



Drainage and Wastewater Management Plans

Technical Summary: Programme Appraisal

March 2023
Version 3



Background

The Programme Appraisal is an important stage of the DWMP. It collates the investment needs identified during the Options Development and Appraisal (ODA) stage, the Regional Storm Overflow programme and the WINEP (Water Industry Environment Programme) into our DWMP regional ‘needs based’ investment programme.

Investment needs to manage risks

The [Baseline Risk and Vulnerability Assessment \(BRAVA\)](#) stage of the DWMP identified the risks for our customers, communities and the environment from the performance of our wastewater systems. This process scored the risks against the 14 Planning Objectives and assigned a risk band of 0 (not significant), 1 (moderately significant), or 2 (very significant). The BRAVA bands are summarised in Table 1 below.

Table 1: BRAVA risk band descriptions

BRAVA Score	Description
Band 2	Very Significant: There is a very significant risk that the performance of the wastewater system is below our desired levels of performance and indicates there is a need for further investment to reduce those performance risks. These risks warrant investigation in the Options Development & Appraisal stage of DWMP.
Band 1	Moderately Significant: There is a moderately significant risk that the performance of the wastewater system is below our desired levels of performance. These risks are not very significant but still require further investigation in the Options Development & Appraisal stage of DWMP.
Band 0	Not Significant: The performance is not currently an issue or concern. Within a catchment there may be some localised issues which need to be addressed as part of ‘business as usual’ investment decisions. Priority does not need to be placed on this planning objective in the catchment although risks should be monitored, and investment planned if they are forecast to increase to band 1 or band 2 in the future.

We developed our DWMP by working with other organisations. Collectively, we agreed to focus on 61 of our 381 wastewater systems during the [Options Development and Appraisal](#) (ODA) process. These 61 systems have the greatest number of current significant BRAVA risks, cover 78% of our customers and are the systems that most urgently require investment to reduce the risks. Our [Selection of wastewater systems](#) Technical Summary explains this process in more detail.

Between them, the 61 systems include a wide range of BRAVA risks of differing complexities with a comprehensive range of different treatment technologies available, and so represent the range and scale of investments needed across our whole region. We recognise that the thresholds used for each risk band may evolve and change over time as environmental constraints or public perception / acceptability evolve and change.

We held 41 Options Development meetings to look at the risks in the 61 wastewater systems and the causes of those risks. Collectively, we identified the risks, or clusters (hotspots) of risks, that we needed to tackle most urgently in the first cycle of the DWMP. The ODA process identified the best value, preferred options for the 61 wastewater systems to reduce the risks for each of the 14 planning objectives. Best value was identified on the basis of a Multi Criteria Assessment of the benefits, the cost of delivering the option and the relative effectiveness of risk band reduction in the longer-term. These best value options were selected as our “preferred” Investment Needs.

For the Programme Appraisal, we compiled the preferred options into a single Investment Needs table (see **Error! Reference source not found.** for a summary of the contents). In the draft DWMP published for the public consultation in the summer of 2022, the preferred options were all derived from the ODA process.

In our final plan, we supplemented, and in some cases replaced, these preferred options with investment needs from the Regional Storm Overflow (RSO) Programme, the WINEP (Water Industry Environment Programme) and the WTW Growth Business Plan as appropriate (see “Demonstrating Best Value” below).

Table 2: Content of Investment Needs Table

Investment Need Information	Details
Reference	Unique option reference
River Basin (L2)	Which river basin
Location	The specific known location within a wastewater system of the risk (eg a flooding hotspot or high spilling CSO)
Option	Description of the Investment Need option
Indicative Cost	Our initial estimate of the investment cost associated with delivering the option
Indicative Timescale	When will the risk need mitigation
Potential Partners (to work with on investment need)	Where opportunities identified to work with other stakeholders
Applicable Planning Objective	Details of the BRAVA risk reduction expected to be delivered by the option against each Planning Objective.

For the Programme Appraisal, we extrapolated the estimated costs from the identified needs for these 61 wastewater systems to estimate the total investment required to reduce the risks arising from all 381 of our wastewater systems to risk Band 0.

Our Programme Appraisal estimated the anticipated risk band reduction for each investment need (see “Estimating risk reduction” below) and assessed the synergistic multiple benefits between options (see “Assessing and prioritising risk reduction across the Planning Objectives” below).

We were then able to extrapolate our preferred options for our 61 wastewater systems to determine the full scale of investment needs that would be required to reach Band Zero for each planning objective across all 381 of our wastewater systems.

In compiling our draft plan, we prioritised our investment needs by cost effectiveness (see Prioritisation below) and consulted on the prioritised plan in the summer of 2022 as part of our public consultation. Subsequently, we worked with the wider business to develop our final

investment plan and prioritise each investment need by allocating it to a specific five-year Asset Management Plan (AMP) period between 2025 and 2050.

Demonstrating “Best Value”

Our final investment plan is a “Best Value” plan as required by the national guidance. We demonstrated that our preferred options are best value through a range of evidence bases, depending on the source of the option.

ODA derived Investment Needs

The preferred options from the ODA show the type and scale of investment that is needed to reduce the risks for each Planning Objective. These options do not yet have funding agreed: they are a statement of the need to invest to manage and reduce the risks. In some cases, a combination of nature-based options, such as separation and SuDS (Sustainable Drainage Systems) are required to deliver the level of risk reduction required. As an example, tackling blockage hotspots effectively needs investments in a programme of customer education and sewer jetting, preferably informed by CCTV monitoring and real time network analytics from monitors installed during AMP7 (2020 -2025), to provide advance warning of an impending blockage. These groupings are known as a “*basket of measures*”. This helps identify that the entire basket of measures needs to be delivered in order to achieve the desired outcome, even if delivery takes more than one five-year AMP timescale.

All of the preferred options identified by the ODA process are categorised as ‘Best Value’ (see our [ODA Technical Summary](#)). During the Programme Appraisal process, a small number of ODA preferred options that were assessed as delivering relatively low benefits were removed from the Investment Needs plan.

