Draft Determination Representation Expenditure allowances

Part 3:Wastewater enhancement costs

YKY-PR24-DDR-04-Cost-efficiency-Part-3-enhancement-costs-wastewater

YorkshireWater

Contents

1. Overview

1.1 Overview of our draft determination representation on expenditure allowances

This document sets out our points of representation to the draft determination in relation to expenditure allowances.

We have reviewed all Ofwat's challenges against our enhancement allowances and set out our responses below. We respond to each enhancement case challenge. We also propose some changes to existing enhancement cases, driven either by regulatory changes, for example an alteration to the WINEP, or by realigning the programme to expected PCL outcomes and stakeholder expectations. We also introduce a number of new enhancement cases driven by the identification of new requirements.

The table below summarises changes to the enhancement programme (pre-Frontier Shift and RPE), from the Ofwat January position and keeps the same Ofwat format for consistency. Please note, the values provided in the Ofwat table differ from the Yorkshire Water submitted tables due to:

- Observed double-count of transitional and accelerated spend that we corrected in the April version of our tables.
- Inclusion of storm overflow expenditure disallowed as DPC.

Table 1-1: Summary of changes for waste enhancement expenditure

	YW January Submission (£m)	OFWAT DD (£m)	YW DDR (£m)
WINEP / NEP: Storm overflows			
Event Duration Monitoring	0.75	0.75	1.35
Continuous water quality monitoring	150.06	240.11	97.49
Storm overflows	1381.45	1055.65	1450.61
WINEP / NEP: Nutrients			
Nutrient Removal	0.00	0.00	0.00
Nitrogen technically achievable limits	0.05	0.05	0.05
P Removal	364.74	362.61	356.54
Nutrients Or Sanitary Determinands NBS	4.32	4.32	3.72
Nutrient Balancing	0.00	0.00	0.00
Catchment Permitting	0.00	0.00	0.00
WINEP / NEP: Other			
Flowing Monitoring At STWs	7.99	7.99	11.35
Sanitary Parameters	49.19	52.01	40.91
Monitoring certification scheme for pumping stations and emergency overflows	19.13	13.39	19.13
Flow To Full Treatment	0.00	0.00	0.00
Chemicals Removal	0.00	0.00	0.00
Chemical Investigations	6.82	6.82	5.57

Habitat Restoration	0.00	0.00	0.00
Microbiological Treatment	9.35	9.35	21.04
Septic Tank	3.94	9.49	4.06
Fish Screen	0.00	0.00	0.00
25 Year Environment Plan	4.84	4.84	4.84
Investigations	97.46	58.47	155.93
Third Party Schemes	0.00	0.00	0.00
River Connectivity	0.00	0.00	0.00
Restoration Management	0.00	0.00	0.00
Advanced WINEP	0.00	0.00	0.00
Sludge Storage Tank	0.00	0.00	0.00
Sludge Storage Cake	37.78	62.65	37.78
Sludge Treatment Thickening	6.06	6.06	6.06
Sludge Treatment Other	0.00	0.00	0.00
Sludge Investigations	0.00	0.00	0.00
Growth at sewage treatment works			
Growth At STW	37.60	22.30	39.14
Other enhancement areas			
Net Zero Wastewater	42.75	0.00	23.21
Freeform	26.25	7.88	26.25
PR19 WINEP carryover	0.00	38.78	35.52
Green recovery carryover	0.00	0.00	0.00
First Time Sewerage	0.00	7.20	5.84
Odour And Nuisance	0.00	0.00	0.00
Additional Control TTT	0.00	0.00	0.00
Destruction technology for Sludge to Land	0.00	0.00	10.00
Resilience and security			
Resilience	0.00	15.11	15.00
SEMD	0.00	0.00	0.00
Security Cyber	0.00	0.00	0.00
Industrial Emissions Directive			
IED	118.20	13.46	72.51
Total wastewater enhancement allowance			
Total Enhancement expenditure	2368.72	1999.27	2443.90

The equivalent total enhancement expenditure included in the 'Changes to our plan' section is shown below. This is the submitted value of our January submission, prior to adjustments made by Ofwat for the purposes of the draft determination (for example inclusion of DPC costs within Totex).

	YW January Submission (£m)	OFWAT DD (£m)	YW DDR (£m)
Total Enhancement expenditure (Changes to Our Plan)	2084.49	1999.27	2443.90

There has been significant movement in our business plan since October. Some areas of the WINEP have been rephased into AMP9, causing the difference between October and April. The changes between April and our proposed DDR include additional enhancement cases and changes to existing cases.

In our proposed enhancement programme for DDR, we accept the inclusion of five schemes totalling £197.5m that were DPC in our October submission, and that Ofwat has determined should be delivered through our proposed Storm Overflow Alliance.

1.2 Overview of enhancement representation

Table 1-2: Summarises the rationale for representation for the wastewater enhancement cases

Enhancement case	Driver (where applicable)	Rationale for representation
Living with Water	Resilience	New evidence provided (optioneering, best value solution and rebut of overlap with AMP7 investment) to support the requirement for reinstatement of business plan costs
Appropriate measures (IED)	Industrial Emissions Directive	Request for Totex to align with other industry draft determinations
First time sewerage	Water Industry Act	New enhancement case to provide first time sewerage connections in line with Ofwat's allowance.
Wastewater resilience	Resilience	New enhancement case to provide flood resilience and power resilience across the region in line with Ofwat's allowance.
WINEP: Waste investigations	WINEP	Additional evidence to meet Ofwat's challenges on the complexity of our investigations and the associated costs, and the inclusion of SOAFv2 investigations.
WINEP: Inland bathing water quality – Microbiological treatment	WINEP	Additional bathing water scheme at Harrogate North STW following 2024 bathing water designations.
Storm overflows	WINEP and discharge reduction	Revision to enhancement case to include previous schemes with a DPC delivery route and drive greater discharge reduction to support the PCL ambition of 20 monitored spills by 2029/30. Challenge approach to cost modelling, specifically the identification and treatment of outliers, potential bias as a result of exclusion of variables other than volume and approach to assessment of Full Flow to Treatment (FFT) schemes.
WINEP: Continuous water quality monitoring	WINEP	Revision to enhancement case following updated Environment Agency Guidance which requires a lower number of monitors.
WINEP: PR19 WINEP carryover	WINEP	Updating the calculation of PR19 Carry Over and challenging Claw Back.

Loss of landbank investigations	Future landbank risks	New enhancement case to support the understanding of our approach to mitigate loss of landbank for sludge disposal.
Grow at sewage treatment works: Growth allowance including Ingbirchworth DWF	Growth	Revision to enhancement case to incorporate one additional scheme at Ingbirchwoth STW.
WINEP: Flow monitoring at STWs - First time P schemes (U_MON3/4 requirements)	WINEP	Revision to WINEP enhancement case to include additional flow monitoring requirements.
WINEP: Monitoring certification scheme for pumping stations and emergency overflows (U_MON6 requirements)	WINEP	Revision to enhancement case to incorporate DEFRA requirement to deliver an increase from 25% to 50% of monitoring of Emergency Overflows in AMP8.
Net Zero (Greenhouse gas reductions)	Net Zero	Additional evidence to meet Ofwat challenges on technology innovation and reinstatement of some components of GHG reduction as per business plan submission.

2 Living with Water

2.1 Overview

Living with Water is a multi-award winning, industry-leading approach to partnership working, rooted in managing complex flood risk in Hull. Outside of London, Hull is the location most at risk of catastrophic flooding in the UK.

Our Living with Water investment for AMP8 sets out the next increment of our systems-based approach to surface water management. It will form the basis for long term, sustained investment in the city, aimed at combatting the severe impacts of climate change while delivering improvements for customers today. The approach is the culmination of multiple AMPs of research, customer engagement, modelling and development, alongside intense collaborative working to bring improved outcomes for customers and the environment as well as efficient delivery options.

Ofwat proposes a 70% reduction in funding for our AMP8 LWW investment. This proposed reduction of funding will require a significant scaling back of the planned intervention. For the proposed value of £7.875m, we will be able to deliver attenuation measures only; the major enabling activities to support surface water separation and future AMP investment will not be deliverable within this constrained budget. This puts the long-term strategy at risk, reducing benefits, and removing the potential for match-funding. In response to the draft determination feedback, we set out further evidence and governance to ensure that we can secure the full allowance.

Through a deep dive assessment, Ofwat has assessed a number of key elements as 'partial pass' and 'some concerns' PR24 – DD – WW – Freeform.

The three areas of concern are:

- Need for enhancement investment (partial pass)
- Best option for customers (some concern)
- Cost efficiency (some concern)

Our original Living with Water enhancement case from the October business plan submission can be found here.

2.2 Key messages

In light of the broader context of the development of the Blue Green Plan (our long-term approach for Hull), our multi-AMP investigation, model development and optioneering that all led us to this point, there is a clear need for enhancement investment.

The maturity of the LWW partnership, and our long-term approach to creating flood resilience, mean that our proposed scheme will set out new measures within the PCD which provide greater governance and clarity on the investment over multiple AMPs, demonstrating that this is the best option for customers.

Additional evidence provided in this representation, including a detailed comparison of unit costs, third party assurance from Stantec and the latest industry research, clearly shows that our proposals are cost efficient.

2.3 Change requested

Within this representation we provide additional evidence, not previously disclosed, in response to the draft determination feedback to ensure the reinstatement of the full business plan costs.

Table 2-1: Summary of changes to the Living with Water enhancement allowance

	Allowance (£m)
October 2023 business plan submission	**26.250**
January 2024 business plan resubmission	**26.250**
Ofwat's draft determination	**7.875**
YKY draft determination representation	**26.250**

2.4 Yorkshire Water's response to Ofwat

The table below presents Ofwat's commentary from the PR24 – DD – WW – Freeform, alongside a summary of the rationale underpinning this representation, which is further detailed in the following chapters.

Table 2-2: Evidence to support the rationale for the Living with Water representation

<table>
<tr><th>Ofwat concerns</th><th>Representation rationale and supporting evidence</th></tr>
<tr><td colspan="2">Need for investment</td></tr>
<tr><td>1. "The company does not provide sufficient and convincing evidence that activities do not overlap with previously funded enhancement schemes."</td><td>This proposed Living with Water enhancement case does not overlap with previously funded enhancement schemes:
The schemes that make up the LWW AMP7 portfolio are listed in the table below and are discrete from this enhancement case.
<table>
<tr><th rowspan="2">Scheme Name/Scheme Benefits Boundary</th><th rowspan="2">LWW Lead partner</th><th rowspan="2">Forecast Delivery Timescales</th><th colspan="3">Forecast Benefit</th></tr>
<tr><th>5yr</th><th>30yr</th><th>75yr</th></tr>
<tr><td>Rosmead St</td><td>YW</td><td>Completed</td><td>14</td><td>17</td><td>32</td></tr>
<tr><td>Bilton Main Scheme (YW WP1 & ERYC Representation)</td><td>YW (Urban)
ERYC (Rural)</td><td>YW - March 2025
ERYC March 2027</td><td>99</td><td>208</td><td>233</td></tr>
<tr><td>Derringham WP1 & WP2 (6 basins)</td><td>YW</td><td>March 2025</td><td>118</td><td>155</td><td>165</td></tr>
<tr><td>Thorngumbald</td><td>ERYC</td><td>March 2027</td><td>35</td><td>5</td><td>8</td></tr>
<tr><td>Hedon</td><td>ERYC</td><td>March 2027</td><td>1</td><td>1</td><td>8</td></tr>
<tr><td>Preston</td><td>ERYC</td><td>March 2027</td><td>90</td><td>101</td><td>97</td></tr>
<tr><td>Orchard Park Road</td><td>YW</td><td>March 2025</td><td>30</td><td>49</td><td>45</td></tr>
<tr><td>Frampton Close</td><td>YW</td><td>March 2027</td><td>38</td><td>30</td><td>18</td></tr>
<tr><td>Garrick Close</td><td>HCC</td><td>March 2026</td><td>9</td><td>21</td><td>22</td></tr>
<tr><td>Noddle Hill Way (Fulmar Close)</td><td>HCC</td><td>March 2026</td><td>11</td><td>8</td><td>4</td></tr>
<tr><td>Falkirk Close</td><td>HCC</td><td>March 2027</td><td>7</td><td>7</td><td>3</td></tr>
<tr><td>Snowhil Close</td><td>HCC</td><td>March 2027</td><td>6</td><td>10</td><td>13</td></tr>
<tr><td>Magdelene Estate Lagoon</td><td>YW</td><td>March 2026</td><td>55</td><td>97</td><td>16</td></tr>
<tr><td>Total</td><td></td><td></td><td>513</td><td>709</td><td>664</td></tr>
<tr><td>PR19 PC Target</td><td></td><td></td><td>494</td><td>808</td><td>644</td></tr>
<tr><td>PC Surplus/Shortfall</td><td></td><td></td><td>19</td><td>-99</td><td>20</td></tr>
</table>

As set out in section 1.3.4 of the PR24 Living with Water Enhancement Case Appendix (YKY-PR24-DDR-33), page 10 states:
"The Blue Green Plan which has been developed to support our AMP8 (and future AMP) investment uses a baseline which is inclusive of AMP7 notional schemes which achieve the numbers defined by the performance commitment, therefore any future investment acknowledges and does not double count properties protected by this previous investment."
This is further evidenced in section 4.1 of the Blue Green Plan Technical Appendix which was provided to Ofwat as part of the query process. Page 43 states:
"As part of the AMP7 solution development, Stantec created a future 2025 baseline model that includes schemes likely to be built to represent a 2025 flood risk baseline".
We propose a clarification within the PCD which will state that the investment for this enhancement case will not be counted towards the AMP7 LWW PC targets.
We will maintain an AMP7 PC version of the Living with Water hydraulic model which will only contain schemes which have been developed and funded to contribute to the AMP7 PC.
The AMP8 solutions will all be developed using the latest version of the LWW hydraulic model which will continue to include all historic investment as a baseline, we will add more detail of specific interventions as they are delivered. This model governance allows us to track the impact of each AMP's investment and the change in risk profile over time.
</td></tr>
<tr><td>2. "The company does not clearly present what deliverables</td><td>The table above provides the detail of the schemes which contribute to the AMP7 performance commitment, alongside delivery dates.</td></tr>
</table>

	are remaining in the 2020-2025 period. The company does not provide sufficient and convincing evidence to demonstrate this investment does not include previously funded activities and enhancement schemes. Therefore, we have applied an adjustment of 30% to the allowance for this scheme.”	Previous AMP periods do not include funded activities similar to, or overlapping with, the proposed EC. The section below outlines past and future investments into flood resilience by AMP period for Hull, demonstrating that this EC is a unique investment to support our customers. **AMP1 to AMP6 enhancement investment:** Prior to AMP3, all storm and wastewater flows in Hull were discharged directly to the Humber Estuary via screens and pumping stations located at East and West Hull. In AMP2, associated with the implementation of the Urban Wastewater Treatment Directive in the Year 2000, Yorkshire Water created a new intercepting sewer from West Hull, via East Hull pumping stations to a new wastewater treatment works at Saltend. Both East and West Hull pumping stations were retained as pumped overflows to relieve flooding on the wider system. This investment was not delivered to increase flood resilience, and so did not address any flood risk throughout its delivery. Following the 2007 floods, a new surface water pumping station was built to increase the flood resilience for the Bransholme estate (which is a separate surface water system located on the East of the River Hull and does not overlap with our AMP8 investment). Additionally, an upgrade was completed at East and West Hull pumping stations as part of the base maintenance expenditure to increase the resilience of the pumping stations but did not increase the capacity of the system. In AMP6, following a succession of significant flooding events, Yorkshire Water funded an integrated catchment model and an initial surface water management strategy. This report formed the basis of the PR19 submission for the newly created Living with Water Partnership. We have not previously had funding that overlaps with our proposed investments in AMP8. **AMP7 enhancement investment:** delivery of community-based SuDS, which return flows to the combined network, gave us invaluable insight into the challenges and opportunities associated with large scale retro-fit sustainable drainage measures. Key learning is that attenuation of surface water and returning to the combined sewer can only offer benefits to a limited number of properties, large scale resilience is reliant upon separation of flows. For this reason, the Blue Green Plan was created in partnership, based on years of hydraulic modelling and the learnings from early AMP7 development and installation. We have not previously had funding that overlaps with our proposed investments in AMP8. **AMP8 enhancement investment:** based on the outcomes of the BGP, this investment will focus on creating a new corridor to move surface water through the city and out into the Humber Estuary. Seven new corridors have been identified across the city, for AMP8, based on partner feedback, the West Network has been selected due to its proximity to existing watercourses and historic East Riding of Yorkshire Council investment. Due to the scale and cost of the West Network, it is proposed to be delivered across multiple AMPs. AMP8 focussed predominantly on enabling structures – pumping stations to increase capacity of existing water courses; infrastructure to allow separation of flows; SuDS measures to attenuate flows and a blue-green corridor which will enable proof of concept and cultural acceptance to allow greater use of Blue Green Infrastructure in future AMPs. **AMP9:** This period will focus on expanding the West Network, allowing further separation of more streets through delivery of roadside rain gardens and blue-green corridors. **AMP10:** This AMP will focus on the final phase of separation via street-based SuDS and a significant programme of blue-green corridor Delivery. It is anticipated that by this time, road usage will begin to change with a move to more travel by public transport and cycling, in response to the climate crisis. We will also have two AMPs of experience in the delivery of blue-green corridors which will give us the essential knowledge, skills and engagement approach to ensure successful delivery at a substantial scale.
Best option for customers		
3.	“The company provides limited evidence that alternative options have been considered and does not provide details of a cost benefit analysis to demonstrate that the chosen option is the right solution.”	Optioneering for a city scale solution to manage flood risk in Hull has been developed over multiple AMPs. Many options have been considered, with all this historic work and evidence informing the long-term approach that has now been developed and agreed by the Living with Water Partnership. In section 2.4.1 below, we provide further evidence of historic optioneering and the place based optioneering that was undertaken to develop the Blue Green Plan. In section 2.4.2 we provide further detail on our long list appraisal for the AMP8 investment, this includes the rejection of the other network, Stoneferry, originally included in the short-term plan of the Blue Green Plan.

4. "The company states that all the LWW solutions within the 2020-2025 programme have been developed to support the "Blue Green plan" but the company does not present the evidence clearly to demonstrate the process in its submission."	Our AMP7 solutions have been developed and designed alongside the creation of the Blue Green Plan, as such we have prioritised keeping water on the surface wherever feasible to support future disconnection through blue-green corridors. The AMP7 schemes have all involved working closely with the local community, to implement source control measures which reduce the risk of flooding locally, whilst also improving the general environment and public realm to bring the quality of the environment up to create a stronger sense of place and pride in the community. This approach supports the vision and pillars of the Blue Green Plan, we attach these as Appendix B. The surface water attenuation schemes we delivered in AMP7 do not disconnect surface water from the combined network because the surface water infrastructure to allow for this disconnection does not yet exist. The Blue Green Plan provides the basis on which to build a network that will allow major disconnection of surface water across a long-term plan. Our intention in AMP8 and subsequently is to install this network of blue-green corridors. As future iterations of the Blue Green plan are delivered, and more specifically, as the blue-green corridors are created, the AMP7 surface water attenuation schemes can be disconnected from the combined network and plumbed into the new green corridors, creating capacity within the combined network and further reducing flood risk accordingly.
5. "The company appears to present four options in its submission, but in practice only two clear options have been considered. The two options are a mixture of blue-green and grey solutions, and a grey (only) solution. These two options are then further split into two different scales of delivery. This means the company only provides one alternative option. Therefore, it does not provide evidence that a range of alternative options have been considered during the optioneering process (for example, a blue-green solution only could have been considered)."	Due to the partnership nature of Living with Water, we have followed the Environment Agency's appraisal guidance for optioneering of the AMP8 enhancement case. This ensures an efficient approach to scheme development for our customers and communities, ensuring only one study needs to be undertaken to support both the price review process and the outline business case (OBC) process for government funding. The guidance is available here: FCERM Appraisal Guidance and sets out that in selecting short list options: "you should limit your shortlist of options to only those which meet the project objectives and Critical Success Factors." Based upon historic optioneering, the limitations set by space within an urban setting, cultural acceptance and the objectives of the partnership we have assessed feasible options and assessed them for cost benefit (including wider benefits) and deliverability. We provide further evidence of our optioneering by providing the AMP8 longlist options in Table 2.5 which can be found below in section 2.4.2. A Blue Green only solution was considered and rejected at an early stage. An entirely Blue Green solution would be able to achieve attenuation only as it would not allow for the new pumping stations needed to lift flows into the main rivers, and as such all flows captured by roadside rain gardens would need to be returned to the existing combined sewer. Our AMP7 investment and solution modelling has identified that the benefits of attenuation only are limited, and separation is key to delivering long term, widespread resilience. The new pumping stations are essential to create capacity in the existing tidal watercourses to ensure that surface water can be separated and managed effectively. As such, in AMP8 we propose to initially construct one blue-green corridor in an appropriate location to demonstrate the concept and benefit to the wider community. We know from our work in AMP7 that managing landscape change is as much about helping the community to embrace and adapt to their new surroundings as it is about providing a functional asset. As these blue-green corridors will help protect communities in Hull long into the future it is important that we deliver the change at a pace that works for the community.
6. "It is unclear if the preferred option would become an entire grey solution and go against the intent of this investment of implementing blue-green solution for the catchments."	The delivery of blue green solutions is a primary principal of the Living with Water Partnership which is illustrated in Appendix A. We will continue to prioritise the use of blue green solutions, but our experience highlights that there are certain circumstances where grey SuDS alternatives have a place, for example where costs escalate due to unforeseen services such as; archaeology; unexploded ordinance (UXO) or unresolvable topography challenges. There is also a need to take into consideration customer opinion and community needs to ensure that the assets will be valued and respected by local communities. In AMP8 we will follow a hierarchy of decision making for solutions which will prioritise blue green, then grey SuDS, with traditional infrastructure only being utilised where essential. We will document these choices and report against them as needed.
Cost efficiency	
7. "Some concerns: We have some concerns whether	As set out in our initial business plan, there are limited tools available that capture the costs associated with delivery of retrofit sustainable drainage assets. We have previously discounted

	the investment is efficient. The company does not provide sufficient evidence that the proposed costs are efficient."	the Environment Agency's cost estimation for SuDS, as this was written in 2007 and does not consider retrofit SuDS scenarios. Since the submission of PR24, the UKWIR project referenced in section 1.5.2 of the PR24 Living with Water enhancement case has now concluded. While the report has yet to be published, as contributors to the project, we have access to the draft tool and have used this to assess the elements of our AMP8 investment. Section 2.4.3 below details the outcome of the tool and compares our costs to those within the tool which has been developed using industry wide data. The tool will be available for Ofwat to view and consider when UKWIR publish the outcome of the "Understanding the long-term costs and wider benefits of surface water removal using Sustainable Drainage Systems (SuDS) to tackle sewer flooding and storm overflow operation" project. Partnership working is an efficient way to deliver flood resilience and wider water management challenges. Although match funding does not necessarily provide direct cost efficiency to the procurement of goods etc, it is a more cost-effective way to raise capital and reduces the burden on our customers as part of the investment is funded by a different entity. Across AMP7 the Living with Water Partnership has, or will, secure circa £17.8m of match funding from a variety of sources, as detailed in the table below. **LWW external Funding** / **Total** / **Status** Blue Green Plan - FCERM / £175,000 / Received Department of Education LWW School SuDS - Bilton and Estcourt / £60,000 / Department of Education £45k received 2023/24. £15k for Estcourt this year LWW School SuDS 24/25 - Local Levy / £48,000 / Proposed schools for Hull Buckingham and Cleeve. East Riding of Yorkshire Council schools out of LWW area (£170,000 levy). Rosmead FDGiA / £815,000 / Received Hull Shared Prosperity Fund SPF - Derringham and Rosmead / £250,000 / £96K for Rosmead, £154k for Derringham to be claimed 24/25 Hull Devolution Deal - AMP7 schemes / £1,000,000 / Bid to be finalised, waiting for info FCERM West Network Feasibility / £140,000 / Approved. To start to claim after DD when West network study to begin, 24/25. Local Levy - LWW Community Coordinator / £178,000 / Ongoing. Bid for further years funding Bilton OBC / £13,000,000 / OBC has been submitted in June 2024 and awaiting outcome Derringham OBC / £2,200,000 / Working on do nothing scenario for YW led schemes. To claim 25/26 Frampton Close OBC / TBC / To claim 2025/26 Orchard Park Road OBC / TBC / To claim 2025/26 Living with water appendix (YKY-PR24-DR-33) - Appendix C highlights the challenges of partnership working and the opportunities that exist to support this more broadly.
8.	"It is not clear how this investment (LWW) is built into the entire "Blue Green plan" or vice versa. It is unclear how the costs presented in the "Blue Green plan" breakdown to the 2025-2030 period and align with the preferred option cost presented in the enhancement case of LWW."	Section 2.4.1 below sets out to explain the approach to the West Network in the Blue Green Plan and how this translates to our AMP8 investment. We have provided a detailed cost memo in Living with water appendix (YKY-PR24-DR-33) - Appendix D which details and accounts for variation in costs between the Blue Green Plan and our AMP8 proposal. which details and accounts for variation in costs between the Blue Green Plan and our AMP8 proposal.
9.	The company states its costs have third party assurance but	Living with water appendix (YKY-PR24-DR-33) - Appendix D provides a Cost Memo from Stantec on their assurance of the blue green infrastructure costings used. This presents a detailed comparison of enhancement case unit costs with the Blue Green Plan and also UKWIR project 'Improving our understanding of retrofit SuDS whole life cost, carbon and delivery to

provides no evidence to demonstrate this investment has been assured externally.	enable deployment', which includes a SuDS costing tool developed for UKWIR by Stantec and supported by cost consultants Gardiner & Theobald. The Cost Memo provides an explanation of the differences in unit cost between the comparative sources.

