 13 Optimised activity expenditure by SPA broken down by option hierarchy



The breakdown of optimised activities varies significantly between different SPA. This is because different needs and priorities were identified in different areas. For example, upstream management options are more prevalent in urban areas with a high proportion of combined sewers.

5.3 Legal obligations

5.3.1 Overview

5.3.2 While certain areas of this plan are discretionary, and we have been able to optimise proposed investment as described in section 4.4.4, UUW is committed to legal obligations to meet environmental and water quality-based drivers. These are derived from the Water Industry National Environment Programme (WINEP), Storm Overflow Discharge Reduction Plan (SODRP), and Water Framework Directive (WFD).

5.3.2.1 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.

5.3.2.2 This section sets out three areas of investment which fall into this category:

- Wastewater treatment compliance – 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
- WINEP- complying with environmental drivers set out in the WINEP (this has been aligned with both permit compliance and SODR).

5.3.2.3 In total, just over £24 billion of totex investment has been identified to meet these mandatory activities for the period 2025–2050. This is associated with known regulatory requirements. As such, the detail set out in this section is likely to change when the AMP8 WINEP is finalised by regulators and also in future iterations of the plan as new requirements are identified.

5.3.2.4 Legal obligations have been included for 334 TPUs for wastewater retreatment and WINEP, along with several WINEP derived schemes which are intended for investment across multiple catchments rather than site specific options.

5.3.2.5 The requirement for these have been identified through the BRAVA process or by following the WINEP driver guidance issued by the Environment Agency.

5.4 Wastewater treatment works compliance

5.4.1 Demand forecasting was undertaken as part of the Baseline Vulnerability Assessment (BRAVA) on the 567 wastewater treatment works to determine sites at future risk of failing permit compliance by 2050. This assessment is for detailed in Technical Appendix 3- Demand Forecasting and Technical Appendix 5- Assessing Future Risk, but key assessments identified wastewater treatment works at risk of failing permit compliance on the basis of:

- End of pipe compliance risk, which identifies long-term investment need in 79 TPUs; and
- Dry weather flow (DWF) compliance risk, which identifies long-term investment need in 94 TPUs.

5.4.2 As part of UUW's options development and appraisal, optioneering (further described in TA7-Options Development and Appraisal section 5.5.4) has been undertaken on the sites identified at risk of failing permit compliance and options developed for each site to mitigate and resolve the risk of failure. Owing to the inherent interdependencies of the permits associated with wastewater treatment works each option developed comprises multiple components at differing stages of wastewater treatment.

5.4.3 All options developed to this stage were considered feasible owing to the binary nature of the planning objective permit compliance. The planning objective can either be passed or failed and is to achieve one hundred per cent compliance by 2050.

5.4.4 Alignment with Our Future Plans

5.4.4.1 Price Review

- UUW are currently developing the next business plan for investment cycle 2025–2030 (also referred to as Price Review 2024 (PR24).
- During the finalisation of the DWMP, we have aligned to key aspects of the business plan development such as planning objective targets and key regulatory expectations such as WINEP and the SODRP. However elements of the WINEP are still being finalised and, as noted by regulators, we may need to re-submit DWMP data tables to ensure alignment when we submit PR24.
- More information about our ambitions for the next investment cycle will be available in autumn 2023.
- The development of this methodology has been in accordance with a programme of work developed by UUW's PR24 preparatory work. Options developed for inclusion in the investment cycle 2025 – 2030 programme have been aligned to better improve the accuracy of the DWMP programme.
- Options for wastewater treatment works selected for implementation in investment cycle 2025 – 2030 have all been included and phased accordingly in the DWMP programme. Any options developed as part of DWMP options development and appraisal which have been superseded by implementation of engineering options in the currently underway and scheduled for completion before 2025 have been excluded from potential inclusion in the programme.
- Demand forecasting work has modelled wastewater treatment work compliance from current to 2030 and 2050. These data form the basis of priority for the options to be implemented. Options have been prioritised dependant on DWF and end of pipe compliance risk across the 25 year plan based on the modelled performance. Wastewater treatment works at risk of breaching permits prior to 2030 are delivered earlier in the programme.

5.4.5 Water Industry National Environment Programme (WINEP)

5.4.5.1 The WINEP is the programme of actions water companies need to take to meet statutory environmental obligations, non-statutory environmental requirements or delivery against a water company's statutory functions. Alignment with the WINEP programme is key to DWMP and has been included as one of the planning objectives although the two are on different regulatory timetables.

5.4.5.2 UUW's WINEP programme was submitted in January 2023, for commencement of engineering and monitoring solutions to inform investment cycle 2025 - 2030 and beyond. The AMP8 WINEP programme investment expenditure is subject to ongoing regulatory review and finalisation as of the date of DWMP submission. However for the purposes of the DWMP submission the non-overflow component of the January 2023 WINEP submission has been used. The DWMP WwTW programme also does not attempt to predict future WINEP investment programmes.

5.4.5.3 WINEP engineering solutions may also provide benefit to future WwTW compliance therefore care has been taken to avoid duplicating the benefit provided. Each WINEP engineering solution has been assessed against its potential contribution to future WwTW compliance. Where inter-process treatment stages are replaced or upgrade by both the WINEP and permit compliance solutions the WINEP solution supersedes the permit compliance solution as it has been detailed designed based on the specific wastewater treatment works it is to be installed at.