Regional Storm Overflow Programme derived Investment Needs

Southern Water’s ‘Regional Storm Overflow (RSO) Programme’ was developed to meet the needs of DEFRA’s Storm Overflows Discharge Reduction Plan, published in August 2022 after our draft DWMP was published in June 2022. The requirements of the Defra plan are more extensive than originally specified in the DWMP national guidance and these therefore supersede the needs identified in our draft DWMP for the Storm Overflow Planning Objective (PO5), Improve Bathing Water Quality (PO13) and Protect Shellfish Water Quality (PO14). We replaced all the ODA identified needs for these planning objectives with the investment needs identified by our RSO Programme. The RSO programme provides the evidence base confirming these needs as “Best Value”.

The RSO Programme needs are ‘Best Value’, as demonstrated when comparing the ‘Best Value’ natural solutions (such as Separation, Wetland and Relining) against ‘Least Cost’ storage only solutions.

WINEP derived Investment Needs

Part of the WINEP plan we submitted included tackling Nitrate and Phosphate in high-risk habitat sites where effluent from our wastewater treatment works is potentially contributing to detriment of

the site. During the ODA stage for the Nutrient Neutrality (PO11) planning objective, we identified investment was needed for studies to assess our contribution. However, the WINEP identified measures to reduce the risk of Nitrate and Phosphate from wastewater treatment works and provide both ‘Least Cost’ and ‘Best Value’ solutions. We therefore replaced all the ODA identified needs for PO11 with the WINEP ‘Best Value’ options.

Wastewater Treatment Works Growth Business Plan

Southern Water’s draft business plan includes options to upgrade Wastewater Treatment Works (WTWs) to manage future growth. These options supersede the needs identified in our draft DWMP for the Risk of Wastewater Treatment Works (WTW) Compliance (Quality) (PO6) and WTW Dry Weather Flow (DWF) Compliance (PO8). We therefore replaced all the ODA identified needs for PO6 and PO8 with WTWs upgrade investment needs.

Estimating risk reduction

For each wastewater system, we summed the BRAVA results for all 14 planning objectives to determine the total “Band Reduction” (BR) needs for each system. Each of the 14 Planning Objectives were scored between 0 and 2, giving a potential total BR requirement of between zero and 28 (2 potential band scores x 14 Planning Objectives). The BR scores were calculated for both 2020 and 2050.

Each investment need addresses at least one planning objective and will have a quantifiable BR based on the measurable value for each Planning Objective, as shown in Table 3. An individual investment need may not deliver sufficient “benefit” to deliver a whole BR and may require to be delivered in combination with other options to achieve the required BR for a specific wastewater system.

Table 3: Benefits Associated with Band Reductions

Planning Objective	Description	Measurable Value
1	Internal Sewer Flooding Risk	Reduction in no of internal flooding incidents
2	Pollution Risk	Reduction in no of pollution Incidents
3	Sewer Collapse Risk	Reduction in no of sewer collapse incidents
4	Sewer Flooding 1 in 50-year storm	Reduction in no of predicted flooding properties at risk from a 1 in 50-year storm
5	Storm Overflow Performance	Reduction in no of CSO spill events
6**	Risk of Wastewater Treatment Works (WTW) Compliance (Quality)	Reduced risk of WTW Quality Compliance failure
7	Annualised Flood Risk (Hydraulic Overload)	Reduction in no of annually predicted properties at risk of flooding
8**	WTW Dry Weather Flow (DWF) Compliance	Reduced risk of WTW Dry Weather Flow Compliance failure
9**	Achieve Good Ecological Status / Potential	Reduction in water bodies failing GES/GEP due to water company operations (measured by the EA)
10	Improve surface water management	Reduced number of properties at risk from surface water flooding

11**	Secure nutrient neutrality	Number of receiving waters obtaining Nutrient Neutral status
12	Reduce groundwater pollution	Reduce length of poor condition sewers within SPZ/SGZ
13**	Improve bathing water quality	Number of receiving bathing waters obtaining Excellent status
14**	Protect shellfish water quality	Number of receiving shellfish water obtaining CEFAS A status

Some Planning Objectives (denoted with **) are not readily measured with the information available at this time due to the limitations in the data.

Assessing and prioritising risk reduction across the Planning Objectives

Some types of investment needs can achieve BR across multiple planning objectives. An example of this is a Customer Education Programme that aims to reduce the number of blockages in the sewers, and which could also reduce the number of internal flooding incidents (PO1) as well as preventing a pollution incident (PO2). It therefore provides a BR benefit across more than one planning objective.

We identified strong synergies between the investment needs that address:

- Flow quantity (hydraulic) related planning objectives (PO4, PO5, PO7, PO13 and PO14)
- Flow quality related planned objectives (PO9, PO11, PO12)

For cycle 1 of the DWMP, the risk reduction benefits identified across the multiple planning objectives are not limited to those detailed in this section. The Programme Appraisal quantified the risks reductions at a high level. Improvements for cycle 2 can build upon these assumptions to identify the impact on BRs for network improvements, such as separation, and which may also create BRs at the Wastewater Treatment Works.

Flow quantity related planning objectives

Band reduction benefits between Sewer Flooding 1 in 50 Year Storm Risk and Annualised Flood Risk

There are links between the options developed for the planning objectives for Sewer Flooding 1 in 50-year Storm Risk (PO4) and Annualised Flood Risk (PO7). The methodology for PO7 was based on a probability factor of different storm events occurring annually up to a 30-year event. Where a wastewater system was flagged as at risk in the BRAVA assessment for both PO4 and PO7, a solution for a 50-year storm event was costed as this would provide a BR benefit for both planning objectives.

Band reduction benefits between Storm Overflow Performance and Bathing and Shellfish Water Quality

There are some storm overflows that have an impact on both Bathing and/or Shellfish Waters. Therefore, reducing the spill frequency for PO5 (Storm Overflows) to bring about a BR will also bring a BR benefit for PO13 (Bathing Waters) and PO14 (Shellfish Waters).

Band reduction benefits that separation options provide for Flow Quantity related Planning Objectives

Our assumption is that separation options will bring about BRs for PO1 (Internal Sewer Flooding) and PO4 (Sewer Flooding in a 1 in 50 Year Storm) by reducing the number properties at risk of flooding. There are also synergies with Storm Overflow (PO5) spill frequency, as removing flow from the wastewater system reduces pressure on our sewer network. The RSO is implementing a large number of separation options for their 'Best Value' solutions. However due to time constraints it was not possible to rerun our hydraulic models for PO4 and PO7 to quantify what benefits separation derived from the RSO would have in terms of BRs for the number of properties at risk of flooding.