2.4.1 The need for investment

In this section we address Ofwat's feedback on overlap with historic investment, setting out our investment overtime and the scale of the challenge that will require 25 – 50 years of sustained investment in the city. In this section we provide detail of the deliverables of our AMP7 investment programme as requested.

2.4.2 Blue Green Plan context

Hull is at risk from extreme flood events from all sources of flooding; the communities here are among the most vulnerable to climate risks in the UK. Furthermore, Hull has the second highest number of residential properties at risk of flooding of any local authority as well as thousands of businesses and significant infrastructure also at risk.

At PR19, we proposed that our AMP7 investment would deliver flood resilience to a number of properties across Hull and Haltemprice while establishing an approach for the long-term plan for city-wide resilience. In establishing this long-term approach, we have revisited our previous studies and built in our AMP7 learning. This long-term approach is called the Blue Green Plan and was co-funded and co-created with the partnership. Its alignment to city master planning ensures the plan is supported and embedded by our partners, influencing policy well beyond flood risk management to influence broader water-sensitive design policy.

In developing the Blue Green Plan, we have called upon our existing studies, knowledge and experience to determine an approach that gives the best possible outcome. In the development of the plan, we have further enhanced our hydraulic model, which re-affirms the hugely significant flood risk that remains in the face of climate change and the scale of investment needed to address this. Our AMP7 schemes have allowed us to implement attenuation measures through SuDS in key locations where this provides flood resilience benefits, we have undertaken a significant programme of scheme development and optioneering which has highlighted that the effectiveness of this approach is limited to a small number of key locations. The Blue Green Plan identifies that to go beyond the current level of resilience, significant infrastructure investment is needed alongside cultural and managed change to further enhance resilience. Managed change focusses on areas which do not benefit from the Blue Green Plan investment and will need to adopt in other ways to ensure flood resilience, eg through regeneration projects to deliver flood resilient homes that are easily recoverable after flood events.

Significant flood risk continues to remain beyond our AMP7 investment, our evidence shows that the impact of climate change will increase that risk by 250% (see report extracts below and our original enhancement case for details). To provide further assurances, we have embedded an extract from our Blue Green Plan Benefits Appendix which discusses how the baseline surface water and sewer flood risk has been assessed. This confirms that the BGP baseline was based on the best existing information at the time on the AMP7 programme, and whilst this has changes overtime, the target numbers associated with flood resilience remains the same, as governed by the AMP7 PC.

Extracts from Blue Green Plan Benefits report

3.1 FLOOD RISK BENEFITS

3.1.1 Categorising the flood risk benefits

Properties were identified to be at risk of internal flooding if the flood depth was 100 mm or greater. This was assessed for residential and non-residential properties and assessed flooding from sewer and surface water sources. Interactions with watercourses, rivers, and tides were included. Where plans are shown, the number of flooding properties are indicated using a coloured hexagon. Figure 3-1 shows the range using hexagons with an area of 25 ha. Areas with no properties at risk of flooding have no colour, <5 properties are blue, with a rainbow gradation up to >150 properties at risk in a 25 ha area.

Figure 3-1 Legend used to indicate the number of properties at risk of flooding internally within a 25ha area

A range of rainfall events were run. These events were the 1 in 5 year event or 20% annual exceedance probability (AEP), 1 in 20 year event or 5% AEP, 1 in 30 year or 3.3% AEP, and the 1in 75 year or 1.3% AEP. A range of duration events had been run and 240 minutes summer event was assessed to be the critical duration.

3.1.2 Understanding residual risk

The hexagon flood risk plans can also be used to understand locations of residual risk. These may be low lying areas or areas requiring additional hydraulic improvements to reduce flood risk. Areas with 'orange' or 'red' hexagon have more properties with residual flood risk and could be targeted for further investment, managed change, or prioritisation as part of the Collaborative Opportunistic Adaptive Planning Framework (COAPF).

3.1.3 Predicted flood risk benefit results from hydraulic modelling

As part of the BG Plan, multiple scenarios have been modelled with different rainfall events to establish 2025 and future baseline flood risk positions along with the future implications of implementing the plan using a 2080 model. Table 3-1 provides the summary of the results completed, for the different scenarios using different rainfall events (including to compare spill flows discussed in section 3.1.4).

Due to the size and complexity of the 2D hydraulic model for Hull and Haltemprice, a design storm (20% AEP up to 1.3% AEP) takes approximately 10 hours to simulate. The annual rainfall simulation takes approximately 1 week to run in the 1D model. Running the 2D model for the annual rainfall simulation would take longer and has not been done as part of this project.

Table 3-1 Scenario model name and the simulations completed

Model Name	Description	1 in 5yr (20%)	1 in 20 yr (5%)	1 in 30yr (3.3%)	1 in 75yr (1.3%)	1 Year Rainfall
Baseline – 2025	2D Hull Model including AMP7 Proposals	✓	✓	✓	✓	
Baseline – 2080	2025 Baseline + growth, climate change, creep uplifts	✓	✓	✓	✓	
Blue Green Plan – 2025 – Short Term	2025 Baseline + Short Term Solutions from BG Plan	✓	✓	✓	✓	
Blue Green Plan – 2080 – Short Term	2080 Baseline + Short Term Solutions from BG Plan	✓	✓	✓	✓	
Blue Green Plan – 2080 – Medium Term	2080 Baseline + Short & Medium Term Solutions from BG Plan	✓	✓	✓	✓	
Blue Green Plan – 2080 – Long Term	2080 Baseline + Short, Medium & Long Term Solutions from BG Plan	✓	✓	✓	✓	
Blue Green Plan – 2080 – Short Term – More SC	2080 Baseline + Short Term Solutions from BG Plan with more source control	✓	✓	✓	✓	
Blue Green Plan – 2080 – Medium Term – More SC	2080 Baseline + Short & Medium Term Solutions from BG Plan with more source control	✓	✓	✓	✓	
Baseline DWMP	1D model used in DWMP assessments and includes all CSOs and SPSs					✓
Baseline DWMP – modified for BG Plan	Basic representation of blue green corridors					✓

The short term proposals were built into the 2025 and 2080 model. The medium and long term proposals were built into the 2080 model. This avoided creating multiple incremental changes to the model, appropriate at this planning scale considering the scale of uncertainties. Table 3-2 shows the predicted number of properties at risk for the different model scenarios completed.

Table 3-3) using the model results in Table 3-2. Further model simulations could be completed to confirm these estimates, but the interpolated data is reasonable to see changes over time and make strategic decisions.

Table 3-2 Internal Property Flood Risk Counts

Model Name	1 in 5 yr (20%)	1 in 20 yr (5%)	1 in 30 yr (3.3%)	1 in 75 yr (1.3%)
Baseline – 2025	1942	6617	8585	14325
Baseline – 2080	5131	14508	18013	26511
Blue Green Plan – 2025 – Short Term	1709	5942	7714	12865
Blue Green Plan – 2080 – Short Term	3729	13067	14384	22437
Blue Green Plan – 2080 – Medium Term	1752	7359	9840	17544
Blue Green Plan – 2080 – Long Term	1005	4381	6459	12410
Blue Green Plan – 2080 – Short Term – More SC	2037	8421	11128	19266
Blue Green Plan – 2080 – Medium Term – More SC	1045	5734	7917	15048

Over time, flood risk is expected to increase as population increases and development follows, as urban creep decreases green space, as climate change increases rainfall (in this part of the UK), and tide levels rise.

As shown in Table 3-3, with implementation of the Blue Green Plan, flood risk will decrease over time as rainfall is managed at the source and the flow through the region is slowed. This trend is reflected across increasing return period storm events. Years 2025 and 2080 have been modelled explicitly and the flood risk levels for the intermediate periods (2030, 2040 and 2050) have been estimated so as to be consistent with the overarching trend. At 2100, the impact has been estimated based on the long-term performance at 2080 (i.e., it is assumed that no further risk reduction measures are implemented beyond the long-term plan interventions).

Table 3-3 Internal Property Flood Risk Change over time with implementation of Blue Green Plan

Year	1 in 5yr (20%)	1 in 20 yr (5%)	1 in 30yr (3.3%)	1 in 75yr (1.3%)
Baseline – 2025	1942	6617	8585	14325
2030 (End of Short Term)	1507	5354	7171	12292
2040 (End of Medium Term)	1104	4177	6086	11146
2050 (End of Long Term)	700	3000	5000	10000
2080	1005	4381	6459	12410
2100	1310	5762	7918	14820

As shown in Figure 3-2 and Table 3-4, flood risk decreases over time as the Blue Green Plan is implemented. Additionally, the impact on flood risk is shown if the Blue Green Plan is only partially implemented, e.g., flood risk reduction in the future if only the short term measures are implemented.

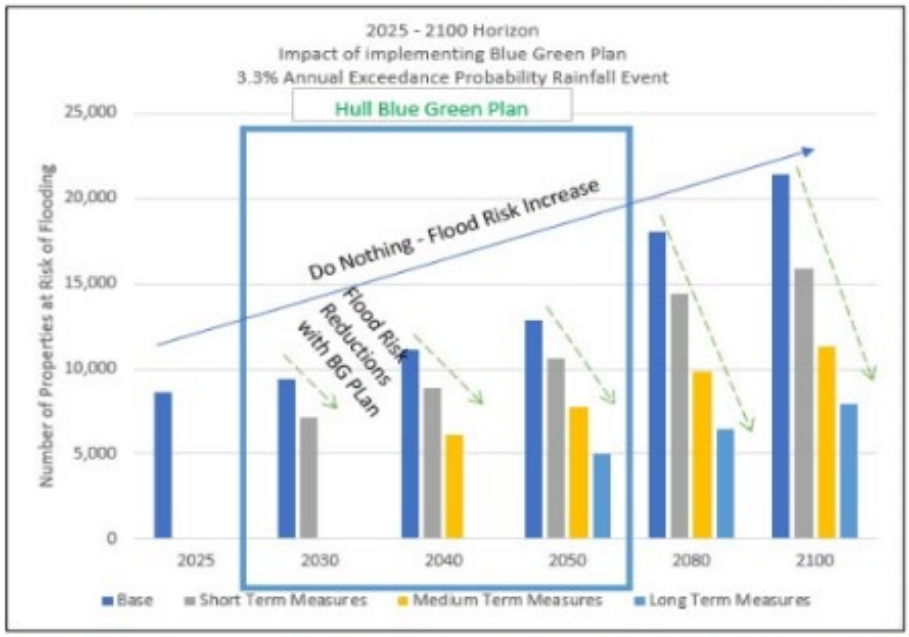


Figure 3-2 Change of Flood Risk with 'Do Nothing' and with Implementation of the Blue Green Plan

3.4

It must be noted that the 'short-term plan' originally detailed in the Blue Green Plan represents in the region of £400m of investment with a large number of the West Network being fully delivered and the Stoneferry Network. To ensure deliverability, affordability and community acceptance we have carried out further optioneering and prioritisation to put forward a partnership endorsed plan for 2025 – 2030.

To help articulate the scale of the risk in Hull in comparison to our AMP7 investment, we highlight the PC target associated with our AMP7 investment and the number of properties

which continue to remain at flood risk. Our AMP7 investment is a hugely critical step in our approach to partnership working and the delivery of retrofit blue green solutions, but our long-term strategy outlines the need for long term sustained investment. The long-term plan sets out an investment plan of over £1.5 billion, delivering in excess of £2.6 billion in benefits. The Blue Green Plan is fully supported by all Living with Water partners, and the vision and pillars have been endorsed and signed up to by the LWW Board which is made up of the area director for the Environment Agency; vice chancellor for the University of Hull; assistant director of economic growth and regeneration for Hull City Council; director of strategy and regulation for Yorkshire Water and director of asset strategy for East Riding of Yorkshire Council.

Our AMP7 investment is planned to deliver resilience to a number of properties as set out in the LWW bespoke performance commitment:

Table 2-3: Planned number of properties benefitting from resilience expenditure

Event type	Number of properties
1 in 5 years	494
1 in 30 years	808
1 in 75 years	644

Table 2-4 is from our LWW Enhancement Case (YKY39) identifies the scale of flood risk that remains within the city after the achievement of the PC targets, and the impact that climate change will have.

Table 2-4: Internal Property Flood Risk Counts (Living with Water Hydraulic Model)

Model Name	1 in 5 yr. (20%)	1 in 20 yr. (5%)	1 in 30 yr. (3.3%)	1 in 75 yr. (1.3%)
Baseline - 2025	1,942	6,617	8,585	14,325
Baseline - 2080	5,131	14,508	18,013	26,511

2.4.3 Historic investment

Our AMP7 delivery is set out in Table 2-5 below. This table highlights the benefits associated with each project, which partner is leading the delivery, and the project timescales. A proportion of the schemes will continue delivery into AMP8 (inline with the PC definition) and there is a shortfall associated with the one in 30 year target. Partnership funding has been secured to support a significant proportion of the schemes, extending into AMP8, but Yorkshire Water will also have some service improvement in terms of flooding risk reduction that we will carry on into AMP8 at our own cost, with the ambition of meeting the full reputational gateway detailed within this performance commitment. Any AMP8 investment associated with the AMP7 performance commitment gateway is independent of the investment in this enhancement case.

Table 2-5: AMP7 Living with Water projects

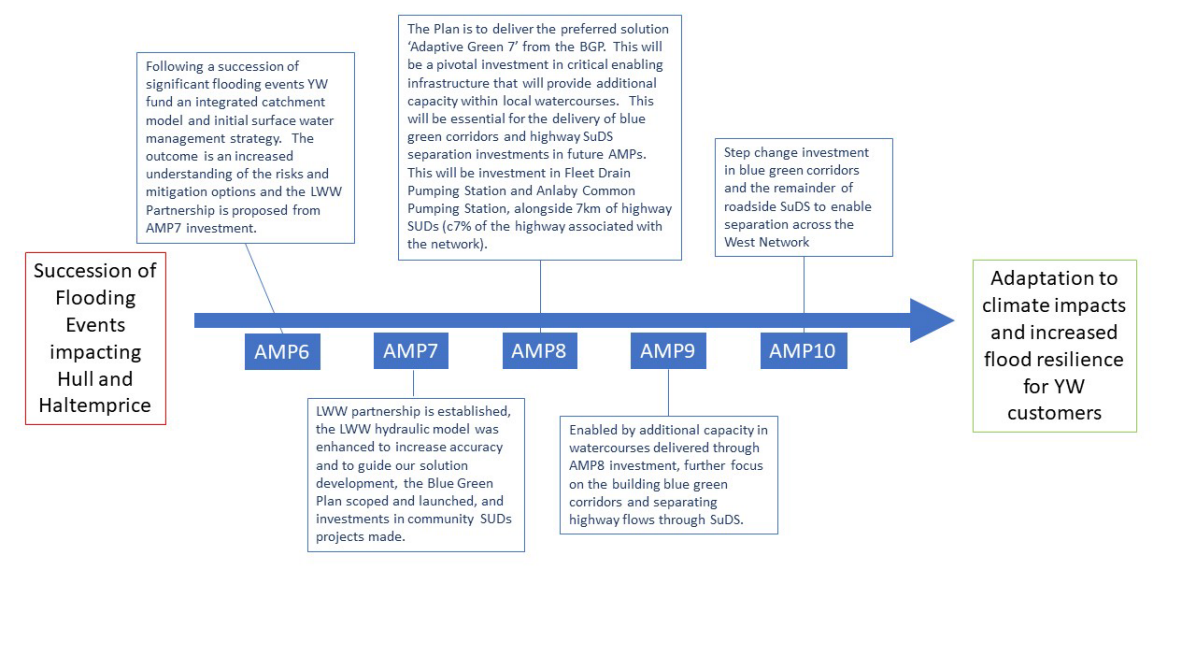
Scheme Name/Scheme Benefits Boundary	LWW Lead partner	Forecast Delivery Timescales	Forecast Benefit		
			5yr	30yr	75yr
Rosmead St	YW	Completed	14	17	32
Bilton Main Scheme (YW WP1 & ERYC Representation)	YW (Urban) ERYC (Rural)	YW - March 2025 ERYC March 2027	99	208	233
Derringham WP1 & WP2 (6 basins)	YW	March 2025	118	155	165
Thorngumbald	ERYC	March 2027	35	5	8
Hedon	ERYC	March 2027	1	1	8
Preston	ERYC	March 2027	90	101	97
Orchard Park Road	YW	March 2025	30	49	45
Frampton Close	YW	March 2027	38	30	18
Garrick Close	HCC	March 2026	9	21	22
Noddle Hill Way (Fulmar Close)	HCC	March 2026	11	8	4
Falkirk Close	HCC	March 2027	7	7	3
Snowhil Close	HCC	March 2027	6	10	13
Magdelene Estate Lagoon	YW	March 2026	55	97	16
Total			513	709	664
PR19 PC Target			494	808	644
PC Surplus/Shortfall			19	-99	20

Our AMP7 investment has been hugely successful, with significant advances in our knowledge, understanding and ability to work in partnership. We have undertaken incredibly complex modelling to guide our solution development. We have worked in detail with the communities in our scheme areas and more widely across the city. We have tested delivery routes across the partnership for efficiency and effectiveness. We have received match funding for schemes from a number of sources, which has delivered significant flood resilience to the city. The process of securing match funding is a further demonstration of both the stakeholder and partnership support that is generated around such schemes. However, there is still much to be done. The scale of the challenge in Hull requires sustained investment over the next 25-50 years to manage the impact of climate change.

This enhancement case is the first step on the pathway to delivering the vision and Blue Green Plan for Hull. It will create the first green corridor, enabling the separation, transport and ultimate discharge of surface water to the main river system. It will be followed with future enhancement cases to deliver the full plan over time.

The Blue Green Plan is the culmination of years of work, knowledge and collaboration, and it sets out a long-term delivery strategy that has an adaptation pathway at its core. Here, we set out a brief history of the development and approach of LWW in AMP6 and AMP7 alongside the opportunity for AMP8, AMP9 and AMP10.

Summary Visualisation



AMP6 Summary of Approach and Key Milestones and Learning

Developed the tools to better understand the risk of flooding in the Hull and Haltemprice area. This commenced with drainage area study modelling, followed by the development of an integrated urban drainage multi-agency model that replicates 2D flooding on the surface. The result is that all the agencies responsible for flooding are clearer in terms of the different sources and mechanisms of flood risk.

Hull and Haltemprice Surface Water Management Strategy was procured by Yorkshire Water and developed in consultation with the LWW partners. The strategy undertook two phases of optioneering, the first reviewed 12 different options:

1. New CSOs at Hull East and West SPS
2. Diversion of surface water to Holderness drain – discounted in the short term, until additional infrastructure (Blue Green Plan) enables this work
3. Interception of overland flow from the west
4. Watercourse disconnection
5. New western trunk sewer

6. Disconnection of roof drainage
7. Components of proposed PR14 solutions – hard engineered trunk sewer replacement
8. Improved and upgraded operation of East and West Hull pumping stations to mitigate flood risk
9. Removal of roof drainage
10. No climate change
11. Overland and watercourse flows removed
12. Removal of permeable contribution

The study concluded that:
'Although some scenarios have a significant impact on the number of properties with predicted flooding, no scenario removes more than approximately one third of the flood risk. It is therefore likely that a combination of measures will be required to address flood risk across the whole study area. In reality, the practicality of applying each scenario to any extent will vary across the catchment and will be restricted by physical characteristics, political will and cost-benefit appraisal.' RPS Report
Detailed optioneering, based upon the results of the first phase, evaluated:
1. The construction of a new combined sewer system with trunk mains that would discharge to the estuary via two new pumping stations;
2. Installation of SuDS assets that would attenuate flows and discharge back to the public sewer;
3) A surface water separation opportunity to integrate with Environment Agency investment.