5.4.5.4 All the sites identified as part of this programme will need careful monitoring to understand the growth rate and point where capacity is exceeded in light of what is likely to be a significant programme of surface water management upstream. This programme of work is likely to be under continual review as part of an adaptive plan. Decisions on this type of investment have historically been subject to decision and prioritisation through the periodic review processes and managed flexibly to incorporate changes in growth location and size as part of the overall plan.

5.5 Storm Overflows

5.5.1 Introduction

5.5.1.1 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.

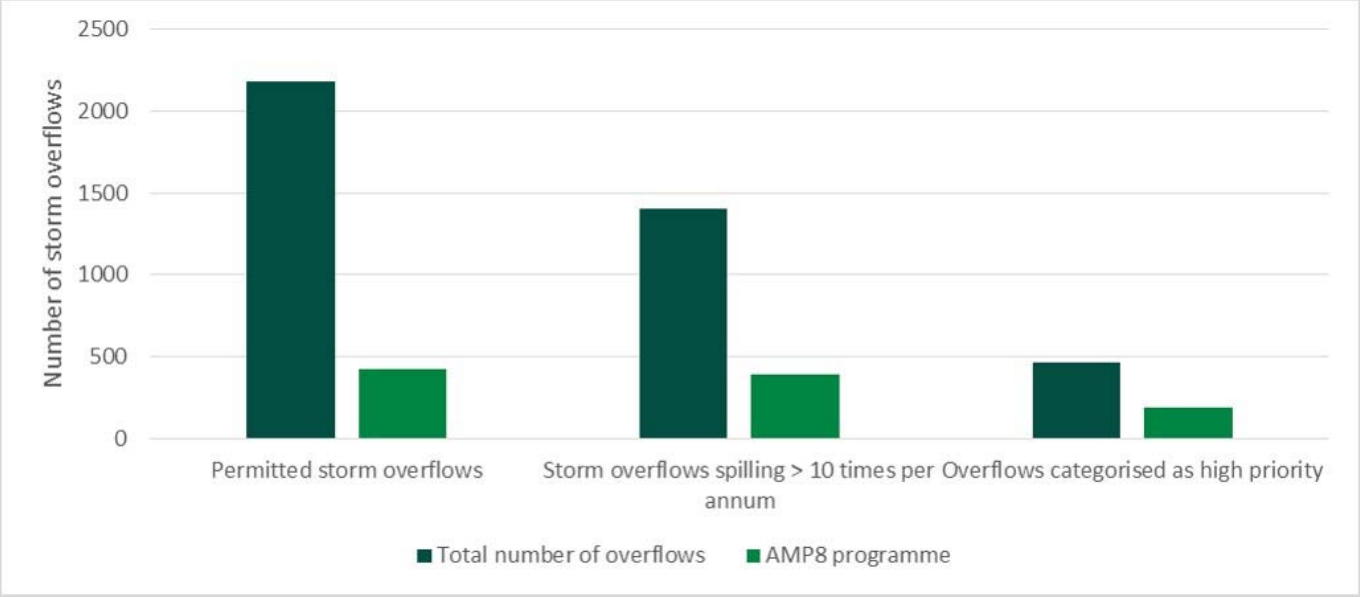
5.5.1.2 Over £18 billion (totex) of investment (over 25 years) has been identified across the North West to address the regions storm overflows in line with SODRP. This includes conventional storage solutions plus a significant amount of surface water management activities.

5.5.2 Background

5.5.2.1 The analysis carried out by Stantec for the Storm Overflow Evidence Project identified that 35 per cent of the investment required to meet the standard of 10 activations per annum set out in the Storm Overflow Discharge Reduction Plan (SODRP) would fall in UUW's area. This broadly aligns with the scale of investment need we have identified following the WINEP guidance and means we have a sizeable programme of work to deliver in the next 25 years.

5.5.2.2 We have categorised 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. In doing this we have been able to rely on our extensive integrated catchment modelling capability along with our full coastal modelling capability. Figure 14 shows a summary of the categorisation of all our storm overflows when compared to the number we plan to address in AMP8.

Figure 14 **UUW proposed AMP8 storm overflow programme compared with total number of overflows by SODRP category**