During Programme Appraisal, a method was used to determine the BRs obtained by investing against these planning objectives, shown in Equation 1. The total number of overflows with a separation option has been calculated by equally distributing the number of properties at risk of flooding across the total number of overflows within a wastewater system and applying a 30% factor for individual overflows that have used Separation. The 30% factor is the same level of separation estimated from the RSO Programme.

Equation 1: Reduction in properties at risk from 30% Separation

$$\frac{\text{Overflows with Separation option in Wastewater System}}{\text{Overflows in Wastewater System}} \times \text{Number of Properties at Risk of Flooding} \times 30\%$$

Flow quality related planning objectives

Band reductions related to PO9 - Achieve Good Ecological Status / Potential from flow quality related Planning Objectives

The ODA process identified the need for additional studies to determine the measures necessary to reduce risk, where our wastewater activities are listed as contributory to "Reasons for Not Achieving Good" (RfNAG) for a waterbody in the Environment Agency's RfNAG database. These RfNAG reasons include:

- Sewage Discharge (Continuous)
- Sewage Discharge (Intermittent)
- Leaking utility sewers

The Programme Appraisal attributed these 'activities' as receiving a direct benefit from other planning objectives that impact the flow quality. The activity 'Sewage Discharge (Continuous)' has been directly linked to achieving BRs derived from the options detailed in the investment needs relating to Nutrient Neutrality (PO11), which forms part of the WINEP plan. The continuous nature of sewage discharge from the RfNAG has been interpreted as the flows coming from our Wastewater Treatment Works. The planning objective most closely linked to improving water quality discharge from our WTWs is PO11.

One of the other activities noted as having a significant contribution is 'Sewage Discharge (Intermittent)'. This has been interpreted in the Programme Appraisal associated with Storm Overflow Performance (PO5) as the amount of effluent that has been discharging to watercourses is variable. It has been assumed that an option, or a combination of options that reduces the BRAVA risk band score to 0 for PO5, will, in turn, also contribute to reducing the BRAVA risk band score for PO9.

The final activity linked to PO9 from RfNAG is 'Leaking Utility Sewers'. This has been directly linked with the condition of sewers (PO3) within our wastewater systems. In turn, this is linked to our planning objective on Groundwater Pollution (PO12) and the requirement to reduce the risk of this occurring.

Extrapolation of Needs to Band Zero

The efficacy of the preferred options in reducing risk has been assessed, whether alone or as part of a basket of measures. Some of the options make good progress to achieving Band 0 in the wastewater system, although some do not reduce the risks sufficiently to get to Band 0.

The wastewater systems selected during the ODA stage of the DWMP are a representative mix of system sizes. These range from low with around 500 properties connected to our networks, to our largest with over 150,000 connected properties. Most of these systems have at least one planning objective with a BRAVA risk band score of 2 and some have a varying number of planning objectives with a BRAVA risk band score of 1 or 2. We have three systems with seven Band 2 risks, Sandown, Swalecliffe and Weatherlees Hill, our most challenging systems.

The ODA covered only 61 of the 381 wastewater systems across the region. It has therefore been necessary to extrapolate the identified investment needs to determine how much it would cost to achieve Band 0 across the entire region for all but three of the Planning Objectives. The Planning Objectives not needing to be extrapolated are Storm Overflow Performance (PO5), Improve Bathing Water Quality (PO13) and Protect Shellfish Water Quality (PO14) because the RSO Programme has identified best value solutions for these wastewater systems.

Another planning objective that has not been included in the extrapolation of needs is "Improving Surface Water Management" (PO10). It was not possible or viable to extrapolate this approach with any confidence therefore revision of this PO and the approach taken will be incorporated in subsequent iterations of the DWMP.

We describe below how the needs were extrapolated from the 61 wastewater systems.

Internal Flooding (PO1) / Pollution Risk (PO2) / Sewer Collapse Risk (PO3) and Reduce Ground Water Pollution (PO12)

The total solution costs identified during the ODA stage for the 61 wastewater systems were divided by the total BRAVA Risk Band Score reduction for the relevant planning objective. This generated an estimated cost per band reduction. The estimated average cost per risk BR was then applied to the total Band Score of the relevant planning objectives to meet Band 0.

Sewer Flooding 1 in 50-year storm (PO4) / Annualised Flood Risk Hydraulic Overload (PO7)

To identify a cost to achieve Band 0, an average cost per property at risk of flooding was created by combining the cost identified from the ODA and the separation options cost identified from the Regional Storm Overflow Programme against the reduced number of properties at risk of flooding. This average cost was then applied to the remaining properties at risk that are required to meet the Band 0 threshold.

Risk of WTW Compliance (PO6) and WTW DWF Compliance (PO8)

The solution costs from the 'WTW Growth Business Plan' were used for (PO6). Where a solution had not previously been developed but the DWMP had identified a wastewater system with a Band Score of 1 or 2, an extrapolated figure was used based on an average cost per PE (Population Equivalent).

Nutrient Neutrality (PO11)

The costs from the WINEP relating to Nutrient Neutrality were used for the Programme Appraisal. Where a solution for WINEP had not been developed but the DWMP had identified a wastewater system with a Band Score of 1 or 2, an extrapolated figure was used based on an average cost per PE.

The BRAVA's PO11 methodology identified more wastewater systems at risk than the WINEP. However, the WINEP is focused on funding and delivering solutions during AMP8 and AMP9, whereas the DWMP is a 25-year plan up to AMP12 (2050), resulting in different approaches to the methodologies used.

Following extrapolation, an average cost per PE was developed based on the total WINEP Nutrient Neutrality options costs against the total WINEP Nutrient Neutrality PE.

Extrapolation of Investment Needs for our Whole Region

Using the 61 wastewater systems taken through the ODA process, we identified a total of 618 BR for our baseline year of 2020, and 705 BRs for 2050, of which the options in our first DWMP would

deliver 397 BRs. Therefore, the investment needs to mitigate the 397 BRs would cost an estimated £5 billion.