Option 2 was taken forward at PR19 as a business case.
In 2017, the Living with Water Partnership was established, and a charette was held which brought together the founding partners and national and international flood resilience specialists to develop the approach. The partnership continued to develop, creating a clear vision, core objectives and establishing governance.

In 2018, Living with Water was launched publicly. For the first two years that partnership focussed on building trust with local communities and developing an education programme. The main objective of this approach was to raise awareness of flood risk and resilience and to understand community views on the use of SuDS.

The Blue Green Plan recognises that, while in isolation the above options do not significantly address flood risk, certain aspects in combination are ultimately needed, in a phased manner, to deliver the optimal level of flood risk reduction.

AMP7 Summary of Approach and Key Milestones and Learning

Living with Water has focused on investment in community-based SuDS that attenuate flows and convey them back to the combined sewer after a storm event. These schemes have been co-created, co-funded and co-delivered by the partnership. The installation of SuDS assets in the community has been delivered with detailed community engagement, Living with water appendix (YKY-PR24-DDR-33) Appendix E and Appendix F showcases the approach to engagement at Rosmead Street and Derringham, two of the AMP7 schemes.

The Living with Water hydraulic model provides a trusted source of evidence to the partnership, and during the course of AMP7, the model has been further improved and developed with the following enhancements made to increase accuracy:

- developments, creep and flood alleviation schemes updates;
- amended Horton infiltration zones (rainfall applied to the mesh outside of sub-catchment areas);
- amended initial soil saturation values following in-depth groundwater analysis;
- varying watercourse levels;
- varying tide levels using spring high tide;
- applying FEH13 design rainfall.
-

During the first three years of the AMP, the LWW partners have taken learning from across the world to scope and deliver the Blue Green Plan with support from consultants Stantec. Co-funded by Yorkshire Water and Flood Defence Grant in Aid (FDGiA), the study built upon the foundations of the RPS Strategic Study and focused on delivering a surface water management plan which would be supported at a city scale across multiple disciplines. This approach is important to ensure acceptance, but also to ensure efficiency can be achieved by aligning surface water management to wider

regeneration priorities. Optioneering was carried out at a city scale through a series of charettes; these were detailed workshops that were carried out with representatives from multiple departments from across the partner organisations and key members of supporting universities. Appendix G and H documents the charettes and their outcomes.

Throughout the AMP, as the solutions have been developed, designed and built into the model, we have ensured a continuous learning cycle. Our key learnings include:

- The importance of community acceptance: SuDS assets are visible and interact with public places and spaces. This is significantly different to traditional drainage and sewer systems which exist underground, serving one purpose only. The Living with Water partners have shared multiple examples from across the city of arson attacks on flood resilience infrastructure and the removal of newly-planted trees. To mitigate the risk of vandalism, we have taken a detailed approach to community consultation and engagement and for example this has led to us dramatically adapting our scheme at Rosmead Street to ensure it was in keeping with the needs of the local community.
- The need to maintain parking spaces, and the presence of existing underground services and trees have had a huge impact upon the design of the assets delivered in AMP7, often meaning that storage volumes need to be reduced to accommodate shallow services and existing trees. Accommodating for this in a densely populated, urban environment where space is limited is incredibly challenging, and this is something that has significantly influenced our AMP8 designs.

In support of this, substantial work within the community has been undertaken by LWW partners, including multiple community drop-in sessions, meetings with local Councilors, the development of a manifesto with the Youth Parliament, business breakfasts to identify opportunities, City of Culture events, school engagement and job fairs to raise awareness of flood risk and potential long-term solutions for resilience.

The surface water attenuation schemes we delivered in AMP7 do not disconnect surface water from the combined network because the surface water infrastructure to allow for this disconnection does not yet exist. The Blue Green Plan was completed midway through AMP7 and provides the basis on which to build a network that will allow full disconnection of surface water. Our intention in AMP8 and subsequently is to install this network of blue-green corridors.

As future iterations of the Blue Green Plan are delivered, and more specifically, as the blue-green corridors are created, the AMP7 surface water attenuation schemes can be disconnected from the combined network and plumbed into the new green corridors. This will create capacity within the combined network and further reduces flood risk, accordingly.

AMP8 Summary of Approach and Key Milestones and Learning

1. The Blue Green Plan sets out a long-term adaptive plan for Hull and the surrounding catchment. As detailed in the Blue Green Plan Report (submitted previously to Ofwat as part of a query response, and available as Living with water appendix (YKY-PR24-DDR-33) - Appendix H), the proposed short-term plan for 2025-2030 focused on delivering parts of the West Network and the Stoneferry Network, the cost associated with this was in the region of £357 million. Through a number of partnership workshops, supported by Stantec and our AMP7 delivery partners, it was agreed that deliverability at this scale over five years was not feasible, and that installation of blue-green corridors at this scale, given the knowledge gained through our AMP7 work, would not be acceptable for the impacted local communities.

The partnership agreed to focus on the West Network due to the knowledge and understanding of this location, as well as the presence of existing assets which could be utilised to support the plan.
The West Network is one of seven proposed networks across the city which allows surface water to be separated from the combined network and discharged to the Humber Estuary. In the Blue Green Plan Report, the West Network features in the short-, medium- and long-term delivery plan.
Further workshops and subsequent solution modelling took place to identify the preferred solution for AMP8. Section 2.4.2 further details the long list optioneering for AMP8 and Table 1.6 in the original PR24 Enhancement Case (YKY39) details the short list options appraised. Critical learning from AMP7 has been built into the long list and short list appraisal process.

2. The preferred solution for AMP8 is Adaptive Green 7, this will deliver critical enabling infrastructure for future AMPs: Fleet Drain Pumping Station and Anlaby Common Pumping Station. In AMP8 we would also propose to manage 7km of residential roads through new highway SuDS installations. This represents around 7% of the total length of highway associated with the West Network

3. We anticipate that further work will be needed in AMP8 to identify and secure wider funding for AMP9, including from regeneration and development funding sources, in order to continue to build flood resilience and transform the region.

AMP9 Summary of Approach and Key Milestones and Learning

1. The proposed investment for AMP9 will maximise the enabling infrastructure delivered in AMP8. Fleet Drain PS and Anlaby Common PS will have created the additional capacity within local watercourses to enable significant volumes of surface water to be disconnected, and to maintain discharges during high tide.

2. AMP9 will focus on building additional blue-green corridors and separating highway flows through the use of SuDS.

3. The success of the AMP8 work will be used to demonstrate progress towards overall flood resilience goals, and also to show how this can be achieved while enhancing the area for local communities.

4. Further funding will be sought for AMP10 to continue the creation of blue-green corridors, and for the separation of surface water from combined sewer systems. Additional areas for change will be identified that align with regeneration plans.

AMP10 Summary of Approach and Key Milestones and Learning

1. Building on 15 years of delivery experience, there will be a step change in pace and investment in AMP10.

2. This AMP focusses on delivery of larger blue green corridors, and delivering the remainder of the roadside SuDS to enable separation across the West Network.

2.4.4 Impact to EC of reduced funding

Following the draft determination, we have reviewed our options with regards to the allowance of £7.875m and identified that this level of investment would enable us to deliver ‘slow the flow’ measures only, for example: water butts, raingardens and roadside SuDS. The AMP8 schemes have been identified to create a system which disconnects flows from the combined network and attenuates them before ultimately discharging to the Humber Estuary via new and existing drainage systems. Delivering slow the flow measures only will drastically reduce the associated flood benefits, move costs forward into AMP9 to enable the future construction of the West Network and delay the progress needed to act ahead of the more significant impacts of climate change – minimising benefits that can be achieved for customers now. The effectiveness of the measures would be limited, as flows would need to be returned to the sewer network rather than to a new surface water management system of pumps, pipework and blue-green corridors. Due to a lack of effectiveness in flood risk reduction, it is unlikely that this investment would attract substantial match funding opportunities.

The Blue Green Plan has highlighted that a holistic approach to surface water management is needed and that disconnecting flows and diverting these to the Humber is a key objective. In AMP7 we have maximised the opportunities for SuDS measures which attenuate and return flows to the combined network, taking a city-wide approach to optioneering to identify where this method is effective and efficient. On this basis, we believe that there will be minimal opportunities for match funding. Given the time available to reassess our plans we have not been able to quantify this, however; it is an estimate based upon discussions with our partners.

To highlight the comparison on deliverables, we have set out our initial proposals from our original enhancement case and a table of deliverables associated with the draft determination allowance:

Deliverables associated with PR24 submission

Solution Type	Scheme Name	Cost Total (£m)	Cost YW (£m)
Water butts, raingardens, road-side SuDS	Slow the Flow	20.22	13.43
Blue Green Corridors	Blue Green Corridors	4.57	2.97
Pumping Station	Small Pumping Station	1.71	1.71
Pumping Station	Large Pumping Station Phase 1	10.6	6.89
Opex measures	Opex measures	1.8	1.25
	Total	38.9	26.25

Deliverables achievable with draft determination allowance

Solution Type	Scheme Name	Cost Total (£m)	Cost YW (£m)
Water butts, raingardens, road-side SuDS	Slow the Flow	7.7	7
Opex measures	Opex measures	0.96	0.875
	Total	8.66	7.875

2.4.5 Overlap of investment

To give confidence that there is no overlap of investment from previous AMPs, we have set out further detailed information at the outset of this section. This sets out our historic investment in flood resilience in Hull, and also provides further evidence of how this historic investment is accounted for in the hydraulic baseline. We have discussed the risk that remains and the need for long term sustained investment to address this.

To give further confidence, we also propose the introduction of a clause within the PCD which will state that the AMP8 investment cannot be attributed to the AMP7 performance commitment.

2.4.6 Stakeholder support

In Living with water appendix (YKY-PR24-DR-33) appendix J we provide letters of support from East Riding of Yorkshire Council and Hull City Council. The Environment Agency have confirmed that due to their role and their work with Ofwat, they are unable to provide a letter of support. We recognise that Hull is an area of business and housing growth, as discussed in their letter of support, and we will need to ensure that we respond to meet these needs in the future.

Our recent research shows that resilience, particularly against flooding, is an important priority for our customers. When testing support for our long-term delivery strategy this year (in which we spoke to 1,167 customers), the elements relating to flood resilience were all very well supported, with our Living with Water scheme (to increase flood resilience in Hull) receiving support from 92% of customers. In addition, 'Wastewater resilience', which improves the resilience of our wastewater assets to flood risk, had a support level of 96% from customers.

In the Ofwat-led Acceptability and Affordability testing, increasing resilience to flooding was the clear priority of both household and non-household customers, with 44% of household

participants and 48% of non-household participants choosing it as being most important (sample of 2,175 and 203, respectively).

Our stakeholder engagement work conducted in 2019 also shows that stakeholders want flood resilience to be a top priority for Yorkshire Water, with stakeholders citing this as their top choice when selecting up to three top priorities.

As evidenced in the sections above, the need of this enhancement case investment is clear, as failure to address the flood resilience risks will severely impact the city of Hull. It is a strategically important city for the region and nation, and our customers require full investment now, to make this next incremental step to mitigate future risks.

2.4.7 Best option for customers

This section addresses Ofwat's draft determination feedback on optioneering. We highlight where historic optioneering is discussed in other sections and here focus on the approach that was taken to get to the four options outlined in our enhancement case.

Section 2.4.1 details the investigations and studies that were undertaken in AMP6, highlighting the outcome of this study and previous optioneering activity that helped inform the Blue Green Plan.

The Blue Green Plan now sets the direction for our future investment. Based upon practical experience of AMP7 delivery, we have assessed the 'short-term plan' within the Blue Green Plan and opted to focus on the delivery of the West Network over multiple AMPS. The original short-term plan was to deliver a significant proportion of the West Network in 2025 – 2030, alongside a second network in the Stoneferry area of the city. This approach was discounted by partners on the ground of deliverability, affordability and community acceptance.

Once it was established that the partnership would focus on the West Network in AMP8, a wide and diverse range of options were considered before developing the shortlisted options in more detail. The table below provides a description of the long list of options and gives the reasons for their rejection in favour of the shortlisted options presented in the enhancement case.

It should be noted that this long list assessment did not revisit the in-depth whole city-level optioneering exercise undertaken in AMP6 and for the development of the Blue Green Plan (see Section 2.4.1) but rather considered more localised options.

In the draft determination feedback, Ofwat raise concerns about why blue-green only options were not considered. There are a number of blue-green options within the shortlist that were discounted, these are: 'source control only'; 'natural flood management' and 'exceedance management via aquagreens'. To ensure the partnership continues to adhere to the principles of blue-green, we will maintain a hierarchy approach. This is further detailed in table 2-6.

Table 2-6: Living with Water considered options

Option Name	Option Description	Reasons for rejection
Fleet Drain pumping station only	Installation of Fleet Drain pumping station to prevent tide-locking and release capacity in the upstream drainage network.	Insufficient flood resilience benefits when delivered in isolation. Minimal contribution to key LWW aims 'Showcasing our place' and 'Driving Sustainability'.
Source control only	Installation of source control SuDS measures in key areas of the west network.	Measures would need to operate in 'attenuation mode' only until connected into a separate surface water network at a future date. Insufficient flood resilience benefits.

Option Name	Option Description	Reasons for rejection
Stoneferry Blue Green Network	Begin delivery of the Stoneferry Blue Green Network in East Hull (identified in the BGP as a potential area for short term delivery).	Requires large blue-green corridors to be installed, in order to provide the separate system disconnection network required for flood resilience benefits to accrue. Need to build ability to deliver blue-green corridors in order to gain acceptability within the community before commencing with larger corridors.
Natural Flood Management	Extend the WADFAS basin arrangement to capture and store more overland flow from North West Hull before it enters the Sand Dyke and Setting Dyke systems.	Potential alternative use of this land at the time of discussion of the option. Should be re-reviewed in future if this situation changes.
Intelligent control of AEEFAS discharges	Balance available capacity in the Western Drain and Acre Head Drain by intelligently controlling the release of stored flows from AEEFAS. Would need to be delivered in addition to Fleet Drain pumping station.	Insufficient model data to verify this option and confirm potential benefit. Planned upgrades to EA river models may make this more feasible in future. Option should be revisited with LWW partners.
Large blue-green corridors	Installation of key blue-green corridors across the Hull west network to facilitate future disconnection of drainage areas.	Need to build ability to deliver blue-green corridors in order to gain acceptability within the community before commencing with larger corridors.
Exceedance management via Aquagreens	Construction of basins (Aquagreens) to collect exceedance flows from combined sewer network.	While this approach has been implemented in certain areas in the past (AMP7), for long-term flood resilience surface water needs to be removed from the combined system in order to relieve the pressure on the combined system by removing exceedance flow completely.
Use existing green corridor parallel to Willerby Road	Offset the requirement for a blue-green corridor on Willerby Road by routing it through this existing green corridor.	Would require replacement of a large number of trees. It may in future be possible to locate a smaller conduit via this route to augment the Willerby Road blue-green corridor.
Local grey storage	Provision of buried storage on existing available green space such as Anlaby Common, Costello Fields or the Hub School fields.	Previous model testing has shown minimal flood resilience benefits from this type of option. Additionally provides no contribution to key LWW aims ‘Showcasing our place’ and ‘Driving Sustainability’.
Separation via new surface water sewer network	Construct buried Surface Water pipe network without SuDS devices to collect and slow the flow. Discharge into Fleet Drain.	Likely to overload the downstream system due to no attenuation of surface water collected. Minimal treatment of collected flows could cause water quality issues in downstream system. Provides no contribution to key LWW aims ‘Showcasing our place’ and ‘Driving Sustainability’.
Local upsizing of sewers	Upsizing / installing additional combined sewers to increase network capacity. Provides online storage in addition to conveyance capacity.	Very disruptive to implement. Previous model testing has shown minimal flood resilience benefits from this type of option. Additionally provides no contribution to

Option Name	Option Description	Reasons for rejection
		key LWW aims 'Showcasing our place' and 'Driving Sustainability'.
Create new outfall to the Humber at Priory Sidings Pumping Station	Provide alternative route to Fleet Drain via Priory Sidings in order to reduce the dependence on Fleet Drain and avoid the need for a tidal pumping station on Fleet Drain.	Likely to be costly due to geotechnical implications of railway embankment above Priory Sidings Pumping Station. Additionally, most of the hydraulic constraint in the existing surface water is north of Fleet Drain, rather than in the Fleet Drain itself.
Direct connection into Acre Head Drain north of Anlaby Common	Avoid requirement for works on Anlaby Common by separating Surface Water and connecting into Acre Head Drain in area of Hull Road and/or Springfield Way.	Insufficient information on the Acre Head Drain (owned by East Riding of Yorkshire Council) to determine potential scope of connection. Would still probably require a pumping station at Anlaby Common to drain flow from the Norland Road / Derringham area.
Increase capacity of Anlaby Common Drain	Create the potential for additional Surface Water flow to pass to the Fleet Drain via the Anlaby Common Drain.	Very disruptive for residents along Anlaby Park Road South. Drain is very shallow at north end so may not be possible to substantially increase conveyance capacity even with a larger cross-sectional area.

2.4.8 Cost efficiency

- In this section we address Ofwat's feedback on cost efficiency and how the costs associated with our AMP8 investment link back to the Blue Green Plan.

As set out in our initial business plan enhancement case, there are limited tools available that capture the costs associated with delivery of retrofit sustainable drainage assets. We have previously discounted the Environment Agency's cost estimation for SuDS, as this was written in 2007 and does not consider retrofit SuDS scenarios.

Since the submission of PR24, the UKWIR project referenced in section 1.5.2 of the PR24 Living with Water Enhancement Case has now concluded. While the report has yet to be published, as contributors to the project, we have access to the draft tool and have used this to assess the elements of our AMP8 investment.

Living with water appendix (YKY-PR24-DR-33) Appendix D presents a detailed comparison between the costed blue green elements in the enhancement case against the unit costs used for the Hull Blue Green Plan and the UKWIR Cost of SuDS tool (further details of this reference source is provided in the appendix). Here we provide a summary of the cost comparison.

The assessment shows a slight increase in costs compared to the Blue Green Plan due to the specific locations presenting additional challenges (for example narrow streets in certain areas, as well as the requirement for redesign/relocation of park railings to facilitate the construction of one of the blue-green corridors). However, the overall costs proposed still reflect an efficient position, in terms of the source control measures, and considering the innovative nature of blue-green corridors, combined with the significant potential to provide flood resilience while improving the place for local communities.

Table 2-7: Unit cost comparison for source control SuDS (raingardens)

Cost Comparison Source	Unit cost per m2 of impermeable area managed	Unit cost per m3 of storage provided	LWW Enhancement Case Cost as a % of comparator

Living With Water Enhancement Case	£75	£3950	-
Living With Water Blue Green Plan	£65	£3420*	115%
UKWIR Cost of SuDS Tool	£91*	£4800	82%

The source control measures (raingardens) proposed in the enhancement case are costed at £75 per m^2 of area disconnected from the combined sewer network. This compares favourably with the equivalent cost calculated in the UKWIR cost of SuDS tool of £81. The reason for this cost efficiency is that the preferred enhancement case option allows the construction of raingardens in parallel with the installation of new surface water sewers in the streets concerned.

Table 2-8: Cost comparison for Anlaby Common blue-green corridor

Cost Comparison Source	Unit cost per m of blue-green corridor	Unit cost per m3 of storage provided	LWW Enhancement Case Cost as a % of comparator
Living With Water Enhancement Case	£1845	£268	-
Living With Water Blue Green Plan	£1540	£224	120%
UKWIR Cost of SuDS Tool	£2784	£405	66%

The 20% increase in the enhancement case as compared with the Blue Green Plan equivalent cost is an added risk allowance, due to the fact that no blue-green corridors currently exist in Hull and it is expected that there will be some learning required before a 'business as usual' position can be achieved. This is considered a proportional risk allowance for the current project stage based on AACE's Cost Estimate Classification System.

The unit cost used for the enhancement case is substantially lower than the equivalent cost generated by the UKWIR cost of SuDS tool because the Anlaby Common blue-green corridor will run across a large open field. Therefore, the costs associated with constructing the asset in a public open space (as assumed by the cost of SuDS tool) would still include cost components that are not likely to be a factor in this case.

It should also be noted that the large dimensions of the Anlaby Common blue-green corridor are outside the boundary of the cost model used by UKWIR Cost of SuDS tool. As such, the cost estimate produced by the tool is an extrapolation of the model and may therefore be less accurate.

Table 2-9: Cost comparison for Anlaby Park Road blue-green corridor

Cost Comparison Source	Unit cost per m of blue-green corridor	Unit cost per m3 of storage provided	LWW Enhancement Case Cost as a % of comparator
Living With Water Enhancement Case	£5955	£4315	-

Living With Water Blue Green Plan	£4646	£3367	128%
UKWIR Cost of SuDS Tool	£2743	£1988	217%

The 28% increase in the enhancement case as compared with the Blue Green Plan is an added risk allowance applied for similar reasons as for the Anlaby Common blue-green corridor (Table 3). This risk allowance is further increased due to the presence of railings and a bus stop in this section of Anlaby Park Road, which will potentially result in additional costs being incurred in completing the blue-green corridor.

All unit costs presented in Table 4 include a 30% risk allowance to cover the management of third party utilities.

The UKWIR Cost of SuDS tool does not allow for a like-for-like comparison in the case of the Anlaby Park Road blue-green corridor. This is due to the non-standard channel section required for the blue-green corridor, including the box section at invert and the steep sides of the channel. This is a significant part of the Blue Green Plan cost build up for this item and is necessary because of the need to secure sufficient hydraulic capacity alongside a relatively constrained street. As a result, the UKWIR tool calculates a lower cost than is required for installation of this type of corridor.

To cost the grey solutions, we have used the following approaches:

- We used a SuDS tool developed by a consultancy partner to estimate the costs for geocellular storage and cross checked this with our cost estimates.
- An estimate was used, based on agreed AMP7 LWW projects, for water butts in domestic properties across the catchment area.
- Costs provided by the Environment Agency for a similarly sized and situated pumping station, currently in delivery have been used to cost the large pumping station. The details of the Environment Agencies tidal pumping station on the Humber Estuary can be found here: Holderness Flood Alleviation Scheme (2024) | (waterprojectsonline.com)
- Where no suitable cost models were identified in our Unit Cost Database (UCD), we utilised information held in the national water industry costing database where applicable (TR61 v14). Adjustments to this data are required to account for differences in methodology and to account for Yorkshire Water design costs. We used this approach for the 20km of surface water sewers.
- For the rest of the scope, sewerage cost models from the UCD were deployed (sewers, chambers, smaller submersible pumping station, kiosk, power upgrade, emergency generator, telemetry outstation).

2.4.9 Customer protection

In the draft determination, Ofwat requested that:

“Yorkshire Water sets out what it will deliver in its response to draft determinations. We will then take this into account and consider establishing a deliverable linked to outputs to provide sufficient customer protection in case of non-delivery.”