5.5.3 AMP8 WINEP Submission

5.5.3.1 In our AMP8 WINEP submission of January 2023, we have developed a plan for:

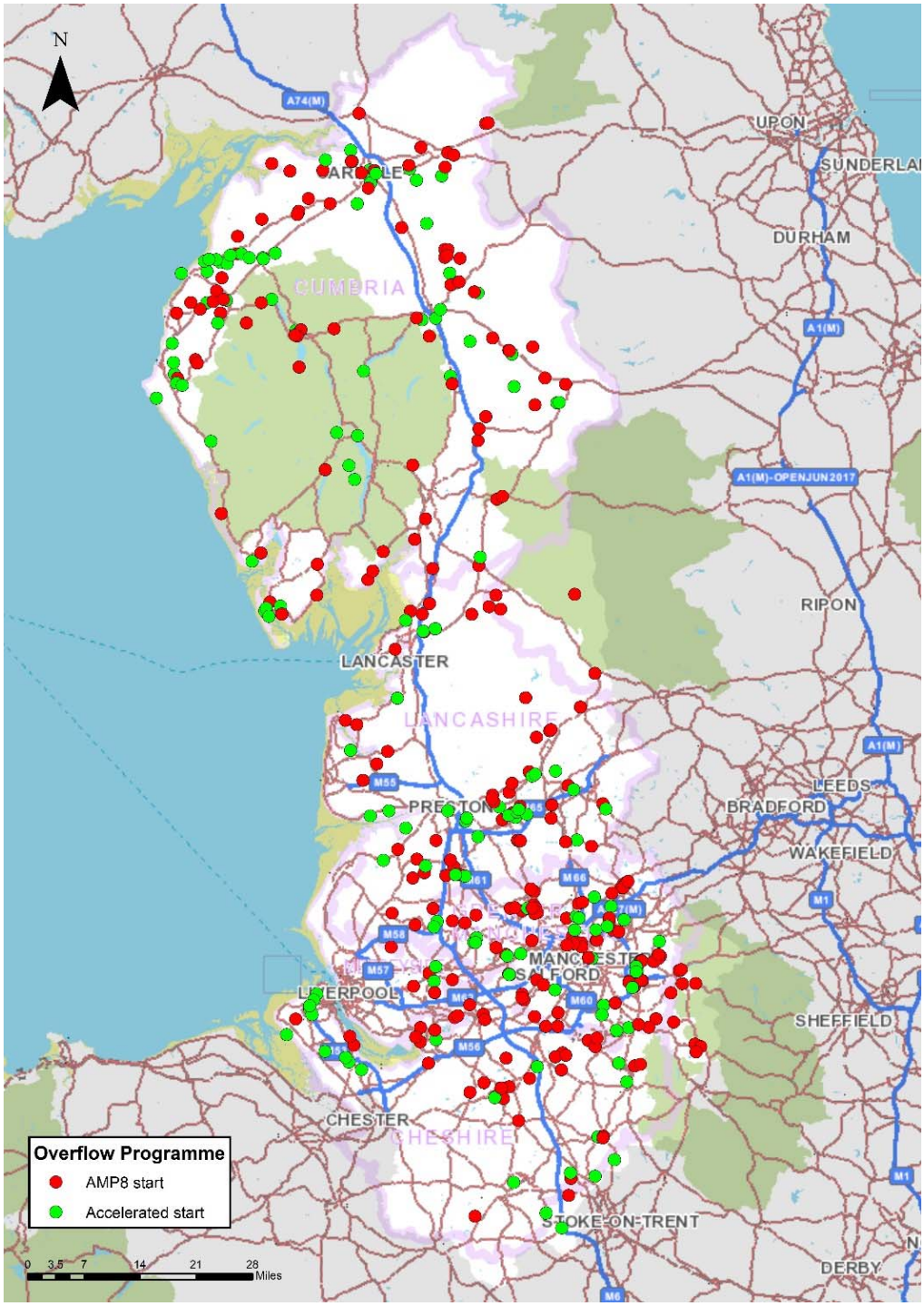
- Delivering the trajectory set out in the SODRP for high priority overflows and achieve a reduction in activation frequency across UUW to a regional average of 20 activations per overflow per annum by 2030;
- An Advanced WINEP that will enable us to work more flexibly to deliver the rainwater management solutions and partnerships required as part of the long term adaptive plans required for our

sewerage systems, as well as advancing the techniques, relationships and approaches to mainstream these solutions and sharing knowledge gained;

- Screens and chambers for all overflows in the programme that require one, irrespective of whether the solution is blue/green only (SuDS), hybrid or grey only; and
- Starting early on our plan following the submission and acceptance of an accelerated programme that enables us to commence delivery of this substantial programme ahead of AMP8, as well as delivering earlier benefits and economic activity.

5.5.3.2 Figure 15 demonstrates the spread of investment in addressing storm overflows across the North West as part of the AMP8 WINEP submission in January 2023. This includes investment across 419 storm overflows, with 154 of those receiving accelerated investment allowing work to commence sooner.

Figure 15 Geographic spread of the 419 storm overflows submitted within the AMP8 WINEP



5.5.3.3 UUW has a history of investing in storm overflow improvements where impacts had been identified; however, these have been to meet Water Framework Directive standards, which can still leave an overflow activating more than 40 times a year, and thus the new requirement to get to 10 activations per annum on average at each overflow represents a very substantial additional change in performance standard.

5.5.3.4 The proposed plan meets the Defra trajectory targets of 14% of overflows improved and 38% of high priority overflows improved as shown in Table 10. The programme is appropriate in the context of the overall targets we need to meet over the next 25 years and the drive a substantial reduction in activation frequency as soon as possible. The programme has been designed to offer customers the best blend of costs and benefits by meeting the Defra trajectory targets, addressing proven harm where we have been able to identify the best value solution and achieving a reduction in activation frequency to around 20 activations per annum in the most cost effective way possible.