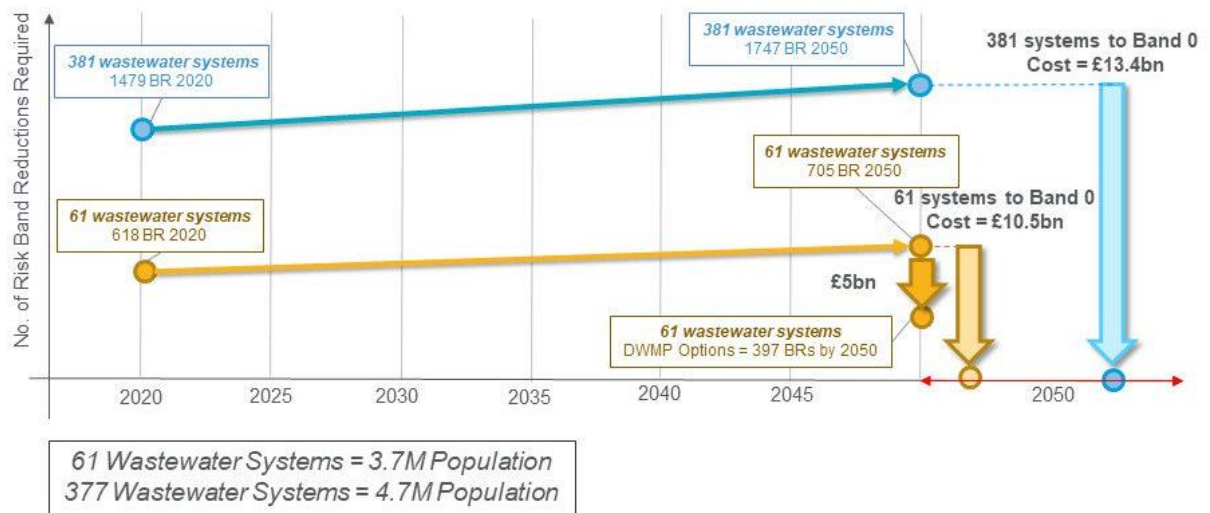
This investment will not achieve Band 0 across all PO's for these 61 systems. By further extrapolating the methods detailed earlier to the whole region we were able to use the needs identified to estimate the cost of achieving Band 0 where no investment need has yet been identified.

- PO6, PO8 and PO11 - Average cost per PE
- PO4 and PO7 - Average cost per Property at Risk
- PO1, PO2, PO3 and PO12 - Average cost per Band Reduction

We estimate that a total of £10.5 billion is required to achieve band 0 across the 61 initial wastewater systems, rising to £13.4 billion once we extrapolate our needs across all 381 of our wastewater systems. This process is shown in **Error! Reference source not found.** below.

Appendix A details this information for each individual River Basin.

Figure 1: Extrapolation of Investment Needs to Band 0 for all wastewater systems in the region

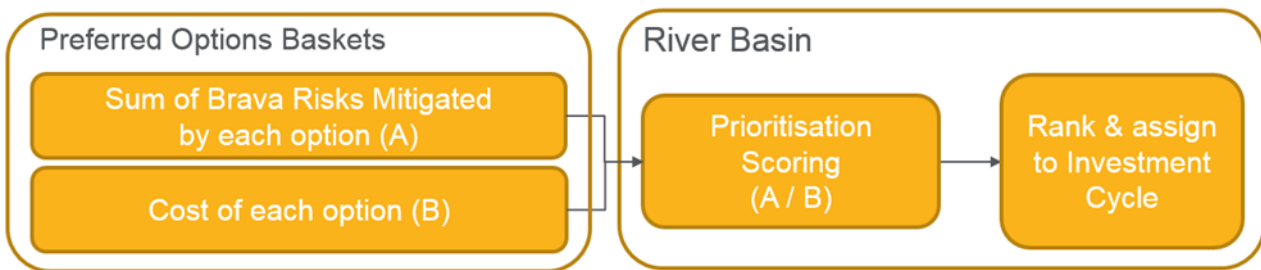


Prioritisation of Investment Needs

Initial Prioritisation of Investment Needs by River Basin

The combined list of preferred options by River Basin were prioritised according to the process set out in Figure 2.

Figure 2 Prioritisation Scoring of Investment Needs



Each Preferred Option passed forward from the ODA defines both the total number of BRs the option will mitigate (A) and the associated capital costs (B). This allows the relative benefit / cost (A/B) ratio to be determined for both the baskets of measures and the individual options. This is known as the Prioritisation Score.

The Prioritisation Score has been calculated for individual Investment needs, considering the BR achieved for individual Planning Objectives and the overall BR achieved using Equation 2.

Equation 2: Total Prioritisation Score

$$\text{Total Prioritisation Score} = \frac{\text{Total Mitigated Risk Band Reduction for each Planning Objective}}{\text{Option Cost}}$$

The units of Total Prioritisation Score are “BR / £ TOTEX”, where TOTEX is the Total Expenditure cost (the sum of the capital and operational expenditure costs associated with an option).

The Investment Needs for an entire river basin were then ranked according to Total Prioritisation Score (for all POs). A higher prioritisation score means more BRAVA risks will be mitigated for every pound spent.

Final Prioritisation- Alignment with Business Plan

The final prioritisation was aligned with Southern Water’s business planning which estimates the AMP cycle in which a solution is likely to be implemented. For certain investment needs, the AMP implementation date was already defined from the extensive source information from the WINEP

and the RSO Programme. We manually determined implementation dates for Investment Needs that were not derived from the WINEP or the RSO, to line up with the draft SW business plan.