In Section 2.4.1 ‘**Impact to EC of reduce funding’** we set out the deliverables that would be achievable with the draft determination allowance and compare this to our original business case.

We have updated our approach to the LWW PCD and this is detailed in ‘YKY-PR24-DDR-07-Price-control-deliverables'

We have opted for a deliverable associated with area managed or removed from the combined network as these measures can be based upon our original business plan and the draft determination allowance.

As we have set out, our AMP8 investment is focussed on creating new SuDS, networks and corridors which manage water and allow it to ultimately discharge to the Humber, an effective way for us to monitor the progress and success of this project is through the area managed or disconnected from the combined network. This ensures that we are making progress that enables future investment as well as delivering in AMP outcomes.

Through our draft determination representations, we have demonstrated that the best option for customers is to reinstate our full plan, as requested. For this original business plan investment of £26.25m, we propose a target of 10.5 hectares of **area disconnected** from the combined sewer network and drained to the Humber.

Should Ofwat maintain the position from the draft determination of £7.875m, we propose a target of 6.1 hectares of land **area, managed** via SuDS only. It is critical to understand that this 6.1 hectares will still drain through the existing combined network, and so will have limited overall impact on improving flood resilience across the full range all flood scenarios.

We are concerned that it appears as if we can achieve more with the £7.875m of allowed Ofwat funding than is actually possible. Our full plan (£26.25m) allows for the vital element of **surface water disconnection**, whereas the allowed £7.875m enables **attenuation** of flows only. While this looks like more hectares of surface water can be managed for less money through the allowed £7.875m plan, there will be limited flood resilience benefit associated with this.

We propose this is an end of AMP delivery PCD, with non-delivery returned on a unit cost basis. We do not include a formal delivery profile within the period. This is because the nature of the work within this PCD is highly dependent on partnership funding, the timing of which is very difficult to predict and is reliant upon national programming of Flood Defence Grant in Aid, which is updated annually. An end of AMP target gives us flexibility and allows for the timing of funding from external partners to vary.

In addition to the above, we propose two other additional amendments to the original PCD to strengthen our governance of the enhancement investment:

> We propose to include a provision that ‘slow the flow measures will prioritise blue-green options, but where these are not feasible, we will document the reason for selecting a grey alternative.
>
> We propose to include a caveat that none of the AMP8 investment attributed to this enhancement case can be attributed to the AMP7 performance commitment.

2.5 Concluding points

In conclusion, Yorkshire Water, our Living with Water Partners and our customers support the need for this enhancement case investment in AMP8. Across the last 10 years we have undertaken extensive optioneering and customer research to inform the co-creation of the Blue Green Plan. In AMP8, we have prioritised the first increment of this plan based upon deliverability, affordability and customer acceptance. The investment will enable the next step in creating greater levels of flood resilience within the city of Hull, a strategically important city for the region and nation, and will provide important benefits locally to our customers. Through our partnership, we are able to deliver the increased flood resilience at an efficient cost, with the additional benefit of match funding to share the full cost of the investment across organisations that also benefit. Together with our partners, we strongly believe that this is the right investment for our region, helping to deliver long-term security for years to come.

3 Industrial Emissions Directive (IED)

3.1 Overview

Yorkshire Water is requesting IED enhancement allowance to cover AMP8 IED costs and the shortfall in funding currently provided by Ofwat for our AMP7 IED costs. We request that Ofwat provides an enhancement allowance for 25% of its AMP7 IED costs, and 100% of its AMP8 IED costs, as submitted under CWW3.189 and ADD14, in order to provide Yorkshire Water with an equivalent level of funding compared to other WASCs.

Although Yorkshire Water received a favourable cost sharing mechanism as part of the CMA process in PR19, we received no funding for IED and a maximum potential recovery of 75% of our IED expenditure.

In the draft determination, Ofwat has granted companies (except Northumbrian Water and Yorkshire Water) 100% of Ofwat's modelled IED allowance, meaning comparatively Yorkshire Water is receiving a shortfall in funding equivalent to 25% of our costs.

We are therefore requesting Ofwat puts Yorkshire Water on an equal footing with the other companies in providing full funding for our IED costs instead of the maximum 75% currently proposed. This is particularly acute given an increase in forecasted costs in AMP8. This is due to the greater certainty of cost forecasts since submission, and a delay in the EA issuing permits and responding to proposals. This delay means that Yorkshire Water is unable to achieve completion of IED works by 31 March 2025, and there will be significant continuing work – and therefore cost – in AMP8. This is further detailed in section 3.4.4.

Our original appropriate measures enhancement case from the October business plan submission can be found here and the bioresources sludge strategy enhancement case from the October business plan submission can be found here.

3.2 Key messages

- Yorkshire Water is currently only able to recover a maximum of 75% of its IED costs in both AMP7 and AMP8, whereas other WASCs have been granted an allowance equivalent to 100% of Ofwat's assessment of their IED costs, therefore Yorkshire Water is materially disadvantaged in comparison.

- Yorkshire Water proposes that Ofwat provides an enhancement allowance for 25% of its AMP7 IED costs, and 100% of its AMP8 IED costs as submitted under CWW3.189 and within ADD14 of the additional data tables (YKY-PR24-DDR-64) in order to provide Yorkshire Water with an equivalent level of funding compared to other WASCs.

- The need for this enhancement allowance is further increased by the growth in IED expenditure in AMP8 since submission, owing to:

    1) **Delays in the EA issuing permits and responding to proposals** – these delays mean that Yorkshire Water is unable to achieve completion of IED works by 31 March 2025. Significant work and cost will therefore continue in in AMP8.
    2) **Costs have increased since submission in December 2023** - since submitting our IED costs to Ofwat in December 2023 we have received firm quotations from contractors. Our costs, particularly in relation to secondary containment have increased, further increasing the AMP8 IED expenditure. More detail on these points is provided in 3.4.3.

3.3 Change requested

We request that Ofwat re-assess our modelled cost as per table ADD14 within the additional data tables (YKY-PR24-DDR-64), considering our increased IED expenditure forecast since the December 2023 information submission, given our forecast is now more certain with a greater percentage based on firm contractor costs.

We ask that Ofwat provides an allowance for 25% of our AMP7 costs and 100% of our AMP8 IED expenditure in line with the provision Ofwat granted to other WASCs in the draft determination, so that Yorkshire Water is treated equitably on this issue. If additional funding is not granted in line with other WASCs, we fear this sets an unwelcome precedent of differing funding allowances for companies despite delivering the same regulatory obligations. Without providing a comparative level of funding to Yorkshire Water, Ofwat is creating an additional affordability challenge for Yorkshire Water compared to other WASCs across both AMP7 and AMP8, despite no previous funding being provided, only a cost share via the CMA process.

Table 3-1: Summary of IED submissions and Ofwat allowances

	Allowance (£m)
December 2023 IED Submission (OFW-OBQ-YKY-091, "IED Information request November 2023 – updated request.xlsx")	190.734
Effect of removal of covered cake storage by Ofwat in draft determination	-117.598
YKY net IED total submission December 2023	73.136
Ofwat draft determination assessed total IED allowance (pre-reconciliation)	75.8
Ofwat draft determination post reconciliation adjustment factor cost allowance	13.5

Table 3-2: Summary of changes to the IED enhancement allowance

	AMP7	AMP8	Total
December 2023 IED Submission with covered cake storage forecast removed	40.233	32.903	**73.136**
YKY draft determination response IED total forecast as per ADD14	38.572	72.515	**111.087**
PR19 CMA cost share reimbursement forecast (75% AMP7 only)	28.929	0	**28.929**
Requested PR24 allowance at draft determination Response (25% AMP7 / 100% AMP8)	9.643	72.515	**82.158**
Total effective YKY proposed allowance (consistent with Ofwat allowances to other WASCs in DD)	38.572	72.515	**111.087**

3.4 Yorkshire Water's response to Ofwat

3.4.1 The need for investment

The Industrial Emission Directive 2010/75 EU (IED) was the main EU instrument regulating pollutant emissions from industrial installations. The requirements of IED were implemented in the UK through the Environmental Permitting (England and Wales) Regulations 2016 (EPR).

IED sets out requirements to reduce harmful industrial emissions to achieve a high level of protection of human health and the environment. It regulates emissions to air, water, outputs management, and soil and groundwater contamination. Wastewater companies are required to obtain installation permits and expected to bring their applicable biological sludge treatment sites up to the standard required by IED and the Best Available Techniques (BAT) reference document for Waste Treatment (the BREF).

Yorkshire Water is required to comply with the IED at 12 digestion sites, investments to meet these new asset standards are extensive and are determined by the EA through the IED permitting process. Through its application of these standards, the EA is prescriptive in its assessment of what asset changes are necessary. There is therefore very limited scope for efficient alternative solutions.

3.4.2 Best option for customers

Ofwat assessed Yorkshire Water as efficient in the draft determination. Ofwat's modelled IED assessment of Yorkshire Water's costs was higher than our submission at the time.

While the activities we are delivering have remained the same, (except for the fully enclosed cake barns removed by Ofwat in DD) our costs have increased as we have moved from pre-contractor quotation estimates to firm contracted costs and contractor quotations. Opportunities to reduce cost through use of innovative solutions is extremely limited owing to the prescriptive nature of the IED requirements and its application to our extensive existing asset base.

We tested the IED Appropriate Measures Enhancement Case (EC) with customers and found that 84% of household customers supported the EC on the basis it was preventing odour issues and other risks. They deemed it was an acceptable level of investment for problem faced by Yorkshire Water, and the risk to customers overall. Support for the case rises to 92% of non-households and 100% of future bill payers.

3.4.3 Cost efficiency

As requested, we supplied detailed cost information to Ofwat in August 2023 and again in December 2023 on our forecast IED implementation costs. However, since those forecasts were submitted, we have further advanced our construction projects into delivery and have seen a significant increase in our costs over our previous estimates, particularly in relation to secondary containment delivery. Our forecasts are now more certain, as they are now based on either contracted costs, firm quotations or contractor provided budget quotations based on more advanced understanding of the EA's requirements.

Our previously estimated secondary containment costs were based upon an independent consultant assessment and involved a high degree of estimation. Yorkshire Water has not carried out work of this nature previously, so we did not have reliable cost models on which to base estimates.

3.4.4 Customer protection

Ofwat has proposed a non-delivery PCD in relation to IED compliance.

Ofwat indicated that companies should provide a profile of when IED compliance is expected to be achieved by site. We have provided that profile in the table below.

At the time of writing, Yorkshire Water has only received five of the 12 required IED permits from the EA, despite submitting all permit applications in accordance with the EA deadlines between 1 April 2021 and 1 October 2022. It is therefore unrealistic to expect full compliance with the permit conditions by the EA's deadline of 31 March 2025. Particularly as typical improvement conditions issued by the EA require their approval of designs prior to construction which is not possible for permits yet to be issued, and on issued permits the EA has taken over eight months (still outstanding at time of writing) to respond to an approval request impacting our ability to carry out construction work.

Considering these limitations, we have proposed dates for completion beyond the EA's deadline.

Table 3-3: Proposed completion dates for PCD Outputs

PCD outputs (cumulative)	Unit	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
Number of sites achieving IED compliance*	nr				2	9	12	
***TBC by the company**								

3.5 Concluding points

Yorkshire Water is currently only able to recover a maximum of 75% of its IED costs in both AMP7 and AMP8, whereas other WASCs have been granted a totex allowance equivalent to 100% of Ofwat's assessment of their IED costs, therefore Yorkshire Water is materially disadvantaged in comparison.

Yorkshire Water requests that Ofwat provides an enhancement allowance for 25% of its AMP7 IED costs, and 100% of its AMP8 IED costs as submitted under CWW3.189 and ADD14 in order to provide Yorkshire Water with an equivalent level of funding compared to other WASCs.

Owing to the delays in the EA issuing permits and responding to proposals, Yorkshire Water is unable to achieve completion of IED works by 31 March 2025 therefore there will be significant continuing work and associated cost, in AMP8. Additionally, as our IED projects have progressed since previous forecast submissions and our costs become more certain, the forecast cost to complete the work has increased.

4 First Time Rural Sewerage

4.1 Overview

First time sewerage costs were not represented in our October business plan submission. Since submission, we have received new requests for connection to the public sewer, and as part of our duty as sewerage undertaker, to resolve certain environmental issues. We now present these costs as part of our draft determination response.

4.2 Key messages

Inclusion of £5.84m for first time sewerage costs due to requirements identified after our October submission and new connection applications received.

4.3 Change requested

Table 4-1: Summary of changes to **the first time sewerage enhancement allowance**

	Allowance (£m)
October 2023 business plan submission	00.00
January 2024 business plan resubmission	00.00
Ofwat's draft determination	7.20
YKY draft determination representation	5.84

Addition of £5.84m and increase first time sewerage connections, by 23 to 118 total S101a properties since our October submission.

4.4 Yorkshire Water's response to Ofwat

4.4.1 The need for investment

Under section 101A of the Water Industry Act 1991 (WIA 91), the sewerage undertaker has a duty to provide a public sewer to resolve certain environmental issues. This sets out the need for investment, as we have a duty to provide sewerage connections upon request. This is limited to circumstances where existing drainage systems, that are not connected to existing public sewers, are giving rise, or are likely to give rise, to adverse effects on the environment and/or amenity and the most appropriate way of resolving those effects is by providing a public sewer.

Owners or occupiers of properties may ask Yorkshire Water to consider providing a public sewer in accordance with section 101A, where the sewerage system causing the adverse environmental effects serves two or more domestic properties.

The duty applies to properties served by non-main drainage systems such as septic tanks, cesspools etc or an existing drainage system, which does not already constitute a public sewer. Most importantly it must be causing, or be likely to cause, an environmental or amenity problem, such as polluting a watercourse (ditch, stream or river) or causing a smell, nuisance or public health problem, such that provision of a public sewer is the most cost effective and practicable solution.

There is a high level of uncertainty around predicting the amount of investment and number of properties which will require connecting to the public sewer network in each AMP period, see delivered S101a schemes below:

Table 4-2: AMP 3 S101a schemes

Description	Value (£k)*	No of properties	Unit rate (£k)
Kirkby Grange Flockton	115.4	7	16.5
Storrs Village	712	16	44.5
Falconer Lane Fence	126.4	5	25.3
Total	**953.8**	**28**	

Table 4-3: AMP 4 S101a schemes

Description	Value (£k)*	No of properties	Unit rate (£k)
Blacker Lane Crigglestone	122.1	10	12.2
Ackworth Road Purston	254.6	15	17
Camblesforth Selby	614.6	28	22
Stirton-with-Thorlby Skipton	1319.3	52	25.4
Old Cubley Penistone	100.2	4	25.1
Haggstones Road Worrall	410.6	7	58.7
Cliffe Common Cliffe	304.8	6	50.8
Total	**3126.2**	**122**	

Table 4-4: AMP 5 S101a schemes

Description	Value (£k)*	No of properties	Unit rate (£k)
Krumlin Road Barkisland Halifax	795.8	23	34.6
Lund Lane Lund Wood Barnsley	260	8	32.5
Langton Road Norton Malton	105	3	35
Total	**1056.9**	**34**	

Table 4-5: AMP 6 S101a schemes

Description	Value (£k)*	No of properties	Unit rate (£k)
Quaker Lane, Hightown	615.6	11	56.0

*values listed at outturn price base

There has been no expenditure in the AMP7 period on first time rural sewerage.

This is largely due to the circumstances which trigger an application to be made. However, as there is a duty to invest in this area if the criteria at each location are satisfied, we will always endeavour to respond to applications in the most timely and effective manner. We have only included for S101A applications which will impact delivery in AMP8, estimated at £5.84m.

The value of £5.84m has been derived through a notional design of the S101a requests, this considers location of existing sewage, ground coverage and topography.

Table 4-6: AMP 8 current applications/investigations

Description	Intitial design	TOTEX (£k)	No of props	Unit rate (£k)
Ewe Cote, Whitby - S101A	350m new sewer	715	7	102.2
Balk Farm Court,Birdwell - S101A	New SPS & 100 rising main	545	6	90.9
Kirkbymoorside - S101A	700m new sewer	510	7	72.9
Green Cliff, Honley - S101A	150m new sewer	204	5	40.7
Stillingfleet -S101A	1800m new sewer & new SAF package plant	2,396	81	29.6
Quaker Lane, Liversedge - S101A	125m sewer, new SPS & 200m rising main	1,034	8	129.3
Barrowby Lane, Garforth - S101A	75m sewer, new SPS & 215m rising main	430	4	107.5
Total		**5,835**	**118**	

Quaker Lane, Liversedge – note that there was a separate group of properties that were connected in AMP6. The AMP8 request is for a new group of properties for which there has been no previous allowance.

4.4.2 Best option for customers

Each S101A application is unique, and the solutions required also vary widely from package treatment plants and gravity sewers to pumping stations and rising mains. When an application is received, we will examine a number of possible options, including the provision of a new public sewer, repairing or rebuilding the existing drainage system etc in accordance with the Defra guidelines. In each case, the decision will be based upon a judgement of all technical and financial considerations, as well the expected environmental and amenity benefits.

4.4.3 Cost efficiency

The solutions are notional following a site visit with key stakeholders on the project, while ensuring the asset provided to the customer is suitable and can be maintained to a safe and serviceable standard by complying with current engineering specification. Each of these have been costed using our company unit cost database of historic costs; these costs are based on actual outturns and contain no bias in the types of activities required. The unit cost database is updated annually and kept up-to-date with fluctuations in the market.

The solutions are complex in nature and will require further detailed feasibility studies undertaking solution optioneering, hydraulic model runs and ground investigations. This will potentially present a number of detailed solutions which will be assessed to promote the best option for the business, customer and environment. This stage of work will be undertaken at the onset of the project, which will also help to identify any further cost efficiencies.

4.4.4 Customer protection

The value is below the PCD materiality threshold.

4.5 Concluding points

The company requires £5.84m to connect table 4-6 listed first time rural property applications to the public sewerage system and thereby ensure compliance with Section 101A of the Water Industry Act

5 WINEP: Waste investigations

5.1 Overview

Within our business plan submission, we proposed £87.641m[1] expenditure, covering a range of wastewater WINEP investigations. Following Ofwat's draft determination assessments, an allowance of £58.473m has been made to cover these investigations. We are unable to accept this position, and address the concerns set out by Ofwat within the enhancement case below. Please note, the expenditure proposed within this enhancement case removes the observed double count of transitional expenditure from Ofwat's assessment, as detailed in section 1.1 above.

Ofwat's cost assessment is set out within the PR24-DD-WW-Investigations document, with greater detail found within the 'Deep dive_YKY' tab. Ofwat's concerns, and related efficiencies, have primarily been based on:

- **Need for enhancement investment:** Ofwat has applied a 10% adjustment in respect of the need for our investment. This is due to being unable to fully reconcile our proposed investigation programme against the WINEP, and the inclusion of three holding lines relating to the EnvAct_INV1, 2 and 3. Within our representation, we include a full breakdown of our investigation programme as well as further details on the holding lines which have been specifically requested by the Environment Agency.
- **Best option for customers:** Ofwat has applied a 20% adjustment due to 91% of our investigations being proposed as complex. Within our representation, we detail our assessment of our proposed investigation programme, providing additional detail on their complex requirements, and also include further detail in section 5.5.2 on our costing methodology for these complex investigations, and demonstrate why this does provide the best option and value for customers.
- **Cost efficiency:** Ofwat has applied a 10% adjustment regarding cost efficiency. We provide further detail on our costing approach and historic investigation programme (including Urban Pollution Management studies and Storm Overflow Assessment Framework investigations) within our representation to demonstrate why this adjustment is not appropriate.

Ofwat also raised concern on our Wastewater Investigations Price Control Deliverable, within their assessment. We have reviewed this and provide further information in section 5.5.4 to support our approach. Ofwat's PCD currently expects all investigations to be completed by 30 April 2027, with a query to clarify this position under DDQ_163. As this does not align to the WINEP, we have provided an updated profile for inclusion in WINEP Investigation dates spreadsheet (YKY-PR24-DDR-36).

Within our representation, we also request additional funding for SOAFv2 (Storm Overflow Assessment Frameworks version 2) investigations. This additional requirement was raised by the Environment Agency at the National Intermittent Task and Finish Group in April 2024, following on from our business plan submission. At the time of writing our representation, the guidance for these investigations is yet to be published. However, from discussions with the Environment Agency, we have assessed our 2023 EDM return and proposed an expenditure allowance to undertake 600 SOAF v2 investigations. This number of investigations was derived from the application of a suggested average of 20 spills per year trigger for the proposed SOAF v2 using data from the 2021 to 2023 Event Duration Monitoring returns, excluding any sites which had previous SOAF investigations undertaken in AMP7 and sites which have proposed EnvAct_INV4 investigations in AMP8.

Details on our original enhancement case can be found within Chapter 13 and Chapter 14 of Appendix YWY43_WINEP Enhancement Case[2].

[1] January 2024 data table re-submission
[2] https://www.yorkshirewater.com/media/kukjfz3f/yky43_winep-enhancement-case.pdf

5.2 Ofwat action reference

We received one Ofwat action in relation to the expenditure proposed under wastewater investigations:

- DDQ_163: We are aware that some storm overflow investigations may have a 31 March 2030 completion date, according to the September 2023 WINEP. For final determination, the company should clarify the delivery dates of its WINEP investigations (by driver) so that we can review this PCD to reflect the final number, categorisation and delivery date of investigations, as agreed with the Environment Agency, and assign the correct outcome delivery date for this PCD.

Please see Table 5-1 below:

Table 5-1: Number of investigations by year

	2025/26	2026/27	2027/28	2028/29	2029/30	Totals
Simple	**0**	**0**	**17**	**0**	**0**	**17**
EnvAct_INV1			5			5
EnvAct_INV2			4			4
EnvAct_INV3			3			3
WFD_INV_MOD			2			2
25_YEP_INV			2			2
WFD_INV_CHEM*			1			1
Complex	**0**	**0**	**518**	**0**	**180**	**698**
BW_INV1			1			1
BW_INV2			2			2
EnvAct_INV4			512		180	692
WFD_INV			3			3
SOAFv2 – Complex (Assumed profile dependent on guidance)	**0**	**0**	**0**	**0**	**600**	**600**

* only WINEP ID 08YW100086a Water company contribution towards national local chemical investigations. Investigation of the sources of silver to Knostrop wastewater treatment works

A full breakdown of these can be found within WINEP investigation dates (YKY-PR24-DDR-36).

We also provide further detail on the expenditure associated with our investigations in our response to OFW-REP-YKY-003.

We also address Ofwat's concerns highlighted in the PR24-DD-WW-Investigations assessment deep dive assessment. These are set out in section 5.5 below.