5.5.3.5 As we move through the 25 year programme we will have to intervene with some very challenging trunk sewer overflows which will require multi AMP programmes to address them and the unit cost per activation reduction is going to increase as we tackle these overflows. Future AMPs will therefore contain less overflows but still require similar levels, if not greater, of expenditure to AMP8. We will be using AMP8 to plan for some of this major investment.

Table 10 UUW proposed storm overflow programme for AMP8 compared with SODRP targets

Overflow category	No of overflows requiring upgrade by 2050	Minimum AMP8 target no of overflows	UUW WINEP no of overflows	Minimum AMP8%
EnvAct_IMP2 high priority	463	176	189	38
EnvAct_IMP4 other	1403	196	392	14

5.5.3.6 In optimising our programme for AMP8 we have aimed to strike a balance between addressing as much of the proven harm as possible whilst also reducing activation frequency significantly in line with the expectations.

5.5.4 AMPs 9 - 12

5.5.4.1 Building on the analysis undertaken to create our AMP8 WINEP, we have additionally produced a full 25 year storm overflow phased plan that aims to meet all targets within the SODRP. The plan has been derived to meet the Environment Act targets on High Priority sites (EnvAct_IMP2[1]) and meeting the 10 activations per annum target (EnvAct_IMP4), prioritising addressing known harm.

5.5.4.2 Table 11 details the targets to be met within each investment period.

Table 11 SODRP Targets by Investment Period

AMP9	AMP10	AMP11	AMP12
Ensure 100% of EnvAct_IMP3 addressed	Ensure 87% of high priority overflows are addressed	Ensure 100% of high priority overflows are addressed	All standalone EnvAct_IMP5
Ensure at least 75% of high priority overflows are addressed	Ensure 52% of all overflows requiring improvement are addressed	Ensure 76% of all overflows requiring improvement are addressed	Ensure 100% of all overflows requiring improvement have been addressed

[1] EnvAct_[name] e.g. EnvAct_IMP2 are requirements of the Storm Overflows Discharge Reduction Plan (https://www.gov.uk/government/publications/storm-overflows-discharge-reduction-plan)

AMP9	AMP10	AMP11	AMP12
Ensure 28% of all overflows requiring improvement are addressed – (AMP8 achieves 28%)			

5.5.4.3 This ambitious plan targets 10 activations or less per annum at all overflows by 2050 (Figure 16) and a reduction of over 56,000 storm overflow activations per year (Figure 17) by 2050.

Figure 16 Reduction in annual average activations of all storm overflows

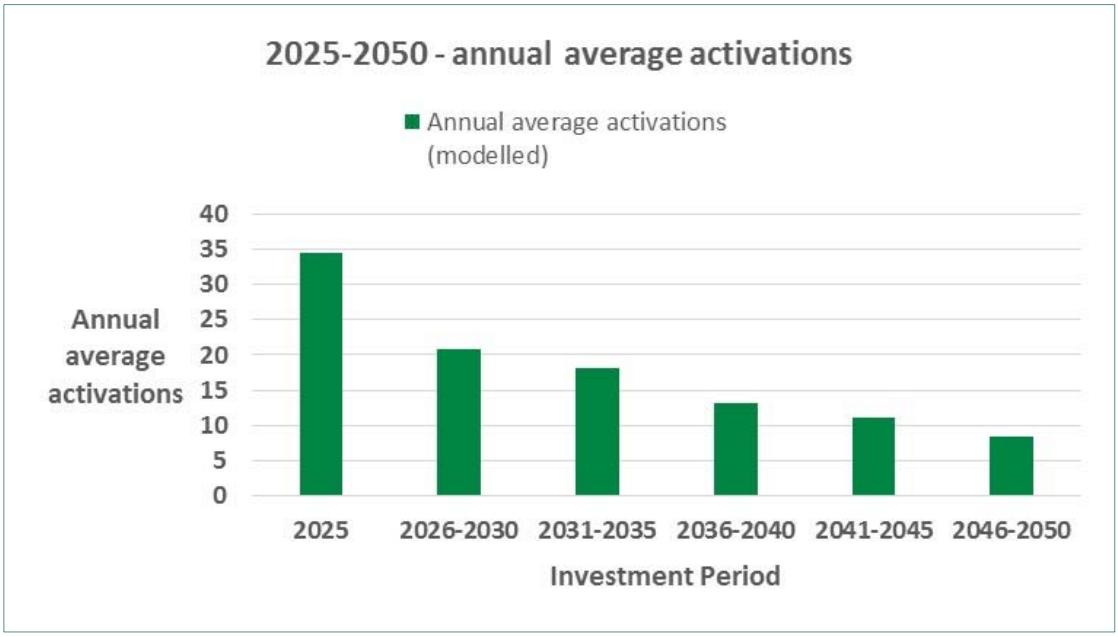
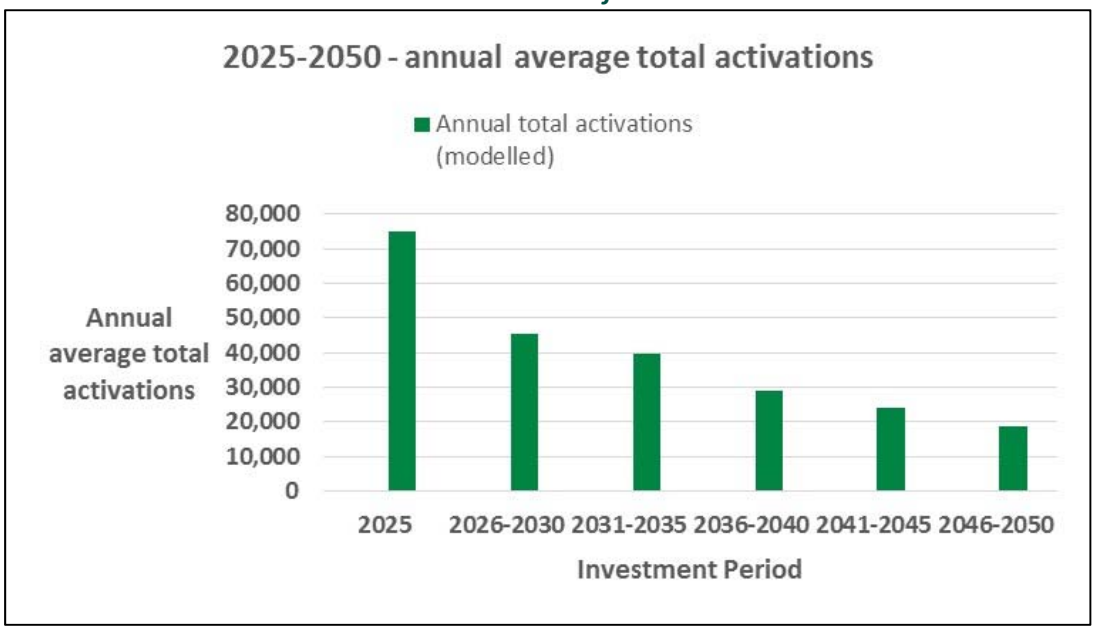