Prioritisation Adjustment of Studies

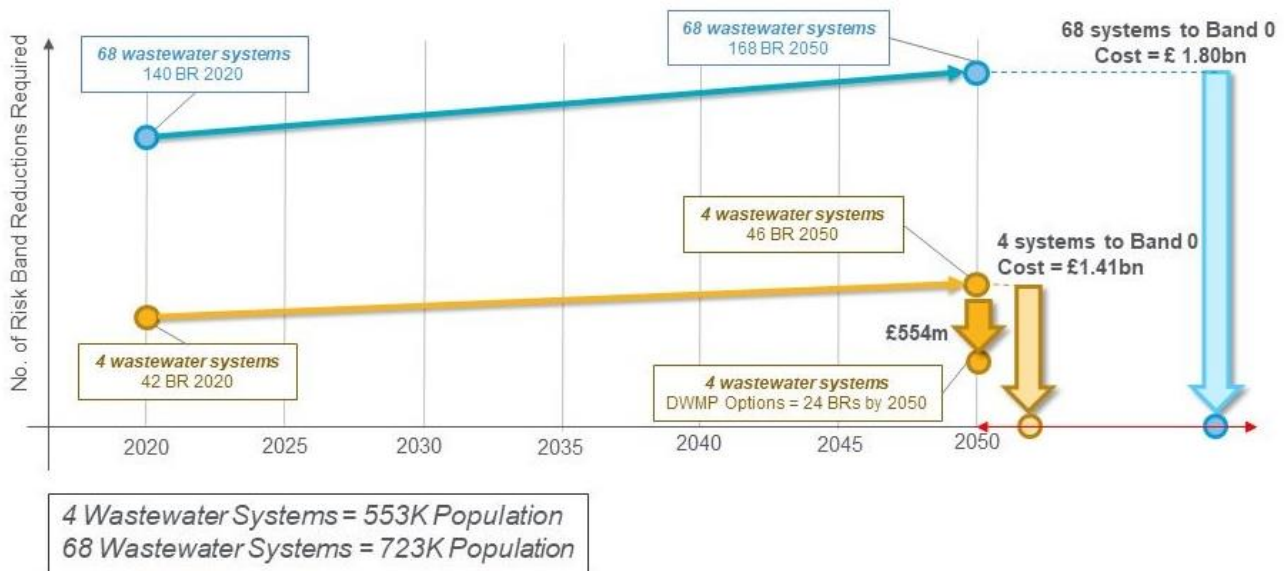
Studies are sometimes required to gain further data and information to inform our investment decisions. However, studies will not directly deliver quantifiable benefits or Band Reductions (BRs). The initial prioritisation scored studies as zero using Equation 2 - but the studies are essential to facilitating the delivery of later investment needs. For the final prioritisation, these studies have been placed in AMP8, with some exceptions being completed in AMP9.

Southern Water
March 2023

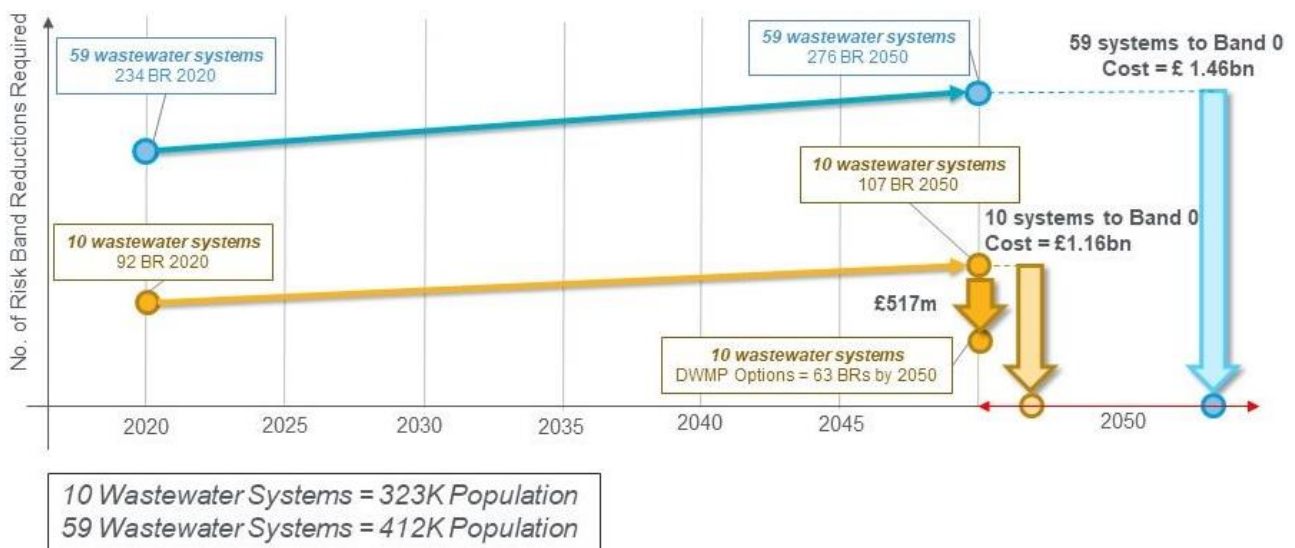
Appendix A

Extrapolation of Investment Needs to Band 0 for each River Basin

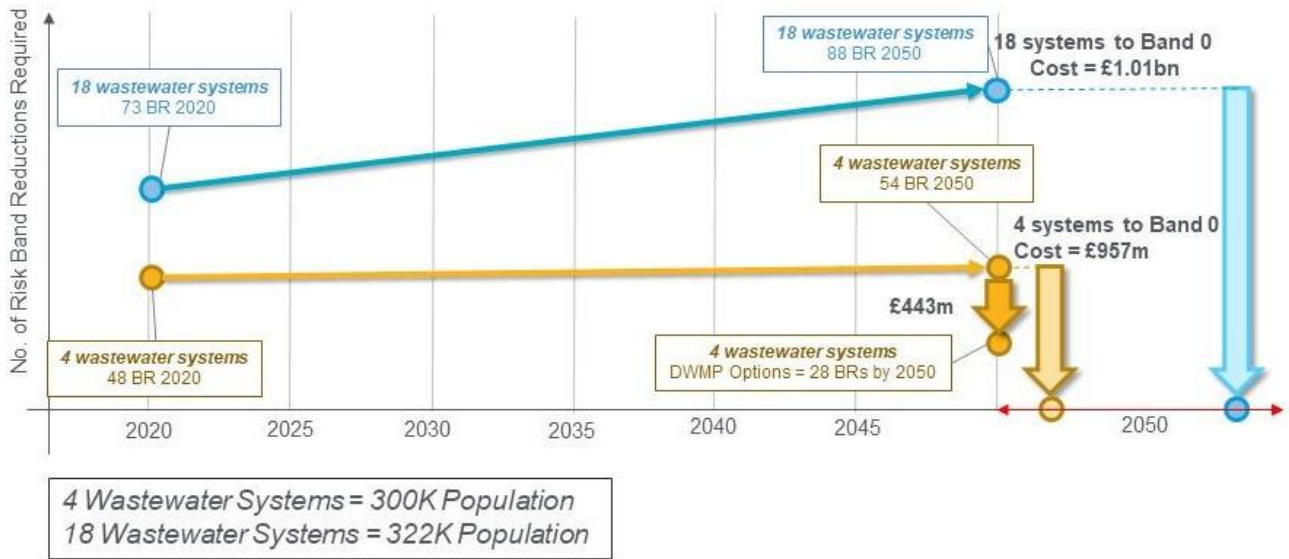
Extrapolation of Investment Needs to Band 0 for Adur and Ouse