5.3 Key messages

Our key points of representation are as follows:

- **40% efficiency assessment**: Within Ofwat's draft determination, a 40% efficiency has been applied to wastewater investigations, making Yorkshire Water's business plan undeliverable. We are unable to accept this, and challenge this efficiency based on our multi-AMP experiences of undertaking complex WFD Investigations and through our AMP 7 SOAF investigations. We understand that our Framework Rates agreed in May

2021, which have been used to develop our costing proposals are competitive compared to the rest of the industry.
    - Our 'Simple' and 'Complex' investigation unit costs are close to the industry median unit cost demonstrating that our proposed costs are not an outlier for the work required. It is only when industry 'Desk Based Investigations' are included that we appear high compared to the median.
    - Our Framework Rates agreed in May 2021, which have been used to develop our costing proposals, are competitive compared to the industry.

- **SOAF v2 inclusion**: We propose an additional £68.4m of expenditure allowance to deliver the proposed SOAFv2 (Storm Overflow Assessment Frameworks version 2) investigations. This is an additional requirement from the Environment Agency since our business plan was submitted. We have provided an assessment of the number of investigations and the expenditure requirement of SOAFv2 investigations based on our AMP7 investigations and our EDM 2023 return, which has resulted in a further 600 SOAFv2 investigations.

- **PCD dates** - Within the "PCD" tab of the PR24-DD-WW-Investigations spreadsheet it states that all investigations need to be completed by 30 April 2027. This is contradictory to the agreed WINEP position for some of the drivers within this expenditure allowance. We are aware that Ofwat has asked us to clarify this position in response to query DDQ_163. We have tabulated the proposed dates in Table 5-1 above.

5.4 Change requested

Table 5-2: Summary of changes to the WINEP: river water quality investigations enhancement allowance

	Allowance (£m)
October 2023 business plan submission	87.062
January 2024 business plan resubmission	87.641 *
Ofwat's draft determination	58.473
YKY Draft Determination Representation	
January 2024 business plan resubmission	*87.533* **
Additional SOAFv2 investigations (600 no.)	*68.400*
YKY draft determination representation Total	**155.933**

* note this value is YW submission, Ofwat value has a double count of transitional
** £0.108m removed from January 2024 Business Plan, due to reallocation to Growth, line CWW3.153

5.5 Yorkshire Water's response to Ofwat

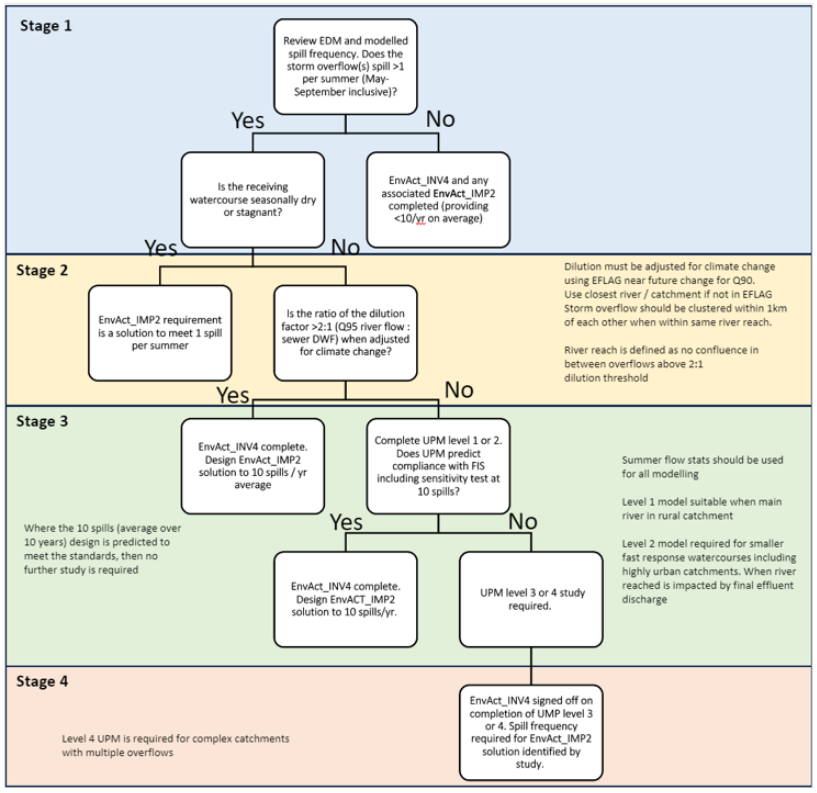
The table below presents Ofwat's commentary from the PR24-DD-WW-Investigations.xlsm Yorkshire Water Deep Dive tab, alongside a summary of the rationale underpinning this representation. This is further detailed in the following section.

Table 5-3: Evidence to support the rationale for the waste investigations representation

Ofwat concerns	Representation rationale and supporting evidence
Need for investment	
The investment partly meets the criteria for enhancement investment and additional customer funding. We are unable to fully reconcile the breakdown of investigations with its 2025-2030 water industry national environment programme (WINEP) programme.	The expenditure for this enhancement case is driven from WINEP requirements, as set out within the Environment Agency's PR24 driver guidance. We have tabulated a full breakdown of our wastewater WINEP investigations in Section 5.2 above in response to DDQ_163. This is also provided in greater detail YKY-PR24-DDR-36-WINEP investigation dates and with supporting expenditure details in response to Query OFW-REP-YKY-003.

The company provides a breakdown of its investigations programme, which covers 10 different WINEP drivers, dominated by storm overflow (EnvAct_INV4) schemes. Its business plan states that investigations contain a mix of levels of UPM and complexity in data collection and modelling. We note that the September 2023 WINEP contains three 'holding lines' for the EnvAct_INV1, 2 and 3 drivers which suggests some uncertainty around the number of schemes required to be delivered. The final number of investigations will need to be confirmed and evidenced for final determination.	Since business plan submission, as a result of an Environment Agency request in February 2024, some changes have been made to the EnvAct_INV4 named storm overflow investigations. This request requires all confirmed, or probable, RNAGs (Reasons for Not Achieving Good) relating to intermittent discharges to have an EnvAct_INV4 investigation completed by 30 April 2027. We have amended our programme as required but our commitment to complete 692 EnvAct_INV4 investigations by 31 March 2030 remains. The WINEP is being updated to reflect these changes. With regards to the three 'holding lines' for the EnvAct_INV1, 2 and 3 drivers, these were included at the request of the Environment Agency within the WINEP correspondence. An industry working group was set up in July 2024 to define objectives, scope, structure, timescales with a further UKWIR investigation proposed. The output of these projects will inform the EnvAct_MON driver as well as EnvAct_INV1, it would also include elements of EnvAct_INV2 and EnvAct_INV3 to allow completion of these holding lines in AMP8. Further details on the UKWIR project can be found in section 5.5.1 below. Within our representation, we have included an additional need to complete 600 SOAFv2 investigations, based on an additional requirement set out by the Environment Agency in April 2024. The scope and expenditure allowance for these investigations is based on the information we have available to date. Further details on SOAFv2 can be found in section 5.5.1 below.
Best options for customer	
We have some concerns that the investment is the best option for customers. Within the submission, 91% of all investigations have been allocated to the 'complex' category. It is not clear why the company has made this assumption for almost all of its investigations. Following insight from the EA, it could reasonably be expected that a large proportion of storm overflow investigations will be simple, and/or the company will be able to utilise previous studies to meet the EnvAct_INV4 requirements. As a result, we would not expect all of a company's storm overflow investigations to require a complex investigation. The company has not provided sufficient and convincing evidence that the options provide the best value for customers, particularly in relation to the justification for the high number of investigations classified as complex.	We have considered that the following drivers constitute complex investigations: - EnvAct_INV4 – discussed below - BW_INV1 – similar in nature to a Level 3 or 4 UPM - BW_INV5 – similar in nature to a Level 3 or 4 UPM - WFD_INV – similar in nature to a Level 3 or 4 UPM The remaining drivers in the expenditure area have been classed as simple investigations. We have determined our EnvAct_INV4 driver to be complex investigations (including multiple surveys, and/or monitoring locations, and/or complex modelling wastewater). These studies will require surveys and monitoring to have been undertaken at multiple locations to ensure that the sewer modelling requirement is compliant with the CIWEM UDG code of practice. We will undertake complex, dynamic modelling to enable assessments of a full range of storm events to determine the impact of our assets. The Water UK-proposed investigation process extracted from the "Draft Technical Paper - EnvAct_INV4", shown below, demonstrates that the full complexity of an investigation cannot be determined until Stage 3. Further details on the development of the Draft Technical Paper and our experience in undertaking investigations can be found in section 5.5.2 below.

Proposed Investigation Process



Where a Level 3 or 4 Urban Pollution Management (UPM) is required, from experience these investigations require 2.5 – 3 years to complete. Level 3&4 UPMs are highly complex and dynamic assessment tools which traditionally requires at least a year's river flow and river water quality data, supplemented by additional triggered event data for several storms. This data is then used to build and calibrate a complex river flow and water quality model, with a complex dynamic sewer model also utilised to undertake the assessments.

In response to Ofwat's concerns regarding a need for 'sufficient and convincing evidence' that our selected options provide the best value for customers we provide additional detail on our costing methodology which takes into account the variance in study complexity and ensures a risk-based approach has been taken to create a fair investigation unit rate. The unit rate for EnvAct_INV4 has been calculated using an average of our AMP7 SOAF programme costs (including forecast and outturn). Our AMP7 programme has been comprised of:

- 57% Level 1 investigations
- 27% Level 2 investigations
- 16% Level 3 investigations.

By developing a unit cost from across a range of complexities within the AMP7 programme, we consider our costings account for the range of risks and potential variation required within the EnvAct_INV4 investigations, despite our programme containing a high volume of complex investigations. Our costings capture this range of risks and potential variations, without exposing our customers to an unfair cost exposure and ensuring we deliver best value for our customers.

Although we have classified the majority of EnvAct_INV4 investigations as complex, we have demonstrated above how our unit cost make up of complex investigations assumes that only 16% of the programme is of the highest level of complexity (Level 3), with the largest proportion of the cost being derived from Level 1 investigations (57%). We have demonstrated how this logic is developed based on the actual outcomes from our existing AMP7 programme. As such our rate for complex investigations does provide the best value for customers and our categorisation of the investigations is justified. Although we have classified the EnvAct_INV4 as complex, the costing approach assumes only 16% of the programme of work is of the highest complexity.

For the additional proposed 600 SOAFv2 investigations, we have costed these, in the absence of formal guidance, as being equivalent to the AMP7 SOAF investigations. We have used the same unit cost for these. We consider them

	to be complex investigations, but as outlined above our unit costing rate takes in to account the variance of UPM Level complexity.
Cost efficiency	
We have minor concerns whether the investment is efficient. The company has the highest requested allowance for investigations despite having only the 4th largest delivery programme. It provides a high-level explanation of its costing approach, using costs developed from previous investigation activities and framework rates that extend partially into the period of 2025-2030 with embedded efficiencies. The company states that its costs were developed either based on previous experience and framework rates with embedded efficiencies or based on a balanced view of the overall cost needed to ensure the schemes are as efficient as possible. The company does not provide convincing evidence of the embedded efficiencies it includes using either benchmarking or third-party assurance for this chosen area of investment. Furthermore, due to the uncertainty surrounding the size and complexity of the investigation programme we have some concerns that the costs proposed are inefficient.	We accept we have requested the highest amount for our investigations, based on the investigations being complex in nature, and within our representation challenge Ofwat's cost efficiency. Our unit cost for both 'Simple' and 'Complex' investigations are close to the median unit cost for the respective categories, demonstrating that our proposed costs are not an outlier for the work required. It is only when the 'desk-based' investigations are added to the assessment that we appear high compared to the median unit cost for 'All' Investigations. Further details on this can be found in section 5.5.3 below. We consider our unit cost for both 'Simple' and 'Complex' investigations to be competitive. We also consider the framework rates used to build these costs to be competitive compared to the rest of the industry. Further details on this can be found in section 5.5.3 below. Our Specialist Modelling Framework Rates were competitively tendered from a range of consultants and agreed in May 2021. This was prior to wider inflation pressures and significant increase in modelling demand across the industry, which we know has driven the rates for more recently tendered agreements higher, by up to 25%. We are highly experienced in the delivery of investigations (including complex) across a number of AMP periods, meaning that we have some of the greatest knowledge and understanding of the complexities and data requirements of such investigations within the industry, and as such have utilised this experience to inform our procurement and tendering process such that we are able to gain bids that are efficient and best value. Our proposed AMP8 programme costs are based on our AMP7 rates as detailed in the previous section. Due to market rate inflation, driven by the demand for modelling resource on the back on the Environment Act, and significant wider inflationary pressures, we also know that our suppliers will need an increase on the agreed rates, if we are to retain the resources and capabilities needed to deliver these investigations. As we have not accepted any increases in these unit rates to date, we have not included any of these costs in our prices submitted for AMP8. If Ofwat do reduce our costs by the suggested 10%, this would create an amount of stretch that we could not deliver. Put simply, Ofwat's assessment of our costs would mean that the programme would be unachievable. We have costed each WINEP driver according to the scale and complexity of the potential investigations. As detailed above, we have calculated a unit rate for our EnvAct_INV4 investigations using an average of our AMP7 SOAF programme costs (including forecast and outturn). This is based on: - 57% Level 1 investigations - 27% Level 2 investigations - 16% Level 3 investigations. The cost to deliver a Level 3 UPM can be up to 5x the cost of a Level 1 or 2 UPM based on the catchment specifics. By assuming the same split as the AMP7 SOAF investigations for UPM levels, we have, in effect, taken on the risk of studies requiring more in-depth UPM investigations. We are also having to cost these investigations without finalised published guidance and not being able to determine the scope of the individual investigations for each named overflow until the work is progressed in earnest. For the additional SOAFv2 investigations, we are proposing the same approach as that listed above. Again, there is no published guidance for these investigations, and we understand that a formal consultation will be issued in due course. For the BW_INV1, BW_INV5 and WFD_INV investigations, we have been able to develop scopes and cost the specifics of the investigations. It should be noted that these are significantly more costly that the unit cost allowance for an AMP7 SOAF investigation.
Customer protection	

We have some concerns regarding the proposed price control deliverable (PCD). The proposed PCD covers only the storm overflow EnvAct_INV4 schemes and excludes other investigation drivers from this customer protection mechanism. The company explains that it is still working with the Environment Agency on the scope of the investigations programme, and it considers that the price control deliverable will protect customers where there is an agreed reduction in scope, for the storm overflows only. The expenditure in this area is material and, due to the scale of the investigation programme dominated by the statutory EnvAct_INV4 storm overflow actions, where c. 70% of the company's actions are due to be delivered by April 2027, we consider a PCD is required. We set a PCD for draft determination based on the number of investigations completed by the action delivery date. For more information on PCD decisions see the PR24 draft determinations: Expenditure allowances - Price control deliverable appendix.	Given the that the EnvAct_INV4 driver guidance is yet to be formally published and based on the draft guidance, the complexity of the study cannot be determined until the work is started in earnest (Stage 3, as highlighted on the flow chart under the Best Option for Customers above). As such, within Cost Efficiency Cross Cutting Issues (YKY-PR24-DDR-05) we propose an update to the Storm Overflows Uncertainty Mechanism to include the EnvAct_INV4 and SOAFv2 investigations to better protect the customer and the water company, following on from Ofwat's response to our query OFW-IBQ-YKY-025. From the water company's perspective, we have had to estimate/ assume the level of UPM investigation, monitoring and subsequent modelling, based on draft guidance. There is potential that some investigations are less involved and therefore cheaper, but this is offset with a risk that some will be complex and more expensive, than the AMP7 Storm Overflow Assessment Framework investigations split. The complexity and total costs are not determined until the first 3 stages of the proposed draft process have been completed. We have proposed an update to the existing Storm Overflow uncertainty mechanism around this which allows for remeasure of costs. This would account for the cost differences between the Level 1&2 UPM and Level 3&4 UPM investigations, this and would provide a fairer way forward for all and better protect customers money. We are aware that Ofwat has asked us to clarify the delivery dates for individual investigations in response to query DDQ_163. We have tabulated the proposed dates in section 5.2, see also WINEP investigation dates (YKY-PR24-DDR-36).

5.5.1 The need for investment

The expenditure in this area is driven from WINEP requirements, in response to the Environment Agency's guidance. In addition, we have included funding to undertake 600 SOAFv2 investigations based on the information provided to date by the Environment Agency based on our EDM returns. These investigations are essential to comply with the Urban Wastewater Treatment Regulations (UWWTR), inform future strategies and the next business plan and ensure that we do not cause harm to the environment from our discharges both now and into the future.

Changes have been made to the EnvAct_INV4 named storm overflows, as a result of a request from the Environment Agency. In February 2024, the Environment Agency requested that all confirmed or probable RNAG (Reasons for Not Achieving Good) relating to intermittent discharges required an EnvAct_INV4 to be completed by 30 April 2027. We have therefore amended our programme to address this requirement but have still committed to complete 692 EnvAct_INV4 investigations by 31 March 2030. The WINEP is being updated to reflect these changes. The list of investigations can be seen in our response to Ofwat query DDQ_163.

With regards to the three 'holding lines' for the EnvAct_INV1, 2 and 3 drivers, these were included at the request of the Environment Agency. Through the Environment Agency's Water Company WINEP Surgeries, an industry working group was set up on 23 July 2024 to agree project objectives, scope, structure and timescales. Since then, a further joint UKWIR investigation has been proposed, with companies required to contribute £250k each to complete the following:

1. a review of what constitutes the estuarine/inland complex/coastal sites,
2. a review of the existing trials/literature/installations,
3. a review of monitoring approaches to include standardised methodology,
4. consideration of practical elements and data reporting, and then
5. physical trials of monitoring equipment.

The output of the project would be a framework of recommendations to inform the EnvAct_MON driver and, while the project would focus on EnvAct_INV1, it would also include elements of EnvAct_INV2 and EnvAct_INV3 (the review elements particularly). The £250k is in line with the costs we proposed in our original business plan submission, based on the number of investigations we proposed.

Both our storm overflow and WINEP enhancement cases presented to customers included reference to investigations. 90% of our customers support the activity outlined in the Storm Overflow Enhancement Case and 88% support the activity outlined in the WINEP enhancement case. This is because customers understand that, if they want an improved environment, it is imperative to select appropriate interventions and investment.

5.5.2 Best option for customers

We have assumed our EnvAct_INV4 driver to be complex investigations, which heavily weights the investigations in this enhancement area. The proposed investigation process extracted from the “Draft Technical Paper - EnvAct_INV4”, shown in the Section 5.5 above, means that the complexity of an investigation cannot be determined until Stage 3.

There is a significant amount of work to be completed prior to completing Stage 3, which poses water companies both programme and financial risks. For instance, if a Level 3 or 4 UPM is required, traditionally at least a year’s river flow and river water quality data is required and supplemented by triggered event data for a number of storms, collected through water quality samplers. This data is then used to build and calibrate a complex river flow and water quality model, linking into detailed sewer network models to undertake the assessments. In our experience, Level 3 or 4 UPM (Urban Pollution Management) investigations take 2.5-3 years to complete and are dependent on weather conditions. Given that the requirement for this work cannot be determined until the completion of Stage 3, this is a significant risk. Given this risk, we have proposed an update to the Storm Overflow Uncertainty Mechanism.

We have costed the EnvAct_INV4 investigations based on the same unit cost as those SOAF investigations undertaken in AMP7. These investigations covered a range of Level 1, 2 and 3 UPM studies. The definition of the UPM Level for the AMP7 SOAF investigation followed a process which we developed with our local Environment Agency Integrated Environmental Planning Team. The UPM level split for the AMP7 SOAFs has been 16% Level 3, 27% Level 2 and 57% Level 1. We therefore consider our methodology for costing takes account of the complexity risks and variation in the EnvAct_INV4 investigations and strikes an appropriate balance of risk.

We were heavily involved in developing the “Draft Technical Paper - EnvAct_INV4”, which is the draft guidance for the EnvAct_INV4 investigations, along with the Environment Agency, United Utilities and Severn Trent Water. From discussions with a number of other water companies not listed here, it was noted that they had not undertaken Level 3 or 4 UPM investigations in the past 3 AMPs. As such, they were not as aware of the complexities and data requirements of such studies. It should be noted that the development of the “Draft Technical Paper - EnvAct_INV4” guidance occurred after the original plan submissions.

Given our experience across previous AMPs in delivering Level 3 UPMs, we are confident in our understanding of the detail required to complete such investigations. As the complexity cannot be defined until Stage 3 of the proposed process, we have embedded our AMP7 experience, and although we have classified the EnvAct_INV4 as complex, the costing approach assumes only 16% of the programme of work is of the highest complexity.

For clarity, we have considered that the following drivers constitute complex investigations:

- EnvAct_INV4 – discussed above.
- BW_INV1 – similar in nature to a Level 3 or 4 UPM
- BW_INV2 – similar in nature to a Level 3 or 4 UPM
- WFD_INV – similar in nature to a Level 3 or 4 UPM

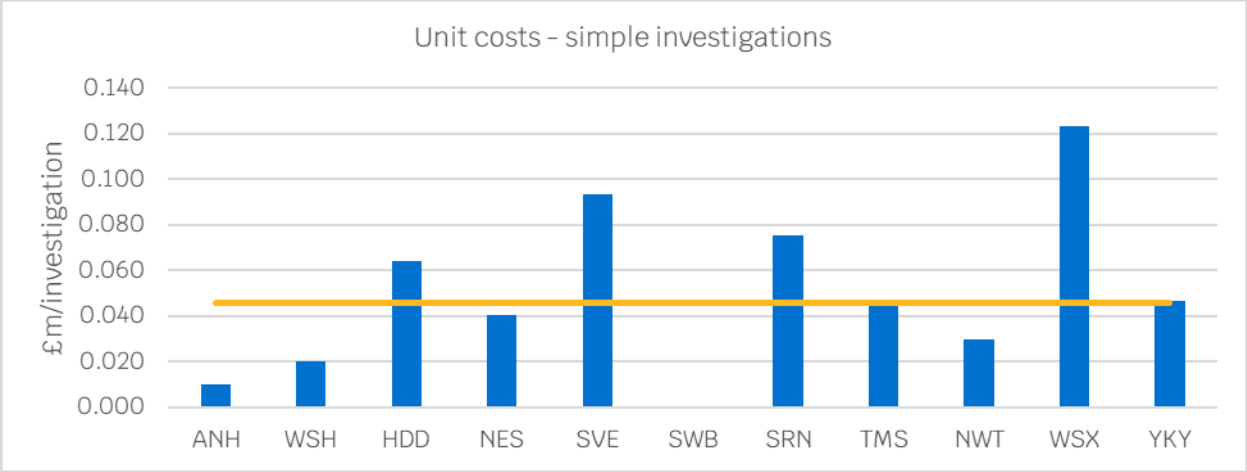
The remaining drivers in the expenditure area have been classed as simple investigations.