Figure 17 Reduction in total activations across all storm overflows



5.5.5 Ensuring our storm overflow programme is addressing hydraulic constraints

5.5.5.1 Extensive sewer network modelling was undertaken to develop our DWMP and WINEP storm overflow programmes. We have extensive model coverage and our modelling approach follows industry code of practise which is accepted and specified by the Environment Agency and allows us to identify where new additional capacity is needed to meet new design performance requirements. This means that additional operating or maintenance expenditure to meet existing obligations are not included in the proposed enhancement investments for 2025-2050. Given that the baseline for our modelling ensures that maintenance requirements are excluded, this provides confidence that the need for enhancement expenditure is certain, incremental and is driven by the new performance standard required rather than "double counting" existing obligations that should be met through base cost allowances.

5.5.5.2 We ensure this approach is embedded into our ways of working through our company model guidance and the industry code of practise, where there is a requirement for historic verification of actual performance versus the model prediction. This now includes a check of the activation performance measured through Event Duration Monitoring (EDM) and that forecast from the hydraulic model and is indirectly equivalent to a Stage 1 of a SOAF investigation (which aims to confirm where a high frequency of activation measured by EDM is due to hydraulic capacity issues). This provides reassurance that the need for enhancement expenditure is genuine and not a double count with base cost allowances. We have used this process to screen overflows before inclusion in the AMP8 WINEP to ensure we only include overflows that require additional hydraulic capacity. We therefore have confidence that base costs and enhancement costs will each be appropriately allocated in our submitted business plan.

5.5.5.3 To provide additional reassurance, in our regulatory return to the Environment Agency for EDMs, we are required to identify the "Primary Reason" for any overflow that is identified as a frequently activating overflow (greater than 40 activations per year). In our regulatory return for 2021 we were a sector leader in complying with this request and our analysis showed that 67 high-activating overflows were attributable to "Performance" issues, which includes operational or maintenance matters, some three per cent of the total number of overflows we have. Clearly, there are occasions when operational issues do occur (for example due to power failure, lost telecom connections or asset failures) but we respond urgently to ensure repairs or mitigation works are in place quickly to prevent activations occurring or to at least minimise the number or duration of activations that result from the issues – this prevents them from becoming high-frequency activating overflows.

5.5.5.4 This provides further supporting evidence that the majority of reasons for high-activating overflows in the North West is not due to maintenance or operational issues. High-frequency activating overflows that are attributed to operations or maintenance issues are expected to be resolved urgently through our base expenditure, and we have robust processes in place to identify and resolve such issues.

5.5.6 Bioresources Price Control

5.5.6.1 Delivery of our AMP8 Bioresources Business Plan will ensure that we continue to maximise the value created through recovery and re-use of sewage sludge. Through our WINEP actions we will increase the resilience of our sludge to land operations, prioritising no and/or low regrets investment to meet immediate resilience needs and focus on maintaining our ability to recycle sludge to agriculture.

5.5.6.2 We anticipate that biosolids recycling to agriculture will reduce over time to match the growing environmental ambitions of our customers and regulators. While we know that the future will not be 'business as usual', there is significant uncertainty of the scale and timing of this change. We are following an adaptive planning approach to avoid over investing in alternative outlets for sludge disposal.