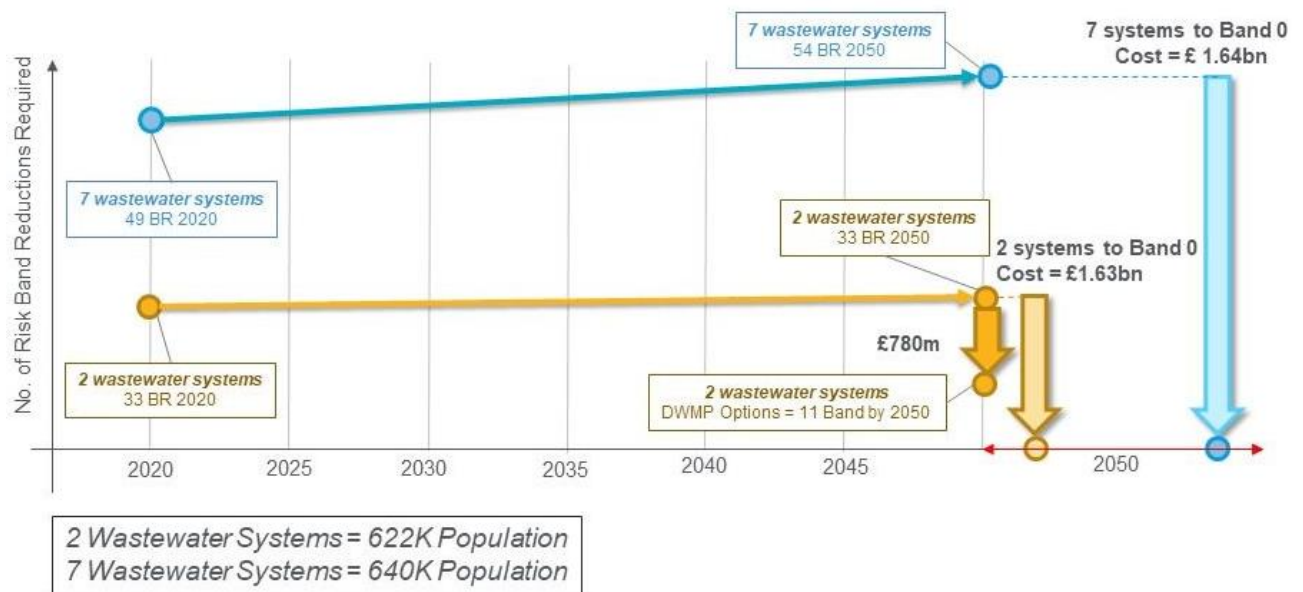
Extrapolation of Investment Needs to Band 0 for Arun and Western Streams



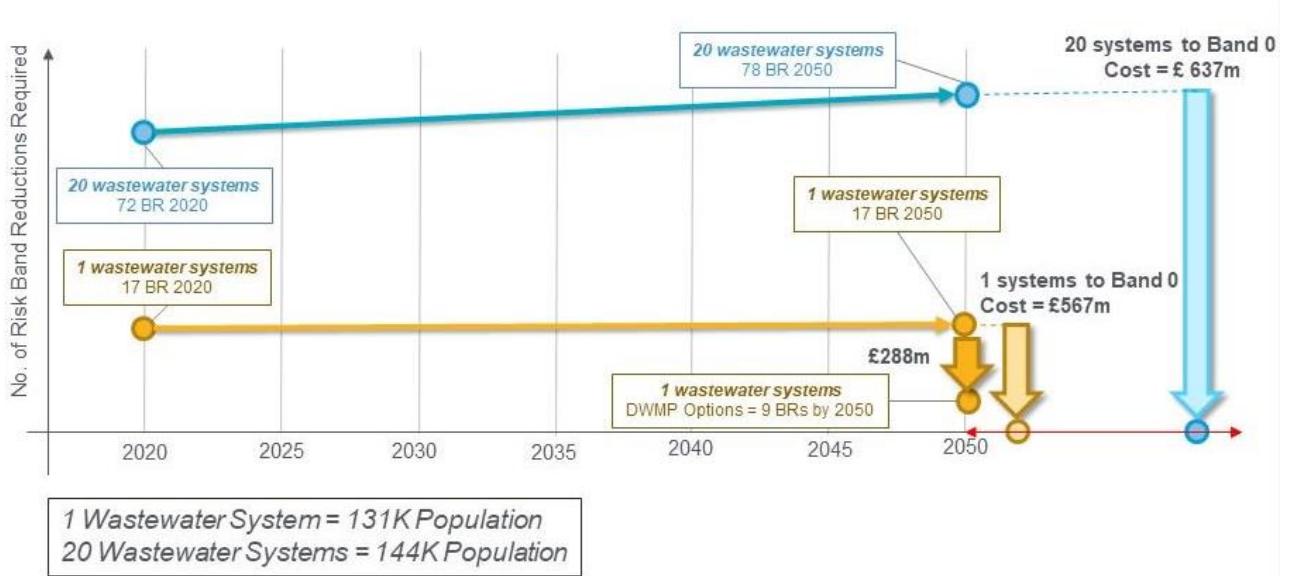
Extrapolation of Investment Needs to Band 0 for Cuckmere and Pevensey Levels