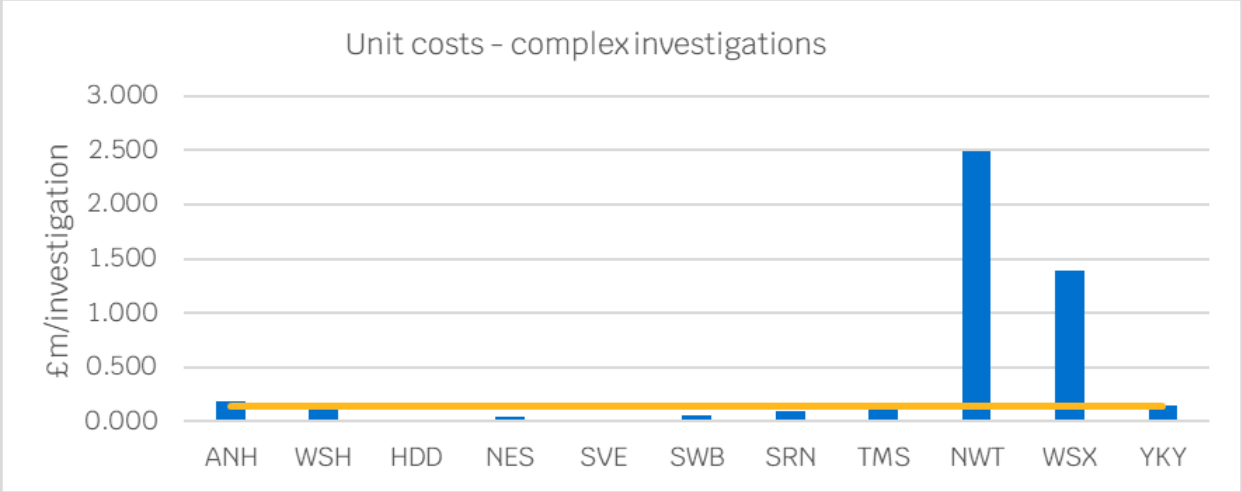
For the proposed 600 SOAFv2 investigations, we have costed these, in the absence of formal guidance, as being equivalent to the AMP7 SOAF investigations. We have used the same unit cost for these. We consider them to be complex investigations, but as outlined above, our unit costing rate takes in to account the variance of UPM Level complexity and is therefore at an efficient rate for these investigations.

5.5.3 Cost efficiency

Our unit cost for both Simple and Complex investigations, as highlighted in the graphs below, are close to the median unit cost (in yellow) for the respective categories, demonstrating that our proposed costs are not an outlier for the work required. These graphs are abstracted from PR24-DD-WW-Investigations document within Ofwat's draft determination. It is only when the desk-based investigations are added to all the investigations that we appear high compared to the median unit cost for all investigations. This is heavily skewed due to the large number of desk-based Investigations that Welsh Water are undertaking; which accounts for 10% of the industry's investigation programme. As explained in the section above, our costs for the EnvAct_INV4 drivers assume the same mix of UPM levels as our AMP7 SOAF investigations.

Figure 5-1 draft determination unit costs for Investigations





We consider our rates to be competitive compared to the rest of the industry. Our Specialist Modelling Framework Rates were competitively tendered from a range of consultants and agreed in May 2021. This was prior to wider inflation pressures and significant increase in modelling demand across the industry, which we know has driven the rates for more recently tendered agreements higher, by up to 25%. We have used our costs for the AMP7 SOAF schemes to cost the programme of work for AMP8.

Since we submitted our business plan, our Specialist Modelling Framework consultants have (through the appropriate contractual mechanisms) requested rate increases, sighting more recent successful tenders won with other WASCs that offer rates far in excess of our current

framework rates. Through our commercial services team, we have scrutinised and tested the wider market, and awarded modest increases where we deem it required. We still believe that our agreed market rates are competitive. Based on this, we consider that the Ofwat reduction to our costs would mean that the programme would be unachievable to deliver in AMP8.

It is important to note that, along with the Environment Agency, United Utilities and Severn Trent Water, we were heavily involved in developing the "Draft Technical Paper - EnvAct_INV4", which is the draft guidance for the EnvAct_INV4 investigations used by the industry. Through the draft determinations process, United Utilities and Yorkshire Water have had 40% reductions on proposed costs. It was noted from discussions with the other water companies not listed here, that they had not undertaken Level 3 or 4 UPM investigations in the past three AMPs and they were not aware of the complexities and data requirements of such studies. The development of the Draft Technical Paper - EnvAct_INV4" guidance occurred after the original plan submissions. It could therefore be argued that the other companies had under-costed their more complex EnvAct_INV4 investigations, compared to Yorkshire Water and United Utilities, who have greater experience of complex investigations.

In terms of the programme uncertainty, we have assumed the same split of UPM levels as our AMP7 SOAF investigations. The UPM level split for the AMP7 SOAFs has been 16% Level 3, 27% Level 2 and 57% Level 1. The costs for Level 1 and 2 UPMs are not significantly different, whereas the costs for undertaking a Level 3 or 4 UPM is in the region of five times the cost of a Level 1 or 2 UPM investigation (the costs for a Level 3 UPM can vary from this five times larger figure, based on the specifics of the study and monitoring requirements of the study catchment). By assuming the same split as the AMP7 SOAF investigations for UPM Levels, we have, in effect, taken on the risk of studies requiring more in depth UPM investigations. We are also having to cost these investigations without finalised published guidance and not able to determine the scope of the individual investigations for each named overflow until the work is progressed in earnest.

For the SOAFv2 investigations, we are proposing the same approach as that listed above. Again, there is no published guidance for these investigations, and we understand that a formal consultation will be issued in due course.

For the BW_INV1, BW_INV5 and WFD_INV investigations, we have been able to develop scopes and cost the specifics of the investigations. It should be noted that these are significantly more costly that the unit cost allowance for an AMP7 SOAF investigation.

5.5.4 Customer protection

Given the that the EnvAct_INV4 driver guidance is yet to be formally published, and based on the draft guidance, the complexity of the study cannot be determined until the work is started in earnest (Stage 3 as highlighted on the flow chart under the Best Option for Customers above). As such, within cost assessment cross cutting issues (YKY-PR24-DDR-05) Chapter Uncertainty mechanisms, we propose an update to the Storm Overflows Uncertainty Mechanism to include the EnvAct_INV4 and SOAFv2 investigations to better protect the customer and the water company.

From Yorkshire Water's perspective, we have had to estimate/ assume the level of UPM investigation, monitoring and subsequent modelling, based on draft guidance. There is potential that some investigations are less involved and therefore cheaper, but this is offset with a risk that some will be complex and more expensive, than the AMP7 Storm Overflow Assessment Framework investigations split. The complexity and total costs are not determined until the first three stages of the proposed draft process have been completed. We have proposed an update to the existing storm overflow uncertainty mechanism around this which allows for remeasure of costs. This would account for the cost differences between the Level 1&2 UPM and Level 3&4 UPM investigations, this would provide a fairer way forward for all and better protect customers money.

We are aware that Ofwat has asked us to clarify the delivery dates for individual investigations in response to query DDQ_163, see WINEP investigation dates (YKY-PR24-DDR-36).

We have tabulated the proposed dates in section 5.2.

5.6 Concluding points

We believe that the cost reductions that Ofwat has proposed in our draft determination will result in an undeliverable WINEP wastewater investigation programme in AMP8. We propose that our original costs of £87.53m, which is both the best option for customers and efficient, is allowed by Ofwat, and we have submitted representations which articulate why this is the case. In addition, we request a further £68.4m of funding be made available to fulfil the new requirements of 600 SOAFv2 (Storm Overflow Assessment Framework version 2) investigations, which have been identified by the EA since our January resubmitted plan. Again, we have demonstrated why these investigations are required and are both the best option for customers and at an efficient rate. We have also proposed an update to the existing storm overflow uncertainty mechanism around this which allows for remeasure of costs. This would account for the cost differences between the Level 1 and 2 UPM and Level 3 and 4 UPM investigations. This would provide a fairer way forward for all and better protect customers' money.

6 WINEP: Inland bathing water quality - Microbiological Treatment

6.1 Overview

Within our business plan submission, we proposed £7.26m expenditure for microbiological treatment, which was allowed within Ofwat's draft determination. Since our submission, we have received two additional bathing water designations (Wharfe at Wilderness Car Park and Nidd at the Lido, Knaresborough). Ofwat's draft determination asks companies to include costed plans to meet the new bathing water designations made in May 2024. As a result of these designations, we are proposing an amendment to our existing PR24 Inland Bathing Water Quality enhancement case, specifically in relation to microbiological treatment, increasing our allowance from £7.26m to £21.043m. This increase in allowance is for microbiological treatment at Harrogate North/STW within the Nidd catchment. Given Ofwat allowed our allowed costs in our business plan, we hope Ofwat will similarly allow the revised enhancement case, which has been put together on materially the same basis for the new bathing waters as the previously agreed expenditure.

6.2 Ofwat action reference

Within this representation, the following Ofwat action is addressed:

- DDQ_137: We ask companies that they include costed plans to meet new designations reflected in their WINEP/NEP in response to the draft determination so we can consider proposed expenditure for final determination (Expenditure Allowances, page 82).

We propose an increase to our microbiological treatment proposals to reflect these additional designations.

6.3 Key messages

- Ofwat allowed the full proposed microbiological treatment allowance within our business plan submission.
- In May 2024, two new bathing waters were designated within the Yorkshire region (Wharfe at Wilderness Carpark and Nidd at the Lido, Knaresborough).
- We have increased our microbiological treatment expenditure proposals within our representation to include microbiological treatment at Harrogate North STW to reflect the designation on the Nidd at the Lido, Knaresborough.
- All other proposals for this enhancement case remain as submitted within our business plan submission and as allowed for within our draft determination.

6.4 Change requested

The table below reflects expenditure proposals set out under CCW3.90, 'Microbiological treatment - bathing waters, coastal and inland (WINEP/NEP) wastewater totex'.

Table 6-1: Summary of changes to the WINEP: inland bathing water quality enhancement allowance

	Totex Allowance (£m)
October 2023 business plan submission	57.166
January 2024 business plan resubmission	7.260 *
Ofwat's draft determination	9.347
YKY draft determination representation	21.043

* note this value is YW submission Ofwat value has a double count of transitional removed

6.5 Yorkshire Water's response to Ofwat

The table below presents our proposed change for microbiological treatment expenditure, alongside a summary of the rationale underpinning this representation. This is further detailed in the following section.

Within Ofwat's cost assessment for our business plan submission, the full allowance submitted was allowed. Due to new bathing water designations being approved following our business plan submission, we propose to increase our expenditure for microbiological treatment.

Table 6-2: Evidence to support the rationale for the Microbiological Treatment representation

Change for Consideration	Representation rationale and supporting evidence
Need for investment	In May 2024, two new bathing waters were designated within the Yorkshire region: • Wharfe at Wilderness Car park • Nidd at the Lido, Knaresborough We have reviewed our bathing water quality monitoring for both of these locations and propose microbiological treatment at Harrogate North STW, within the Nidd catchment.
Best options for customer	All optioneering follows the process set out within Section 13.4.1 of our PR24 WINEP enhancement case[3] in line with the WINEP methodology.
Cost efficiency	The costing methodology for the additional proposal follows the costing process set out within our PR24 WINEP enhancement case in line with the WINEP methodology
Customer protection	The draft determination allowance is covered within the Accelerated Infrastructure Delivery Project PCDs. The remaining allowance falls below the threshold for Price Control Deliverables.

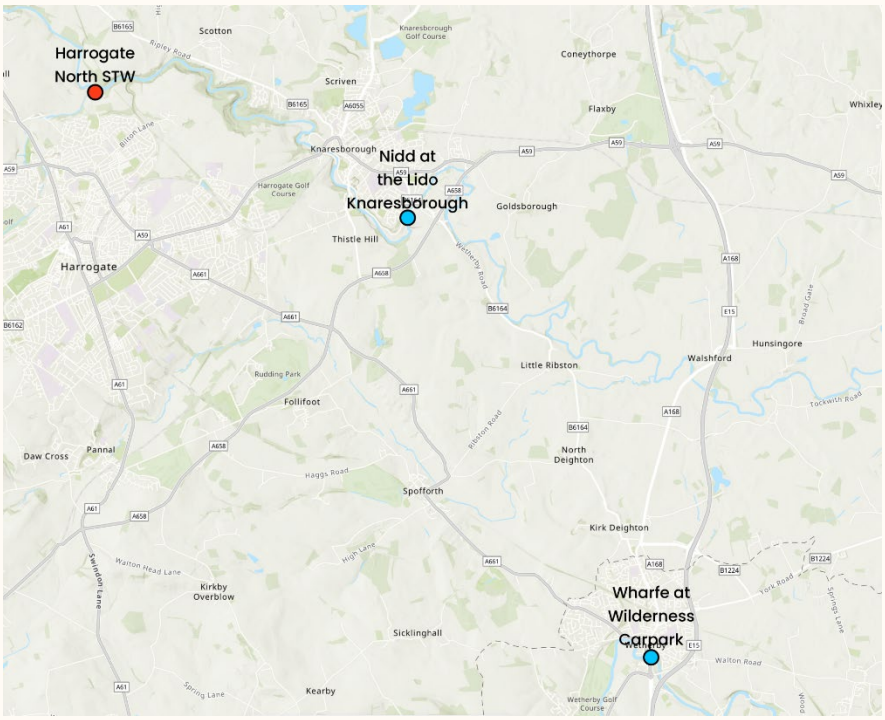
6.5.1 The need for investment

In May 2024, Defra announced the designation of 27 new bathing waters across England ahead of the 2024 bathing water season[4]. Two of these designations, as shown on Figure 6-1 below, were located within Yorkshire:

- Wharfe at Wilderness Carpark, located on the River Wharfe at Wetherby
- Nidd at the Lido, Knaresborough, located on the River Nidd at Knaresborough

[3] https://www.yorkshirewater.com/media/kukjfz3f/yky43_winep-enhancement-case.pdf
[4] https://www.gov.uk/government/news/record-number-of-new-bathing-sites-get-the-go-ahead

Figure 6-1 Location of new 2024 designated bathing waters in Yorkshire and proposed investment at Harrogate North STW



Within our PR24 business plan (October submission), we detailed both designations as non-statutory proposals and included investment proposals for investment upstream of the designations.

Following discussions with Defra and the Environment Agency in 2023, the tertiary treatment element of our proposals for Wetherby and Knaresborough were phased into a future AMP, given these bathing waters were non-designated. As such, our January submission included microbiological treatment for the Wharfe at Cromwheel, Ilkley only, as this was our only designated inland bathing water requiring statutory investment.

As the Wharfe at Wilderness Car Park and Nidd at the Lido, Knaresborough have now been designated, we have reviewed our early bathing water quality monitoring and the Environment Agency's compliance samples for these locations to assess the need for investment. We now propose to include tertiary treatment at Harrogate North STW to support improving the bathing water quality at the 'Nidd at the Lido, Knaresborough'. We have proposed an amendment to the WINEP BW_IMP2 holding line to the Environment Agency to reflect this investment proposal.

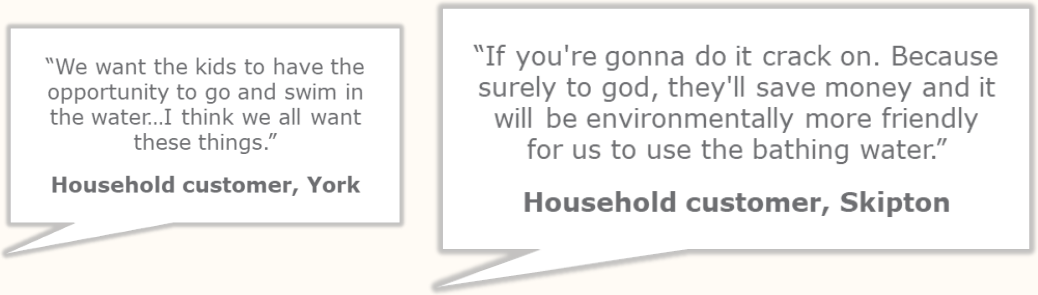
Following the outputs of our WINEP bathing water investigations for both the new designated catchments, further improvements at additional assets within the catchments may be required to support improvements to bathing water quality. We will assess and review these as part of the PR29 process following the outputs of our investigations.

Full details of our original enhancement proposals can be found in Appendix YKY43_WINEP enhancement case[5], Chapter 13, 'Wastewater: Inland Bathing Water Quality'

We have conducted a comprehensive and robust programme of research to explore customer support and perceived value of investments into bathing water quality. This was covered in our enhancement cases and Cost Adjustment Claims research, speaking to 1,967 household (HH), non-household (NHH) and future customers (FBPs) quantitatively and engaging with a further 154 customers qualitatively, including health and financially vulnerable customers. In this research, out of all 15 cases and claims, support from customers was highest for our inland bathing water quality case. The vast majority of all customer cohorts supported the case (92% HH, 95% NHH, 98% FBPs) and the majority also felt it represented good value for money (57% HH, 70% NHH, 72% FBPs).

[5] https://www.yorkshirewater.com/media/kukjfz3f/yky43_winep-enhancement-case.pdf

Not only is customer support for enhancement case investment for inland bathing water extremely high, the vast majority of customers also believe this to be an important issue to them with 93% of household (HH) and non-household customers respectively agreeing it's important, rising to 94% of future customers. In this research, customers cite the desire for children and families to be able to swim in the water at these designated sites, and the environmental implications of not delivering this.



In addition, in the Ofwat prescribed Acceptability and Affordability research, reducing the number of pollution incidents of rivers and bathing waters was ranked the second top wastewater priority with 45% of households choosing it as their biggest priority in this part of our plan (base size n=2,175 households).

Overall, there is significant evidence to show very strong levels of customer support for investments in bathing water quality, with this being an area of particular importance and priority for our customers.

6.5.2 Best option for customers

As this investment was previously included within our business plan submission before being phased to a future AMP period, our approach to optioneering is set out within Appendix YKY43_WINEP enhancement case, Chapter 13 "Wastewater: Inland Bathing Water Quality"[4].

We are only proposing investment at Harrogate North STW following the designations as this is considered a no regrets approach based on its proximity to the bathing water, as highlighted in Figure 6-1 above and the year-to-date compliance results[6]. All further assets within the catchment, and within the Wharfe catchment, will be reviewed following the outcome of our bathing water investigations before a decision is reached on any further requirements for investment. As our bathing water investigations are not due to complete ahead of 2027, in line with their WINEP requirements, we have proposed an amendment to the bathing water element of the Storm Overflows Uncertainty Mechanism. We propose to expand this mechanism beyond storm overflows, and to include additional sewage treatment work upgrades where they are required. Further details on this can be found within our Cost Assessment Cross Cutting Issues representation (YKY-PR24-DDR-05).

6.5.3 Cost efficiency

Within Ofwat's draft determination, the full proposed expenditure for microbiological treatment was allowed for. We have used the same costing methodology for our increased proposal at Harrogate North STW.

6.5.4 Customer protection

Customers are protected against non-delivery of Ofwat's draft determination allowance for microbiological treatment under the Accelerated Infrastructure Delivery Project 'Scheme 6: Inland Bathing Water Improvement Scheme – Wharfe, Ilkley' price control deliverable[7]. The remaining allowance for the scheme at Harrogate North STW falls below the threshold for price control deliverables.

[6] https://environment.data.gov.uk/bwq/profiles/profile.html?_search=nidd%20&site=uke2203-08903
[7] https://www.ofwat.gov.uk/wp-content/uploads/2023/04/Appendix-2-Accelerated-Delivery-Project-Final-Decisions-2023.pdf

6.6 Concluding points

Following our business plan submission, two new bathing water designations were made within the Yorkshire region. We have reviewed the Environment Agency's compliance monitoring for these, along with our initial bathing water investigation monitoring and propose microbiological treatment at Harrogate North STW to support improvements in bathing water quality. We have also proposed an amendment to the Storm Overflow Uncertainty Mechanism to address the potential need for future investment within the catchments following the outcomes of our WINEP bathing water investigations. All other proposals for microbiological treatment remain as submitted within our business plan, and as allowed for within Ofwat's draft determination.

7 Storm overflows

7.1 Overview

Our PR24 business plan submission8 proposed £1.338 billion investment to improve storm overflows and begin delivering the legal requirements of the 25-year Storm Overflow Discharge Reduction Plan (SODRP). This included:

- Statutory investment linked to our AMP8 WINEP obligations.
- Additional coastal bathing investment at storm overflows along the Yorkshire Coast, actions that under the SODRP must be complete by 2035.

Ofwat's draft determination, reduces this allowance has been reduced to £1.056billion. We are unable to accept this position. We have modified our approach based on Ofwat feedback, as well as providing additional evidence in support of our modified claim.

We agree with Ofwat's feedback in our draft determination in respect of the challenge on the storm overflow performance commitment outcome proposed in our business plan. We also agree with Ofwat's view that the key driver is to reduce the number of discharges from storm overflows, and that this reduction should be focused on the maximising protection of the environment. As a result, we have reviewed and refocused our plan to ensure we are able to maximise reduction of discharges from storm overflows, beyond our original submission, in line with achieving 20 spills per overflow by the end of AMP8, set within the PCL.

We have considered numerous approaches to achieve the PCL target and have proposed a refined plan which delivers a greater reduction in storm overflow discharges. To achieve this position, we have focused on the higher spilling overflows with potential for environmental harm. This decision means that the plan prioritises spill reduction at these overflows rather than the non-WINEP coastal overflows (21 sites where we planned to reduce 445 discharges by the end of AMP8). Customers and stakeholders in Yorkshire want us to reduce the number of discharges to coastal bathing waters and we remain committed to delivering improvements for coastal overflows and are exploring options for delivery of these via an alternative funding (and delivery) mechanism, in AMP8.

On 6 August 2024, we received a draft penalty and enforcement notice from Ofwat in relation to the management, operation, maintenance and performance of wastewater treatment works and collecting systems. The notice contains a proposed enforcement order against which we have undertaken an initial assessment of potential costs within the AMP8 period. The order stipulates a number of triggers against which our asset base should be assessed. The order requires any exceedances of these triggers to be fully investigated, and for required remediation to be delivered as quickly and efficiently as reasonably possible, taking account of deliverability, affordability and financeability.

We have assessed our asset performance against these triggers using the most recently available data, and this has determined over 2,000 individual requirements for investigation. We have estimated the cost of these investigations to be around £138m. This would be in addition to the scale of investigations submitted in our business plan, as the trigger thresholds are more stringent than the levels which the EA have historically indicated as the compliance assessment point. We request that Ofwat considers a separate uncertainty mechanism covering the requirements of the draft penalty and enforcement notice (see Cost Assessment Cross Cutting Issues (YKY-PR24-DDR-05).

We have repurposed the expenditure originally proposed for non-statutory coastal overflows, to drive a greater reduction in storm overflow discharges at overflows where there is potential for environmental harm.

In this representation, we set out these changes to our proposed storm overflow programme and provide additional evidence to address the challenges set out by Ofwat at draft determination relating to efficiencies applied.