5.5.6.3 Our AMP8 bioresources plan includes:

- Taking a leadership role in the development of the bioresources market and seeking a market solution to deliver increased sludge treatment capacity to meet rising demand;

- Meeting increasing regulatory expectations including compliance with Appropriate Measures for the Biological Treatment of Waste, Industrial Emissions Directive;
- WINEP actions that will deliver a significant reduction of over 12 per cent in our overall land bank requirement. Generate almost 120,000 tonnes of enhanced (microbial quality) biosolids cake a year at a higher percentage of dry solids, enabling access to greater and more diverse areas of land bank, increasing the flexibility and resilience of our operations. Provide 60 days covered, strategic storage to provide resilience against closed periods in the agricultural calendar, fine screening and increased analysis of our product qualities, and biosolids to agriculture permit compliance. Resilience items that are considered outside the sludge driver will be submitted as separate enhancement cases as appropriate; and
- A mechanism to unlock further investment activities if uncertainties over the future market demand for biosolids crystallise. Additional activities could provide greater resilience in our sludge recycling to agriculture operations, or allow a move to new sludge disposal outlets.

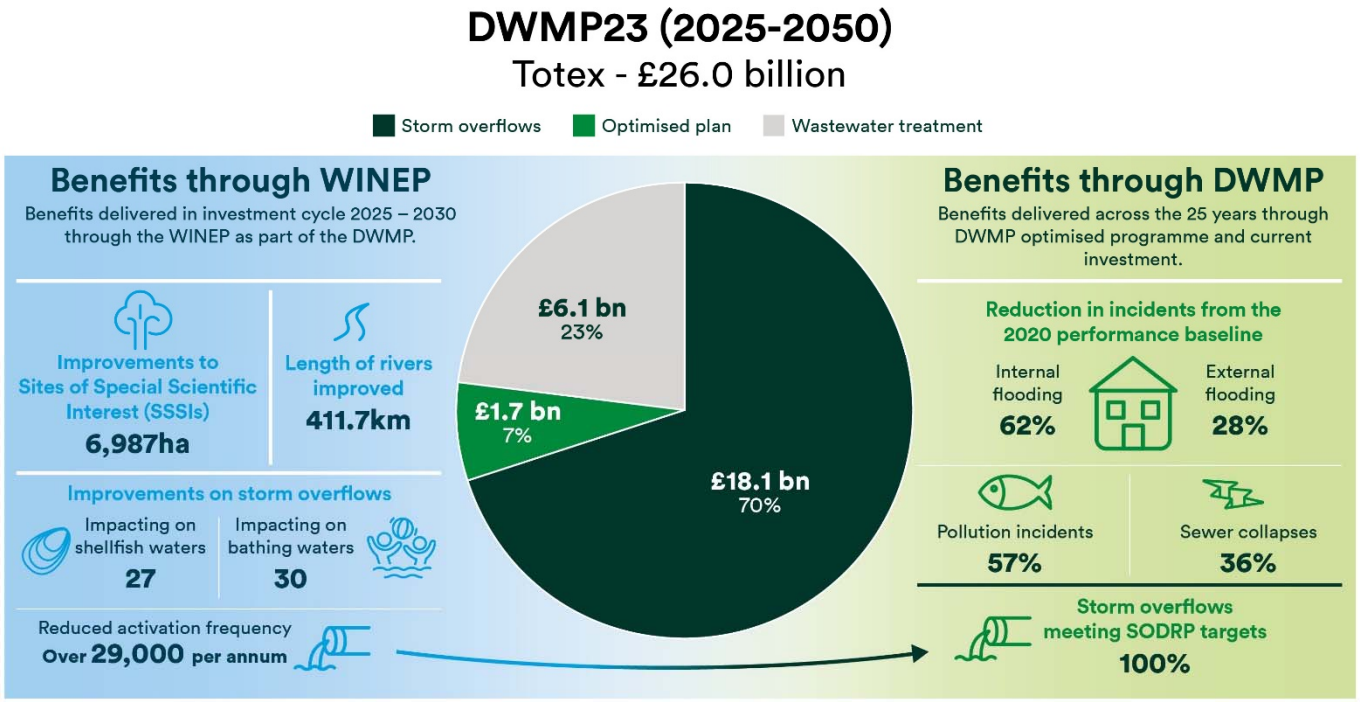
5.5.7 Components of this bioresources plan are contained within our WINEP submission of January 2023. At the time of this DWMP submission the WINEP is still evolving ahead of being finalised by regulators. In the event that some or all of the bioresource components are not included in the final WINEP we may include relevant enhancement cases within our PR24 submission instead.

5.6 A summary of our preferred plan

5.6.1 Overview

5.6.1.1 The preferred plan that is set out in this section is based on legal obligations and optimised activities to deliver performance improvements. The required totex investment over the 25-year period 2025–2050 is £26 billion (Figure 18).

Figure 18 Investment and benefits of DWMP23



5.6.1.2 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. 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.

5.6.1.3 Since the development of this plan began in September 2018, there have been a number of changes in regulatory requirements. The most significant of these is the SODRP published in August 2022. This drives a step change in ambition and performance across the water industry to address the legacy of storm overflows and the pressure from climate change. As part of the WINEP submission in January 2023, UUW 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.