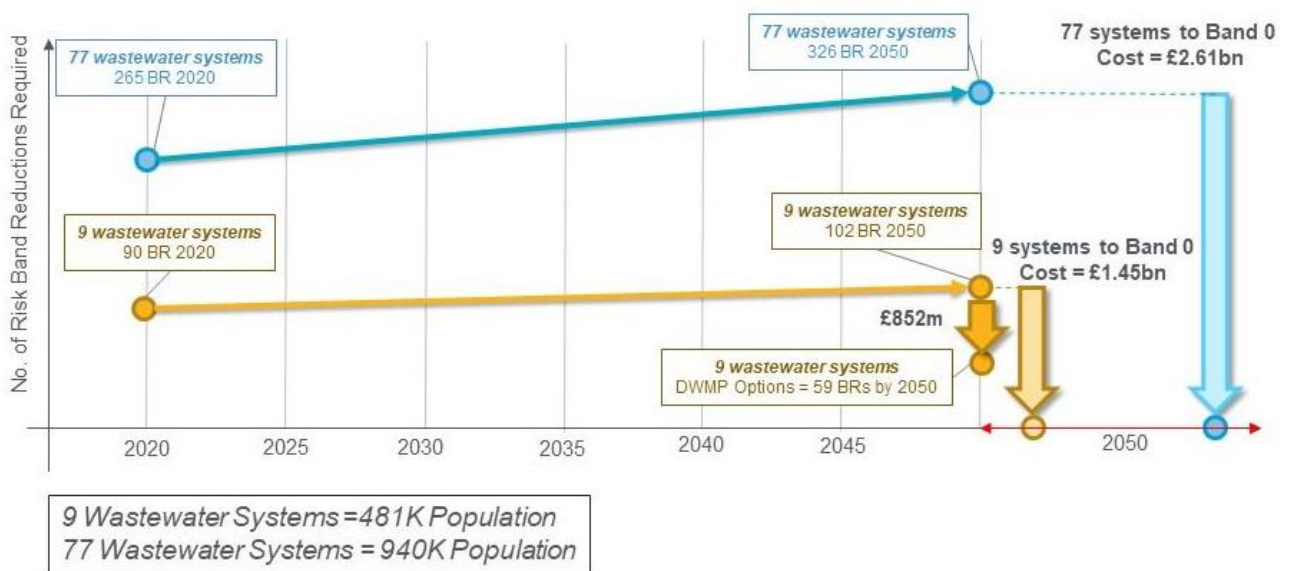
Extrapolation of Investment Needs to Band 0 for East Hampshire



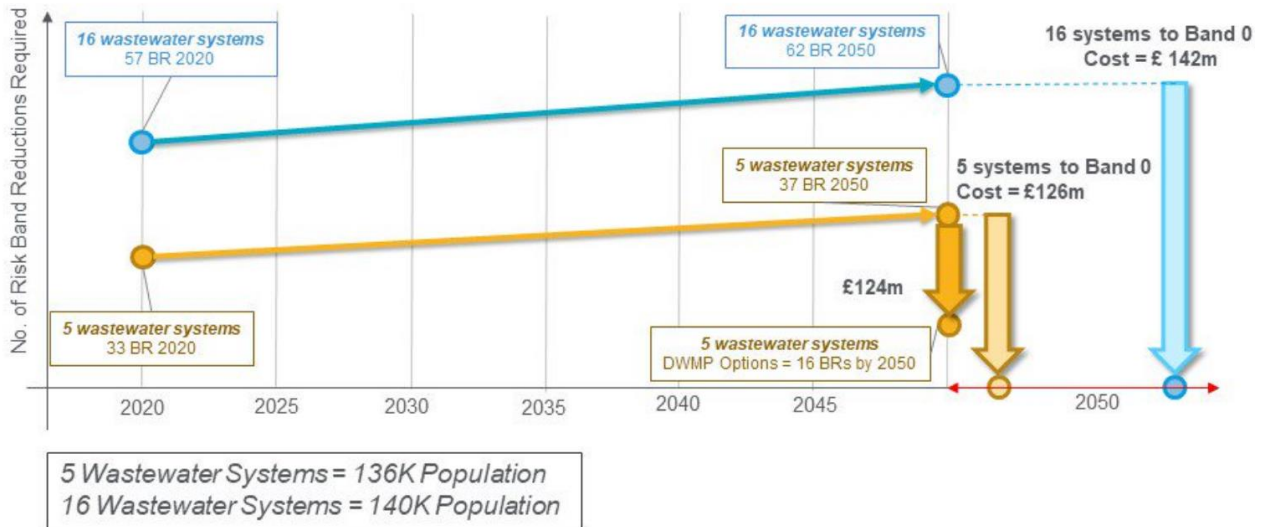
Extrapolation of Investment Needs to Band 0 for the Isle of Wight



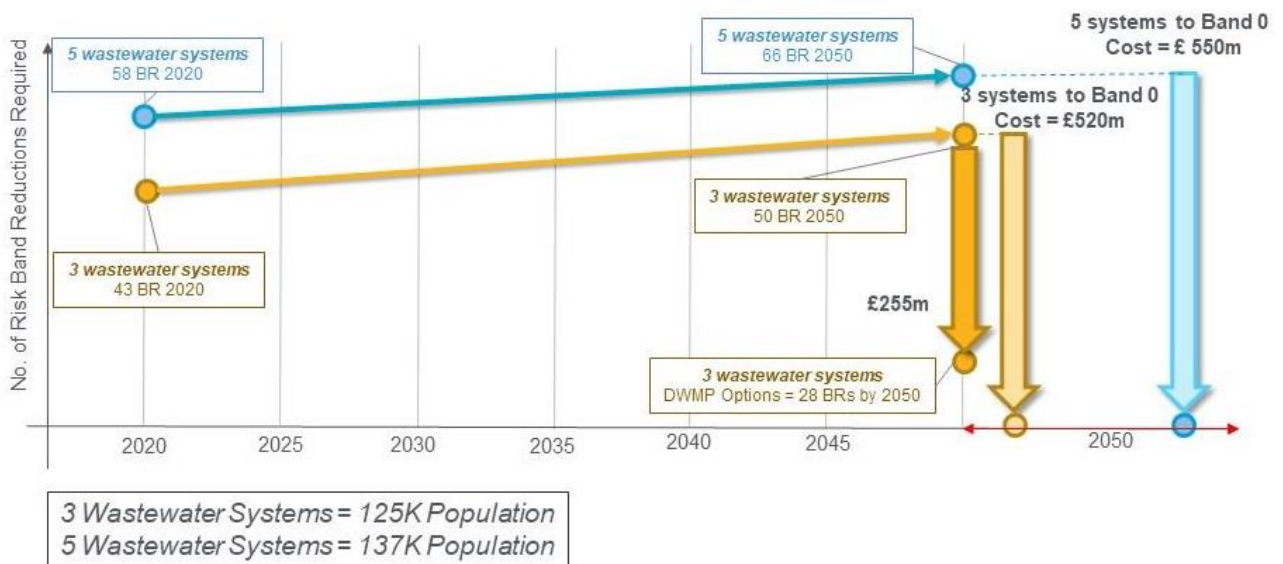
Extrapolation of Investment Needs to Band 0 for Medway