[8] yky43_winep-enhancement-case.pdf (yorkshirewater.com) – Chapter 14

Regarding the amendments, we have:

- Added an additional six named storm overflows to our plan following completion of Storm Overflow Assessment Framework (SOAF) investigations, and the identification of cost-beneficial solutions. This is aligned with WINEP and the Environment Agency's expectations confirmed in a letter dated 28 February 2024 (Ref EA/UWWTR/YWS/1) and 01 March 2024 (Ref EA/UWWTR/YWS/2).

- Added an allowance for any additional SOAF cost-beneficial storm overflow schemes which may arise from the completion of the remainder of the AMP7 SOAF Investigation programme which are due to complete in 2025. Any cost-beneficial solutions will be added to the WINEP to be delivered in AMP8. We request that Ofwat supports this approach rather than assuming allowances are secured at a future date through the uncertainty mechanism. This is because there is high likelihood that the SOAF assessments that we are yet to complete will identify cost-beneficial solutions in equivalent proportions to those that have already completed. Delivering the cost beneficial solutions will be a statutory requirement and will therefore require an overspend of the wastewater totex allowances in the AMP8 period. This (i) places undue stress on Yorkshire Water from a financeability perspective, and (ii) reduces the opportunity for any wastewater efficiencies to be targeted to improve service. (Cost Assessment Cross Cutting Issues (YKY-PR24-DDR-05), Section 4.4)

- Added the originally proposed Direct Procurement for Customer (DPC) WINEP storm overflow schemes back into our totex plan, following Ofwat's decision that DPC is not appropriate for these schemes.

We have then split and reprofiled our plan into two parts:

- **Statutory WINEP enhancement plan:** this part of our plan is aligned with the statutory WINEP enhancement activities, submitted in our original plan in October 2023, with the addition of the WINEP storm overflows that were proposed to be delivered via a DPC route and the Environment Agency's additional WINEP requirements to deliver to the updated known SOAF cost beneficial outcomes.

- **Storm Overflow Optimised Discharge plan:** this second part of our plan repurposes our proposed coastal bathing enhancement expenditure, to drive a more effective plan to help us achieve our overall 20 spills PCL. This may mean that we do not achieve the full SODRP targets, rather we will reduce the largest number of spills for the most optimal investment. This component of the plan focusses on spill reduction and proposes the delivery of the SODRP targets in a phased manner. Where the spill or harm target is not fully delivered in AMP8, further intervention in future AMPs will be required to achieve the statutory targets in line with the requirements of the SODRP. AMP8 interventions will be designed with this adaptive approach in mind.

We challenge the efficiencies made by Ofwat on our storm overflow investment proposals. We do not consider Ofwat's approach to cost modelling storm overflows to be appropriate, due to three key modelling flaws:

- The current use of Cook's distance analysis to remove outliers.
- The potential for bias.
- The application of a stringent benchmark based on poor quality modelling.

We have also reviewed in detail Ofwat's 'Deep Dive and Outlier' assessment and provide additional asset specific evidence for the relevant schemes. We consider Ofwat's cost modelling not to be robust and believe that Ofwat should allow our DDR costs in full.

While we have optimised our plan to drive a greater discharge frequency reduction, we recognise the importance of bathing water quality to support a thriving Yorkshire and understand that our customers support improvements to bathing water quality. Our desire to achieve the bathing water quality SODRP ahead of the statutory target of 2035 remains, and as such, we continue to explore potential funding and delivery routes and have resubmitted these sites as a separate “choice option”. Further details on this can be found in the coastal overflows appendix (YKY-PR24-DDR-32) .

We ask that, should for any reason Ofwat find that our restated storm overflow plan is unacceptable, Ofwat enters into a discussion with Yorkshire Water ahead of final determinations. It is imperative that we find a way forward that ensures we maximise the proposed investment to deliver benefits to customers and the environment. If, for example, Ofwat was to find the Storm Overflow Optimised Discharge Plan unacceptable in its existing form, we would seek to work with Ofwat ahead of final determination to revise this such that the available funding is used to deliver benefit in AMP8, rather than deferring the delivery of this benefit to AMP9.

7.2 Ofwat action reference

Within this representation, the following Ofwat actions and concerns are addressed:

Table 7-1: Evidence to support the rationale for the Storm overflow representation

Ofwat Concerns	Representation rationale and supporting evidence
DDQ_126: In response to our draft determinations, we seek further compelling evidence from these three companies if they want to deliver a performance level different to the 20 spills level we have proposed. Applies to Wessex Water, Thames Water and Yorkshire Water regarding the 2025 storm overflows performance commitment level in relation to our 20 spills target and the companies proposal to deliver a higher level.	This is predominantly covered in the draft determination representation: Outcomes for Customers document (YKY-PR24-DDR-06), under Storm Overflows. We have adjusted our approach to ensure we achieve the 20 average spills by the end of the AMP8 period. Further detail can also be found in section 7.5.3, where we discuss our proposed approach to delivering discharge reduction to the average 20 spills by repurposing funding.
DDQ_128: In response to our draft determinations, we expect Yorkshire Water to provide more ambitious proposals for reducing storm overflow spills. We expect the company to review its ambition in comparison to other English companies. These revised proposals will need to be supported by assurance that the proposed targets are consistent with it operating a clean and well-maintained system. If the company considers it cannot deliver a level of 20 average spills per overflow it will need to provide compelling evidence to justify its lower level of ambition compared to other English companies. It will need to explain why this level of reduction cannot be delivered through operational and maintenance interventions and its enhancement programme.	This is covered in the draft determination representation: Outcomes for Customers document (YKY-PR24-DDR-06), under Storm Overflows. We have adjusted our approach to ensure we achieve the 20 average spills by the end of the AMP8 period. Further detail can also be found in section 7.5.3 where we discuss our new approach.
Storm Overflows: spill reduction schemes - The majority of the cost challenge relates to £645m assessed via our grey/hybrid storage econometric model, which led to a 20% efficiency challenge (£110m); an outlier efficiency challenge for the DPC storage schemes which were transferred into the	We have covered our response to the econometric modelling efficiency challenge in section 7.5.7. We have also discussed this in detail in Storm overflow asset specific details (YKY-PR24-DDR-31) which provides further evidence on: - Low volume, high cost Cook’s distance outlier grey storage schemes in the network

grey/hybrid model; and Cooks distance outlier schemes (£324m). The company was unable to provide evidence to justify the higher costs resulting in a £180 million cost challenge. Our draft determination allows £1 billion of the company's proposed £1.4 billion.	- Low volume, high cost Cook's distance outlier grey storage schemes at STWs - High volume high cost Cook's distance outliers for Bradford Beck UPM sites - High volume, high-cost engineering judgement applied to our former DPC sites We have itemised each of the 19 outliers that has Deep Dive efficiency applied in Storm overflow asset specific details (YKY-PR24-DDR-31). Our view is that our costs are well justified and efficient and that a further deep dive into the schemes that have received significant challenge at DD will find that they should be allowed in full. We have also included a response to FFT efficiencies in section 7.5.8.2
Yorkshire Water has provided information in its submission regarding potential regional factors impacting its performance. However, we have concerns regarding the validity of the modelling approach used by Yorkshire Water. The approach does not produce valid results when tested against data for other companies. We are therefore concerned that it is not providing a credible explanation for the variance between its performance and that of others. Additionally, United Utilities, which Yorkshire Water identified as being impacted by similar regional factors, did make a commitment to deliver below 20 average spills per overflow by 2029-30 in its forecast performance.	This is covered in the draft determination representation: Outcomes for Customers document (YKY-PR24-DDR-06), under Storm Overflows. We have adjusted our approach to ensure we achieve the 20 average spills by the end of the AMP8 period. Further detail can also be found in section 7.5.3 where we discuss our new approach. We provide further detail on our wastewater modelling approach in (YKY-PR24-DDR-42).
We also have concerns regarding the validity of the company's hydraulic modelling as the company did not identify the levels of performance it could deliver from a clean system.	This is covered in the draft determination representation: Outcomes for Customers document (YKY-PR24-DDR-06), under Storm Overflows. We have adjusted our approach to ensure we achieve the 20 average spills by the end of the AMP8 period. Further detail can also be found in section 7.5.3 where we discuss our new approach. We provide further detail on our modelling approach in Section 7.5.5 and within Appendix (YKY-PR24-DDR-42) - 'Wastewater modelling approach'

7.3 Key messages

- Within our business plan submission, we submitted our largest ever investment programme to reduce discharges from storm overflows to drive water quality improvements and support a thriving Yorkshire.
- Ofwat's assessment and draft determination included significant efficiencies within our proposed storm overflow investment which we are not able to accept. The level of proposed efficiency will deem our storm overflow programme non-viable. We provide detailed evidence throughout this enhancement case to challenge Ofwat's applied efficiencies.
- We have reviewed Ofwat's feedback regarding our storm overflow programme, and subsequently made changes to drive a discharge frequency reduction in line with the storm overflow performance commitment. These changes repurpose our non-WINEP coastal storm overflow investment to create a new optimised discharge frequency reduction plan.

7.4 Change requested

Table 7-2 reflects our expenditure proposals, following Ofwat's draft determination.

Table 7-2: Summary of changes to the storm overflow enhancement allowance

	Allowance (£bn)
January 2024 business plan resubmission	1.338 * (included proposed DPC)
Ofwat's draft determination	1.056
YKY draft determination Representation	1.451

* note this value is YW submission, Ofwat value has a double count of transitional, these figures are pre-frontier shift

Table 7.3 below breaks down our draft determination representation expenditure, as per the associated CWW3 table lines:

Table 7-3: Allocation of Storm overflow expenditure by CWW3 table lines

CWW lines	Description	Proposed Expenditure (£m)
CWW3.13-3.49	6 Named Additional SOAF sites	42.441
CWW3.109	Year 5 Unnamed SOAF Sites	66.00
CWW3.187-3.188	Optimised Discharge Reduction plan	370.28
CWW3.13-3.49	Statutory Storm Overflows	971.889
Total		1450.61

7.5 Yorkshire Water's response to Ofwat

7.5.1 The need for investment

Our plan will now contain two elements:

- **Statutory WINEP Enhancement plan:** this part of our plan focusses on the statutory WINEP enhancement plan, and now includes the statutory schemes identified in WINEP that were originally proposed to be delivered via DPC, and the Environment Agency's additional WINEP requirements to deliver all known named SOAF cost beneficial solutions.
- **Storm Overflow Optimised Discharge plan:** this second part of our plan repurposes our coastal bathing enhancement expenditure, to drive a maximised spill reduction plan to achieve our 20 spills target by the end of AMP8.

In the following sections, we set out updates relating to our proposals.

7.5.2 Statutory plan

7.5.2.1 Direct Procurement for Customers

Within our draft determination, Ofwat has decided that storm overflows should not be progressed via the Direct Procurement for Customers (DPC) mechanism. As a result, we have added the proposed statutory WINEP DPC storm overflow investment back into our AMP8 totex plan. This results in 4 storm overflows: Toll House CSO, Corner Café CSO, Scalby Mills CSO and Wetherby STW storm tank moving from a DPC delivery route into our statutory plan. The two remaining non-WINEP DPC storm overflow assets have been removed from the AMP8 plan and phased into the AMP9 plan as they will not form part of the core statutory plan detailed above. These sites are Scarborough STW and Bridlington STW Storm Tanks.

Full details can be found in Table 7-4 below:

Table 7-4: DPC Storm Overflow Updates within our draft determination representation.

Statutory WINEP DPC storm overflows added to PR24 AMP8 plan	Non-Statutory DPC storm overflows phased into AMP9
YWS00513 Scalby Mills CSO	YWS02243 Scarborough STW (Storm Tanks)
YWS00849 Toll House CSO	YWS01453 Bridlington STW (Storm Tanks)
YWS01048 Corner Cafe	
YWS00195 Wetherby STW (Storm Tanks)	

We have updated the long-term delivery strategy (LTDS) tables for AMPs 9-10, as there were a number of schemes that we proposed would be delivered via DPC. These have been moved back into the LTDS tables assuming these will now be delivered by Yorkshire Water and have been added to the totex plan. This is in line with Ofwat's decision that this is not the appropriate mechanism to deliver storm overflow improvements and results in the addition of c.£600m back into our LTDS plans for delivery of eight large storm overflow schemes.

7.5.2.2 Named Storm Overflow Assessment Framework (SOAF) Additions

In letters dated 28 February 2024 (Ref EA/UWWTR/YWS/1) and 1 March 2024 (Ref EA/UWWTR/YWS/2) the Environment Agency stated that we are required to deliver cost-beneficial solutions from our AMP7 SOAF investigations (U_INV) in AMP8. The SOAF programme was established for PR19[9] and investigates storm overflows in line with the EA guidance[10] linked to the impacts of the storm overflows on river water quality.

In AMP7, we were funded to carry out 158 SOAF investigations, of which we have currently completed 113. This has identified 15 cost-beneficial storm overflows solutions, as per the SOAF process under U_INV. This data is correct as of 8 August 2024.

9 of the 15 cost-beneficial SOAF solutions were already included in our PR24 WINEP and storm overflow enhancement case, and 1 cost-beneficial solution was included in our plan under the coastal storm overflows enhancement case, but not in the WINEP. All 6 of the cost-beneficial solutions have been added to the WINEP and are now included in the enhancement case.

In summary, all 15 sites that have cost-beneficial solutions as identified through the SOAF assessment process are included in both the WINEP and the enhancement case. Further details of these storm overflow sites can be found within Table 7-5 below:

Table 7-5: Updated SOAF Solutions included within our representation

SOAFs solutions included in the WINEP and the original PR24 submission	Additional SOAFs included within the WINEP and PR24 draft determination representation
YWS00209 Tadcaster Britannia CSO	YWS01495 Pole Moor CSO
YWS00280 Tadcaster East CSO	YWS00538 Carrhouse Lane Cayton CSO
YWS01593 Vickers Road CSO	YWS01207 Wyke Beck CSO
YWS01773 Dark Lane CSO	YWS01765 Corn Mill Lane No2 CSO
YWS01569 Bobbinmill Lane CSO	YWS01639 Wheldon Road CSO

[9] https://www.yorkshirewater.com/media/txfoxuxx/appendix-8g-winep-technical-appendix.pdf
[10] https://www.water.org.uk/wp-content/uploads/2018/12/SOAF.pdf

YWS01413 Fraser Drive CSO	YWS00605 Runswick Beck CSO* (new WINEP only – was in business plan submission in coastal enhancement case
YWS01172 Rivelin Valley NO 3 CSO	
YWS00897 Syke Lane CSO	
YWS00188 Draughton Priors Lane	

The solutions have been designed and costed in the same way as the other outcomes within the storm overflow WINEP and we will be progressing these costs beneficial SOAF outcomes to meet the U_IMP4 and ENVACT_IMP3, 4 and 5 drivers. Due to the late inclusion of the U_IMP4 driver, the same design risks and limitations that are highlighted in this document are also present for the U_IMP4 schemes.

7.5.2.3 Unnamed Storm Overflow Assessment Framework (SOAF) Additional Expenditure

Alongside the named SOAF outcomes detailed above, there is an additional Environment Agency requirement to be able to invest in any cost-beneficial solutions that may arise from the remaining 45 SOAF investigations to be completed within AMP7 Year 5. As our AMP7 SOAF investigation programme will run beyond Ofwat's final determination, we have included an expenditure allowance within our draft determination representation to enable us to deliver any further statutory U_IMP4 cost beneficial improvements in AMP8. This expenditure allowance is calculated as a lump sum value based on costs of the additional SOAFs and added to the plan. We will be progressing these cost-beneficial SOAF outcomes to meet the statutory U_IMP4 and EnvAct_IMP3 and 4 & 5 drivers.

In the draft determination, Ofwat proposed an uncertainty mechanism to address any statutory requirements that arise after confirmation of the business plan. Yorkshire Water has concerns with the proposed mechanism as it would require an overspend of the totex allowance in the AMP8 period. To minimise the risk associated with this, we propose to include these schemes in the totex allowance. Customers are protected if the schemes are not required, via the WINEP reconciliation mechanism.

7.5.3 Storm Overflow Optimised Discharge Plan

The Storm Overflow Optimised Discharge Plan has been produced based on existing data we have created as part of our DWMP Cycle 1 optioneering. By taking £370m from our non-WINEP coastal storm overflow enhancement case[11] and redirecting the money, we will drive a plan which delivers the storm overflow performance commitment of 20 monitored spills by the end of AMP8. Instead of delivering 21 coastal bathing water sites for a minimal discharge reduction of 445 discharges and a cost of £370m, we will be reviewing our assets and plan to deliver the average of 20 spills to achieve the performance commitment level. We will continue to deliver our statutory WINEP storm overflows and will deliver all bathing water storm overflows by the required 2035 regulatory commitment. We will also continue to work in partnership to support improvements in bathing water quality, as we understand its importance to our customers and the region.

The solutions delivered under the optimised reduction plan will not always meet the SODRP targets. In these instances, assets will require further investment in future AMPs, and as such, we will be taking a no/low regrets approach to identifying solutions. We will look at adaptive and modular interventions to ensure benefits are optimised and design appropriately where we need to revisit and not add extra costs to the overall plan. The plan presented will be predominately grey solutions due to the available time to devise and cost the plan for our representation. However, we will continue working throughout our asset management cycle to ensure we maximise any surface water removal and blue-green solution opportunities.

[11] https://www.yorkshirewater.com/media/tbycgrzk/yky40_coastal-bathing-waters-overflows-enhancement-case.pdf

For the storm overflow optimised discharge plan, we have undertaken a high-level assessment of our DWMP24 outcomes within the representation period but have been unable to undertake any asset-specific analysis. Once we undertake ground investigations and review site specifics then it may become apparent that we are unable to proceed with the scheme in the timescales proposed, so we need flexibility to be able to substitute schemes within this part of our plan. This will also mean that the volumes stored could change, and therefore, the current form of the proposed storm overflow PCD would not be suitable. We therefore suggest that a suitable programme level DPC would be more appropriate to ensure that customers receive the service that we are committing to deliver through the optimised discharge plan component of our plan.

We have provided Ofwat with a discrete version of the ADD20 table for the overflows in the optimised discharge plan and acknowledge that only OUT5 recognises the benefits driven by these schemes.

As part of our assessment of Ofwat's comments on our ambition, we reviewed multiple options to drive towards achieving the 20 monitored spills target. These included:

- Phasing all non-WINEP coastal storm overflow investment across AMP8 & AMP9, and repurposing investment into higher discharging assets.
- Phasing all non-WINEP coastal storm overflow investment into AMP9, and repurposing investment into priority overflows.
- Phasing all non-WINEP coastal storm overflow investment into AMP9, and repurposing investment into reducing discharge from across our assets.

This final option has been chosen as the best option to progress against other options to achieve the 20 spills position.

7.5.4 Enhancement case references

The Environment Act (2021)[12] and government's Storm Overflow Discharge Reduction Plan[13] introduces stringent new targets to protect people and the environment from the operation of storm overflows. The Storm Overflow Discharge Reduction Plan (SODRP) introduces the following new targets:

1. Protecting the environment: Water companies will only be permitted to discharge from a storm overflow where they can demonstrate that there is no local adverse ecological impact.
2. Protecting public health in designated bathing waters: Water companies must significantly reduce harmful pathogens from storm overflows discharging into and near designated bathing waters by either; applying disinfection; or reducing the frequency of discharges to meet Environment Agency spill standards by 2035.
3. Ensuring storm overflows operate only in usually heavy rainfall events: storm overflows will not be permitted to discharge above an average of 10 rainfall events per year by 2050. This enhancement case relates to five Water Industry National Environment Programme (WINEP) drivers arising from new obligations from the Environment Act 2021.

7.5.4.1 WFD_IMP – Urban Pollution Management (UMP) Solutions

In AMP7, a number of investigations were carried out under WFD_INV to make an assessment of Yorkshire Water's compliance against in-river intermittent targets set under the Water Framework Directive (WFD). Where the AMP7 WFD_INV study has concluded that Yorkshire Water intermittent assets are the cause of failure of the WFD standards, and the solution is cost beneficial, then a WFD_IMP scheme will be promoted under WFD_IMP.

7.5.4.2 Storm Overflows

The Environment Act 2021 placed new obligations on the Government to make improvements to storm discharges, over and above the previous requirements. These obligations have been passed through to water companies via the Storm Overflow Discharge Reduction Plan (SODRP). The SODRP requires the following actions to be undertaken by water companies:

[12] https://www.legislation.gov.uk/ukpga/2021/30/contents
[13] https://assets.publishing.service.gov.uk/media/6537e1c55e47a50014989910/Expanded_Storm_Overflows_Discharge_Reduction_Plan.pdf

1. By 2035, all overflows discharging into or near every designated bathing water to have been improved; and 75% of overflows discharging to high priority sites.
2. By 2050, no storm overflows will be permitted to operate outside of unusually heavy rainfall or to cause any adverse ecological harm.

Table 7-6 below demonstrates an indicative trajectory of the required improvements and the spill reductions that should be achieved by the targets from a 2020 baseline.

Table 7-6: Indicative trajectory of storm overflow reductions from the SODRP

Year	2030	2035	2040	2045	2050
% of high priority site storm overflows improved	38%	75%	87%	100%	100%
% of total storm overflows improved	14%	28%	52%	79%	100%

These new obligations apply to all permitted storm overflows including:

- Combined sewer overflows (CSOs)/storm overflows (SOs) on the sewer network.
- Storm discharges at pumping stations.
- Inlet CSOs at Wastewater Treatment Works (WwTW).
- Storm tanks at WwTW.

We will investigate and develop schemes to deliver improvements up to 2050 as part of our enhancement programmes and long-term delivery strategy for storm overflows. Our strategy aligns with the indicative trajectory of improvements outlined within the SODRP.

Through our PR24 proposals, we plan to undertake at least 20% of the storm overflow discharge reduction schemes incorporating blue-green techniques in AMP 8. This includes SuDS features, green roofs, swales, ponds, geo-cellular storage through to treatment wetlands. Our ambition is to increase this to at least 50% of schemes from AMP9 onwards, as we embed the learning that we will take from AMP8 and build on the partnerships that we will strengthen through our Drainage and Wastewater Management Plans (DWMP) and AMP8 interventions. In addition to the direct storm overflow reduction investment proposed in this enhancement case via either grey infrastructure (storage solutions) or upstream surface water management and attenuation, we have also included an expenditure allowance for increasing the capacity of Scarborough Wastewater Treatment Works. This capacity increase is required due to the volumes of storage associated with the WINEP storm overflows in this catchment and the need to empty the storage tanks and to return any stored flows to treatment before the next storm event impacts upon the catchment. The timing of emptying the tanks and the treatment of the flows to safe discharge to the environment is key in making sure that we achieve the lower discharge frequency target of 2 discharges per bathing season for the targeted overflows in this catchment.