5.6.1.4 We have developed an adaptive approach to this plan, which is critical to ensure the delivery of key planning objectives. With the rate of change across society and the industry, it is not always possible to foresee all potential risks and opportunities. Therefore, it is key that the plan can adapt and evolve to meet new unforeseen or changed challenges.

5.6.1.5 We recognise that the interconnected nature of drainage means that partnership and collaboration are fundamental in delivering long-term targets. We have developed the DWMP with support from stakeholders, regulators and customers from across the North West. Our Strategic Planning Groups (SPGs) have enabled a collaborative approach to planning. UUW has a proven track record of developing sustainable and innovative partnerships, such as in the Petteril and Wyre catchments. We will look to build on our many existing partnerships and develop new ones in order to achieve long-term objectives.

5.6.1.6 Since the DWMP will be a cornerstone of our drainage planning and feed our future business plans, UUW has commissioned external assurance on all major risk assessment methodologies. This assurance concluded that our process had exceeded the expectations of the national guidance. In addition to this, UUW has assured that all the ‘guiding principles’ have been comprehensively met. This combined assurance has been utilised to give the UUW board confidence to endorse the DWMP through a Board Assurance Statement. This statement can be found in Board Assurance Statement (C002).

5.6.1.7 The proposed investment aims to meet our short-term (2030) planning objectives for flooding and sewer collapse, and goes a significant way towards our short-term pollution objectives and long-term internal flooding objective. Our long-term pollution planning objective is more challenging from optimised cost beneficial interventions alone, with further progress anticipated through the synergy and residual benefits of our significant storm overflows investment of £18.1bn (totex) over 25 years.

5.6.1.8 The same is also true for our long-term external flooding and sewer collapse planning objectives, with the expectation that this synergy of benefits across investment programmes will, through rainwater management and reduced surface water volume landing in our asset base result in further improvements in performance. The quantification of this potential synergy benefit will be assessed through AMP8 and beyond and will inform future Price Reviews and DWMP’s.

5.6.1.9 These objectives are impacted by both hydraulic risk and by ‘other causes’ of capacity constraints, including sewer misuse, blockages and collapses. We consider that there are good reasons to expect that innovation, legislative changes and future improvements in forecasting should also help close the gap to planning objectives by 2050.

5.6.1.10 For wastewater treatment compliance into the future, the plan has identified significant potential expenditure for a small number of wastewater treatment works likely to be impacted by growth and therefore future permit changes. The expenditure profiled is based on best assessments of likely regulatory requirements and growth.

5.6.1.11 UUW has carried out bill impact assessments on the costs of each of the components contained within the preferred plan. The overall bill impact for the investment cycle 2025 - 2030 will be determined through PR24. The bill impacts have been calculated using FY21 price base and excludes inflation.

5.6.2 Summary of bill impact

5.6.2.1 The overall bill impact for each of the components is summarised in Table 12. The total enhancement expenditure is the total amount over a 25-year period. The 2030 and 2050 bill impacts are the estimated annual increase to customer bills.

5.6.2.2 We have approached calculating bill impacts in line with PR24 and beyond: Final guidance on long-term delivery strategies.

Table 12 Summary of potential bill impacts

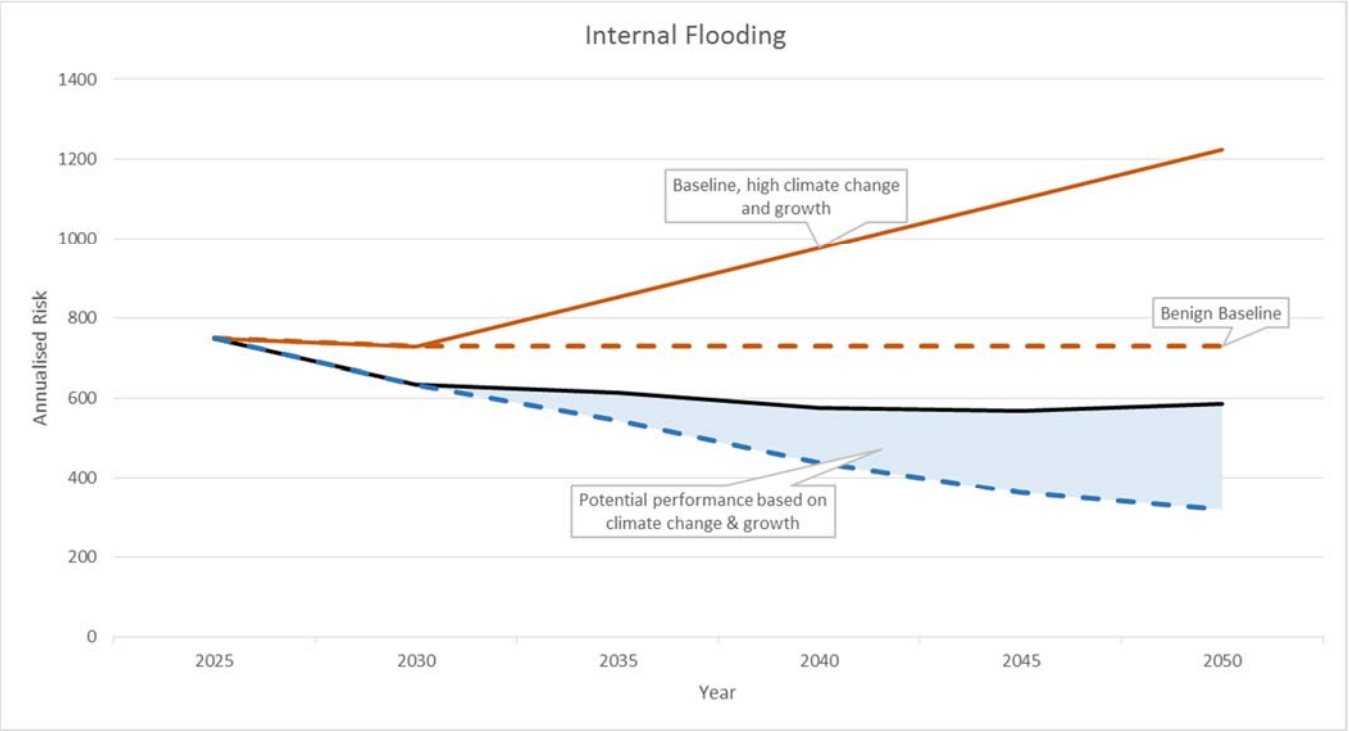
Component	Total enhancement expenditure (£bn)	2030 bill impact (£ annual)	Anticipated 2050 bill impact (£ annual)
Legal obligations – Wastewater treatment (inc. WINEP)	6.1	37.10	59.53
Legal obligations – Storm overflows (inc. WINEP)	18.1	20.67	164.76
Performance improvements – Optimised activity	1.7	4.11	15.17
Total	**26**	**61.87**	**239.46**