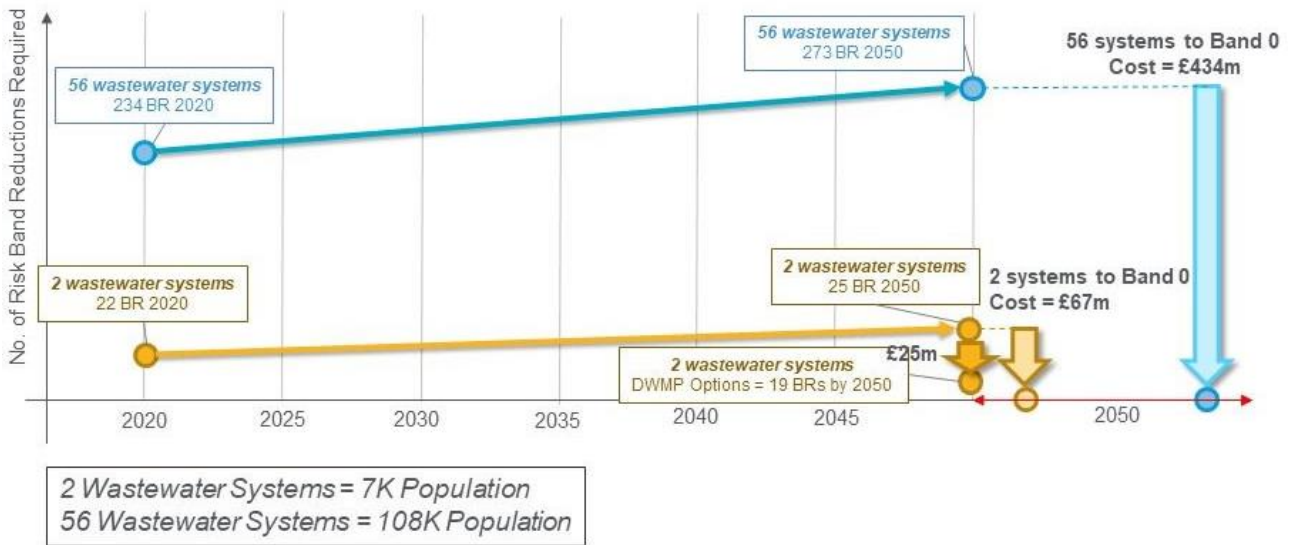
Extrapolation of Investment Needs to Band 0 for New Forest



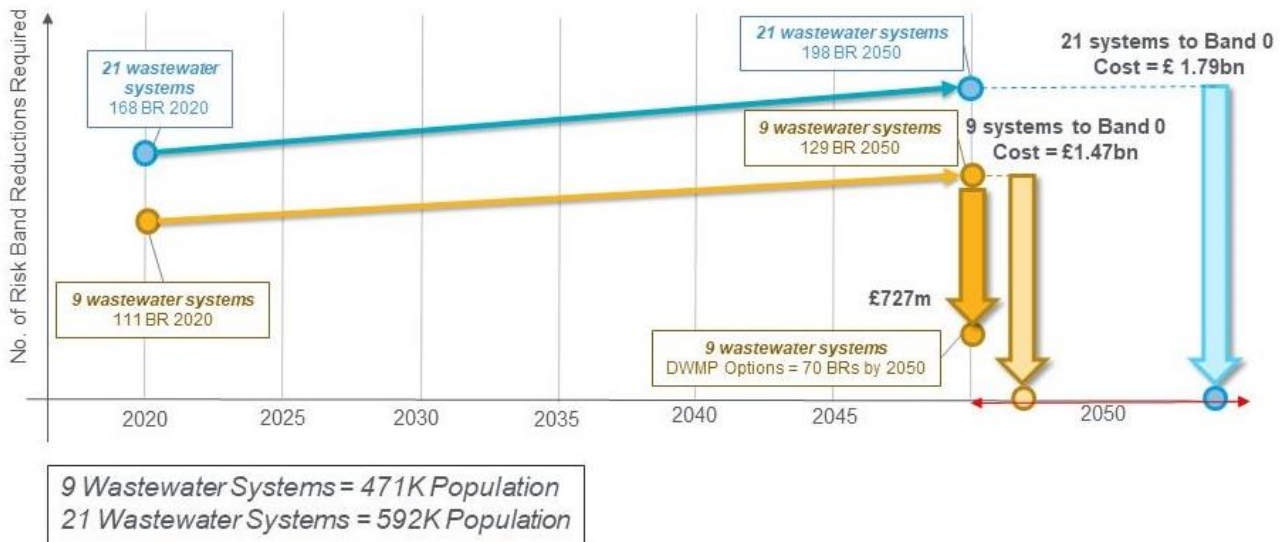
Extrapolation of Investment Needs to Band 0 for North Kent



Extrapolation of Investment Needs to Band 0 for Rother



Extrapolation of Investment Needs to Band 0 for Stour



Extrapolation of Investment Needs to Band 0 for Test and Itchen