5.7 Future Uncertainty

5.7.1 As part of UUW's long term strategy, alternative views of the future based on differing rates of climate change have been developed. A benign climate view of performance was created, the predicted risks modelled in BRAVA were adapted. Modelling of a lower rate of climate change Representative Concentration Pathway (RCP) 2.6 is not commonly undertaken, since there are no propriety tools to create the simulated rainfall required. Instead UUW retained risk values against each of the planning objectives derived from hydraulic sources from 2030 onwards by projecting a stable hydraulic performance to 2050. The outcome of this has produced our low climate change scenario.

5.7.2 Figure 19 demonstrates the potential extremes of climate risk on internal flooding relative to performance. The impact of the low climate change scenario has been applied to the preferred plan retaining the original options selected per annum based on higher climate change more akin to RCP 8.5. The difference in performance can be demonstrated per planning objective, as per the example below.

Figure 19 Demonstration of the range in performance dependent on effects of Climate change on the Preferred Plan



5.7.3 As expected, the lower baseline risk results in greater risk reduction achieved by the options selected. This provides a range of potential performance from the options selected rather than fixed reduction from BRAVA baseline 2020 values accounting for uncertainty in the future climate patterns.

5.7.4 Climate change will only impact planning objectives with a significant hydraulic component. Therefore, risk of pollution events from a sewer is not sensitive to changes in hydraulic network risks and no change is modelled from the 2020 baseline, leading to no variation in modelled performance. The range of variability on reduction of risk by 2050 on the basis of climate change is presented in Table 13.

Table 13 Range of performance achieved by the preferred plan from baseline for flooding, pollution and collapses dependant on climate change

DWMP Planning objective	Scenario 1: Best value (% reduction)
Pollution	57
Internal flooding	62-80
External flooding	28-41
Open space flooding	27-30
Sewer collapses	36-41

5.8 Flooding, Pollution and Collapses Base and Enhancement Performance

5.8.1 Base expenditure is routine, year-on-year expenditure, which companies incur in the normal running of their businesses to provide a base level of service to customers and includes expenditure to maintain the long-term capability of assets, as well as expenditure to improve efficiency. This is not reported in the DWMP as it is included in the PIONEER “Stable performance” model (more detail on this in TA5-Assessing Future Risk).

5.8.2 Base expenditure may also include the 'betterment' costs of replacing life-expired assets with modern equivalent assets which comply with legally required minimum standards. Some of the options included in the decision support tool meet this categorisation for all of, or a proportion of, the 25 year planning horizon.

5.8.3 Enhancement expenditure within DWMP is for where there is a permanent increase or step change in the current level of service to a new 'base' level and/or the provision to new customers of the current service. Categorisation of each of the options developed was undertaken by UUW internally.

5.8.4 To create a low climate change scenarios the decision support tool was again used retaining the 'Best Value' approach to options selection based on the Options Hierarchy (Figure 8). The lower baseline risk changes the options blends selected by the decision support tool and has a reduction in cost to achieve a comparable performance.

5.8.5 The differing options selected have an effect on the ratio of base or enhancement expenditure required as a proportion of the total performance against each of the planning objectives.

5.8.6 The relative proportion of base and enhancement investment required is impacted by the increasing baseline risk driving a requirement for more enhancement expenditure to counter the increasing hydraulic risk.

5.8.7 Please see our main document DP1 for full detail of the preferred plan.

United Utilities Water Limited
Haweswater House
Lingley Mere Business Park
Lingley Green Avenue
Great Sankey
Warrington
WA5 3LP

unitedutilities.com

United Utilities

Water for the North West