Due to time constraints, primarily caused by the late issuing of the specific WINEP storm overflow guidance, we have had to rapidly develop the storm overflow intervention programme. The draft WINEP guidance was issued in July 2021, the final guidance was issues in March 2022, the SODRP was issues on 26 August 2022, followed by the driver guidance on the 10 October 2033 and a final submission for storm overflow information by 23 January 2023. Consequently, we have not been able to assess the impact of our proposed solutions on the receiving wastewater treatment works for the other wastewater catchments included in this enhancement case. While in the majority of catchments we have sought to implement the solutions which have the least impact on the wastewater treatment works, due to the size of the interventions, the risk on wastewater treatment works capacity to treat the returned flows from the storm overflow storage tanks prior to further rainfall events impacting upon the catchment still remains. This is an element we will continue to assess during the design phases of the project and seek to mitigate the risk or review and revisit for AMP9.

7.5.5 Wastewater modelling approach

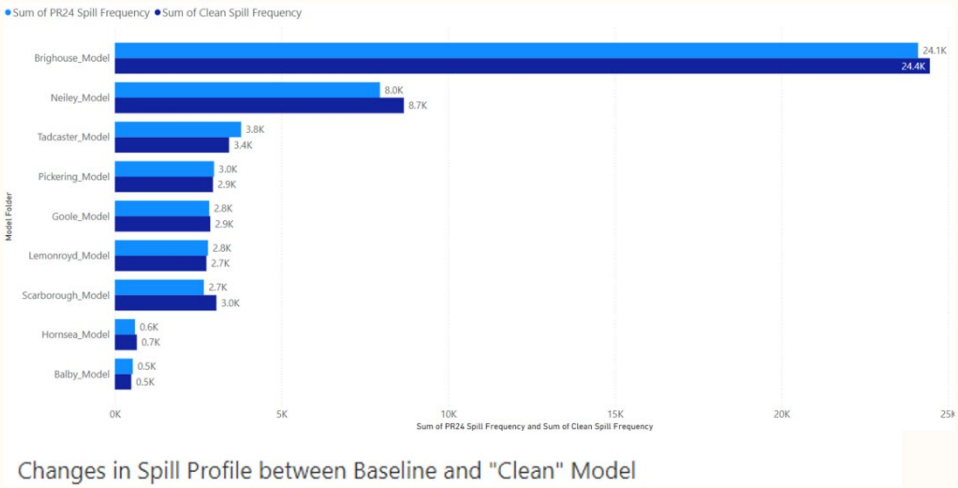
We provide detailed modelling evidence of our wastewater modelling approach for clean networks in appendix YKY-PR24-DDR-42.

As sewers convey solids, silt and sediment from highways and properties, the capacity within combined sewers can be changed due to the settling of these solids if not regularly and proactively maintained. Ofwat raised concerns regarding the validity of our hydraulic modelling, as we did not ascertain whether the levels of storm overflow discharge performance would be affected if we had a hypothetical totally clean sewer network. This test seeks to ascertain the impact of a 'clean' sewer network on storm overflow performance. For modelling purposes, this has been interpreted as a sewerage network without any sediment or silt represented and uniform low pipe roughness, thus creating maximum capacity in each pipe.

It should be noted that it is unrealistic to ever have a 'clean' system, as sediment enters through exogenous factors such as highway gullies (which will vary, dependent upon local authority cleaning programmes), it is naturally deposited and eroded as flows, specifically velocities, vary in dry weather and storm conditions. This means that after any maintenance activities such as jetting, sediment will naturally redeposit over time in certain pipes, based on local physical and hydraulic conditions. So, the results are a theoretical best case and would only be representative if a cost prohibitive and substantial daily vacuuming programme was undertaken. It is standard UK practice[14] to include silt, sediment, pipe deformation and other operational deficiencies in the creation of sewerage network models, as observed through CCTV and other forms of asset survey. This level of detail is frequently required to achieve a compliant level of verification against observed short term flow surveys and wider historical record and EDM validation. Yorkshire Water have detailed modelling processes, based on the CIWEM UDG CoP, for the creation of verified models and their subsequent conversion tools to assess network capacity and performance. The models used for the DWMP 2020 epoch and subsequently for the PR24 datasets were based on the Needs model.[15]

We tested 86 storm overflows across 9 sewer network models with varying amounts of sediment modelled within their conduits (further details can be found in the appendix Wastewater modelling approach (YKY-PR24-DDR-42). The results of the DWMP baseline 10-year time series rainfall (TSR) simulation and 'clean' network are presented below in Figure 7-1 showing the changes in discharge frequency, discharge duration and discharge volume.

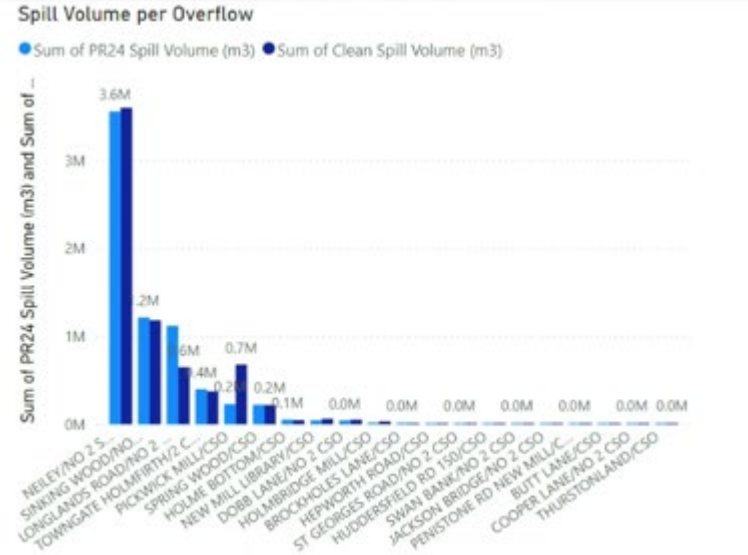
Figure 7-1 Network modelling output showing discharge frequencies



The results showed that for discharge frequency there was no general trend and that results are catchment-specific, based on catchment-specific factors. The same was true for discharge duration and volume. When considered at an asset level there were variations that would be expected, as shown in Figure 7-2 below, where discharge volume at the wastewater treatment works increases, but the overall volume discharged remains virtually the same.

[14] CIWEM UDG Code of Practice for Hydraulic Modelling of Urban Drainage Systems, 2017
[15] The Needs models on which DWMP and PR24 submissions are based have been updated from the verified model to remove operational issues such as significant blockages and asset failure that may have been present during the verification period but resolved through normal operational activities.

Figure 7-2 Discharge volume by CSO



No clear pattern between sediment and change is observed and as such it is not recommended to amend the existing sewerage network performance based on this comparison.

We used our drainage network modelling (from the DWMP) for the PR24 submission. Using verified and realistic sewer conditions, this modelling indicates an average of 37.4 discharges per overflow per year, based on a 10-year rainfall time series set at a 2020 baseline. In 2021, EDM data showed a monitored discharges frequency of 34 spills per overflow (unadjusted for uptime). When accounting for monitor uptime adjustments, the DWMP baseline modelling discharges frequency and the 2021 EDM discharges frequency baseline are closely aligned. This alignment is not significantly sensitive to discharges frequency at a catchment and regulatory scale, even considering the impact of siltation at a local overflow scale. The results of this assessment are described in detail in wastewater modelling approach (YKY-PR24-DDR-42).

We are committed to operating and maintaining a clean network through our base activities. We are proposing that our base activities deliver a 5% improvement in spill reduction and that our activities provide the platform for our 32% improvement in discharge reduction proposed in our enhancement programme. Chapter 15: Storm Overflows of Outcomes for Customers (YKY-PR24-DDR-06) provides details of the activities that are being delivered in 2024/25 and are planned for AMP8 to maintain a clean network.

7.5.6 Best option for customers

Our approach to establishing the best option for customers is presented in the Enhancement Case appendix to our October business plan.

7.5.7 Cost efficiency

7.5.7.1 Storm overflow cost modelling

We challenge Ofwat's approach to cost modelling and the efficiencies applied to our business plan submission by considering the below points.

Ofwat's approach to modelling storm overflows is incorrect due to three key modelling flaws; (1) its use of Cook's distance; (2) bias; and (3) the efficiency benchmark:

1. **The current use of Cook's distance analysis to remove outliers:**

    a. Cook's distance analysis assesses whether a scheme is influential, not whether it should be considered an outlier. The second step of assessing whether a scheme is an outlier or not has not been undertaken by Ofwat, and all identified schemes have been omitted.

b. Ofwat uses an arbitrary threshold to determine which schemes are outliers
c. Ofwat has not explained why its application of Cook's distance is preferable to other outlier methods.

2. **The potential for bias due to:**

a. Omitted variables (the only variable considered is volume of storage) and
b. Poor company forecast data - companies have been asked to provide costs for an unprecedented programme of storm overflow interventions. Companies will have used relatively high-level and different approaches to estimate scheme-level costs.

3. **The application of a stringent benchmark based on poor quality modelling** - efficiency benchmarks need to be driven by the quality of the models that inform them. As set out above, we have concerns that Ofwat's constructed models for storm overflows could be biased.

Table 7-7: summarises the efficiency assessments made by Ofwat at draft determination

Efficiency Component	*Number of schemes*	*YW submitted costs £m*	*Ofwat assessment £m*	*Efficiency £m / percentage*
Low volume, high cost Cook's outlier schemes grey storage schemes in the network	*7*	*11.43*	*7.64*	*3.79% / 33%*
Low volume, high cost Cook's outlier grey storage schemes at STWs-	*2*	*3.16*	*0.89*	*2.27/72%*
High volume, high cost Cook's outliers for Bradford Beck UPM sites (4 of the 6 required to deliver the WQ benefit)	*4*	*90.51*	*37.0*	*53.51/59%*
High volume, high cost engineering judgement applied to our former DPC sites (inland and coastal bathing schemes)	*6*	*218.46*	*93.09*	*125.36/57%*
Full Flow to Treatment (FFT) schemes	*3 (spread across 6 overflows)*	*91.48*	*72.46*	*19.01/21%*

Each of these are discussed in further detail below.

We note that Ofwat states it is considering the inclusion of historical data into its models for final determinations. For the reasons we set out in our representation proforma (Q98), we do not consider the inclusion of historical scheme-level data to be appropriate because it risks under-estimating the cost of PR24 schemes. Storm overflow schemes that have been delivered historically, such as those driven by Storm Overflow Assessment Framework and Urban Pollution Management, have been assessed through these frameworks as cost-beneficial. The SODRP has no cost-beneficial test, therefore the use of this historic cost data is not consistent with the future cost data, as non-cost beneficial data will not occur in the historic data set.

1. Our concerns with Ofwat's use of Cook's distance for removing outliers

Ofwat uses Cook's distance (CD) statistic to identify and remove outliers from its modelling. CD is a statistic that estimates how influential individual observations are within an econometric model. Ofwat calculates the CD for each observation (each storm overflow scheme) and rejects all schemes above its chosen threshold of influence from its models.

Issue 1: Ofwat automatically removes all schemes which it identifies as being influential

As noted in wider literature on outliers, CD is intended to be used in a two-step process whereby: (a) CD identifies observations which are influential; and then (b) those influential observations are assessed to determine whether they are outliers or not[16]. In the case of storm overflow modelling, this would involve two steps: (1) identifying which schemes drive the modelled relationship between storage volume and modelled cost using CD; and (2) determining whether the identified schemes are outliers, for example, based on an engineering assessment[17].

Ofwat, however, has not applied the second step and automatically rejected all schemes that are above its selected threshold. This is an incorrect application of CD. As Professor Dennis Cook, who introduced the concept of CD, states in the International Encyclopaedia of Statistical Science:

> *"**Cook's distance is not a test statistic and should not by itself be used to accept cases or reject cases**. It may indicate an anomalous case that is extramural to the experimental protocol or it may indicate the most important case in the analysis, one that points to a relevant phenomenon not reflected by the other data. Cook's distance does not distinguish these possibilities."*[18] (emphasis added)

In other words, an influential scheme is not necessarily an outlier and may be important for the model being estimated. As CD does not distinguish between these two possibilities, it is important to conduct an 'influence assessment' to check whether schemes are 'true' outliers. This means that Ofwat may be incorrectly rejecting storm overflow schemes and under- or over-estimating allowances.

Our view is that if Ofwat intends to use a statistical approach such as CD to identify outliers, it needs to conduct a separate engineering assessment to confirm whether schemes should be removed. This would ensure that only 'true' outliers are removed, rather than simply rejecting all schemes identified as 'too influential'.

Issue 2: Ofwat uses an arbitrary threshold to determine which schemes are outliers

To determine which schemes are influential, Ofwat has used *"a standard threshold of four divided by the number of observations of the relevant model (4 / N)."*[19] We note that Ofwat's chosen threshold is widely cited in the literature, alongside other commonly used 'rule-of-thumb' thresholds. For example, a CD threshold of 1.0 or greater is often suggested as determining whether an observation is influential.[20][5]

We do not take a view on the appropriate CD threshold to apply, however, we note that any application of a rule-of-thumb threshold needs to be done cautiously. As we set out above, Ofwat needs to ultimately review any schemes that are initially identified as outliers, to determine whether they are appropriate to drop them from the models e.g., through conducting engineering assessments of the identified schemes.

Issue 3: Ofwat has not explained why its application of Cook's distance is preferable to other outlier methods

Notwithstanding our concerns with Ofwat's application of CD, we agree that CD can be a useful tool to identify potential outliers. However, we also note that there are multiple viable methods available that Ofwat could use instead of (or to complement) its own CD approach.

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[16] Fox, J. (2015) Applied Regression Analysis and Generalized Linear Models, Chapter 11.
[17] Outliers in this case would be any storm overflow schemes which would incorrectly bias the estimated relationship between storage volume and modelled cost.
[18] Cook, R.D. (2011) Cook's Distance.In: Lovric, M. (eds) International Encyclopaedia of Statistical Science.
[19] https://www.ofwat.gov.uk/wp-content/uploads/2024/07/PR24-draft-determinations-Expenditure-allowances-Enhancement-cost-modelling-appendix.pdf, p.14.
[20] Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2019) Multivariate data analysis 8th edition, p.306.

For example, there are a variety of alternative regression methods which, unlike Ordinary Least Squares (OLS), can deal with data which includes influential and outlier observations. For example, robust regression is an alternative method which strikes a balance between: (i) excluding influential observations from the model entirely; and (ii) treating all observations, including the potential outliers, equally.[21]

Robust regression could therefore be used instead of removing outliers. Rather than rejecting influential observations, robust regression methods 'down-weight' them. Alternatively, robust regression could be used in addition to identifying and removing unambiguous outliers.

2. Ofwat's econometric models likely suffer from bias

Ofwat's econometric models consist of univariate regressions with modelled scheme cost as the dependent variable, and storage volume as the only explanatory variable.

Our primary concern with Ofwat's models is that they suffer from bias. In particular, we are concerned with two main issues: (i) omitted variable bias through omission of relevant cost drivers; and (ii) measurement error through inconsistencies in how companies have calculated their scheme costs.

Issue 1: Ofwat's models suffer from omitted variable bias

While we agree that storage volume is one of the key drivers of cost, Ofwat's econometric models are subject to considerable omitted variable bias. This is because Ofwat does not account for any additional drivers of storm overflow expenditure. For example, we consider the following cost drivers, which are further detailed within our Bill of Quantities build up, to be relevant:

- Screens
- Ancillaries
- Network pipes and rising mains (including diameters and length)
- Return pumps

Please see below Table 7-8 – Our Bill of Quantities build up for the 19 challenged schemes for examples of items we have included in our costings. We have not included within our costing any costs to cover land purchase and other utilities, services and infrastructure which may need to be relocated and will impact on cost to deliver schemes and solutions.

The key implication of this is that Ofwat's models could be falsely attributing scheme costs to storage volume when it may be driven by other factors. The direct effect of this could be to under- or over-estimate the efficient cost allowances of companies, where their spend is also driven by non-volume factors, such as the length of pipework required for a new storage tank.

We note that Ofwat's position is to exclude any additional cost drivers (such as the length of pipework) on the basis that they are within company control to some extent. We agree that many cost drivers are likely to be within company control to some extent (importantly, including storage volume itself). However, on balance, we believe Ofwat's concern that other cost drivers are within management control is over-stated relative to the issue of omitted variable bias. These cost drivers will reflect exogenous characteristics each site, however as the direct data on these has not yet been collected, these drivers are the best proxies at present.

Issue 2: Ofwat's models may be based on poor company forecast data

We note that the econometric storm overflow models are based on the forecasted data provided by companies across the sector.

[21] https://stats.oarc.ucla.edu/stata/dae/robust-regression/

We have applied a standard approach to costing our storm overflow plan as detailed in our original enhancement case[22] and within our DWMP[23]. We refer to our enhancement case for storm overflows (page 200 onwards) for examples and explanation of the automated GIS routine utilised. We refer to our DWMP technical summary that explains our approach to the geospatial query. See p.134 onwards – section 10.7.3.4.1 Offline tank solutions: Method

Further detail is provided below.

We believe there is a risk that companies have used different approaches to estimating scheme-level costs. By taking different approaches to producing scheme-level forecasts, there is a risk that some companies will (systematically) be under- or over-estimating their costs. This would have the consequence of biasing the estimated relationship between storage volume and modelled cost, and flawed cost allowances.

3. Ofwat's efficiency benchmarks are derived from imperfect models

Ultimately, Ofwat's efficiency benchmarks are a function of its econometric models, and therefore only as good as the specification of those models. As set out above, we have concerns that Ofwat's constructed models for storm overflows are biased.

Ofwat constructs its efficiency benchmarks at the company-level and uses a different benchmark for its Sewage Treatment Works (STWs) and Network models. Ofwat uses a median and an upper quartile benchmark for its STW models and Network models, respectively.

Ofwat's justification for its selected efficiency benchmarks are highly dependent on the associated implied unit costs being validated by its expert engineering judgement. Specifically, Ofwat's chosen benchmark is based on:

- The implied (upper quartile) unit cost allowance for network storage being around £2,557 per meter cube – in line with the mid-range of the unit cost benchmarks Ofwat considered.
- The implied (median) unit cost allowance for STWs being around £1,763 per meter cubed in line with Ofwat's engineering judgement that it should be a lower unit cost than for network storage.

In summary, we do not think that the simple modelling approach taken is appropriate to assess such a material part of company plans. We have concerns about potential biases in the model and the use of an UQ benchmark based on an engineering judgement, rather than on the quality of the model. We also note the incorrect use of Cook's distance analysis which is meant to identify influential observations rather than making the decision that these observations are outliers. We think Ofwat should review its modelling ahead of its final determination to address the above issues. If the issues cannot be addressed, then a more cautious benchmark and a greater focus on the deep dive approach would be more appropriate. Ofwat should also consider whether other protections could be introduced to reflect real efficient costs as they emerge in the process, this could entail a reopener in the early years of of the AMP to ensure confidence in the scale and efficiency of the solutions being delivered.

7.5.8 Deep Dive and outliers

Ofwat has challenged 68 of our Storm Overflow PR24 Schemes as Cook's outliers or Engineering Judgement and removed these from the modelling process. Counterintuitively, the outliers removed are often not outliers at a company level, only at an aggregate level.

[22] https://www.yorkshirewater.com/media/kukjfz3f/yky43_winep-enhancement-case.pdf

[23] https://www.yorkshirewater.com/media/stbghxmd/yw_dwmp_report_final_dwmp24_technical_summary.pdf

A total of 68 assets were reviewed, 19 of these faced a modelled cost adjustment and have had efficiencies applied and 49 were not flagged for any further efficiencies. We have reviewed the 19 identified schemes for which the cost submitted by Yorkshire Water was £324m and the cost allowed by Ofwat was £139m – a reduction of 57%. From the assessment of the 19 schemes, we have identified four main groups:

1. Low volume, high cost Cook's outlier schemes grey storage schemes in the network.
2. Low volume, high cost Cook's outlier grey storage schemes at STWs.
3. High volume, high cost Cook's outliers for Bradford Beck UPM sites (4 of the 6 required to deliver the WQ benefit).
4. High volume, high cost engineering judgement applied to our former DPC sites (inland and coastal bathing schemes).

We provide further detail regarding each asset under these four key groups below, and specific site details in Storm overflow asset specific details (YKY-PR24-DDR-31).

Ofwat has also applied an efficiency challenge to our FFT schemes of £19m (21%), alongside an overall efficiency against the remainder of the plan. Details on our representation to FFT efficiencies can be found later in this section.

7.5.8.1 Storm overflow Deep Dive and outliers

The costing methodology we applied for all our PR24 storm overflows was applied consistently across the plan and was detailed within our enhancement case[24] and also within our Drainage Water Management Plan (DWMP). For each asset with a grey storage solution in PR24, an automated GIS routine was used to determine a suitable location for the proposed grey storage volume based on the DWMP modelled outputs for 2050, incorporating population growth, urban creep and climate change. The solutions were designed to achieve the SODRP targets in terms of volumes required to deliver the discharge target at each location. As we have coastal sites, inland bathing sites and other overflows, the discharge target varied from 1 discharge spill for inland bathing, 2 discharges for coastal bathing in bathing season, and 10 discharges or less depending on delivering no local ecological harm requirements.

The automated GIS routine was used to locate a land parcel considering a number of constraints. An automated pipe route was then used to plan an approximate route and length of pipe required from the overflow location to the selected grey storage location. Mechanical and Electrical (M&E) ancillaries for the grey storage solutions were also included in the costing methodology. For example, a screen, screening chamber, power supply, MCC kiosk, pumps, hydro-ejectors, and rising mains were included in the capex estimates. Table 7-8 below highlights the build-up of the elements that were used to cost the 19 schemes that have been queried.

[24] yky43_winep-enhancement-case.pdf (yorkshirewater.com)

Table 7-8: Bill of Quantities detailing breakdown for the 19 deep dive schemes

	Concrete Gravity Pipe - from weir chamber manhole to storage shaft		Rising Main - from storage shaft to pump return manhole		Offline Storage Shaft	2No. Return Pumps	Hydroejectors		MCC Kiosk	Power Supply	Odour Control Unit	Screen Chamber	Screen
Asset Name	length (m)	diameter (mm)	length (m)	diameter (mm)	volume (m3)	power (kW - total)	power (kW - per unit)	Number of (total)	area (m2)	power (kW)	flow (m3/day - peak flow to be returned)	diameter (mm - incoming pipe)	diameter (mm - incoming pipe)
ST AUGUSTINES AVENUE/CSO	69	1000	69	90	1	8	0	0	6	10	0	1000	1000
HIRD STREET/NO 2 CSO	724	525	724	90	1	8	0	0	6	10	0	2710	2710
SPITAL CROFT/CSO	181	600	181	90	2	8	0	0	6	10	0	600	600
EAST CRESCENT/CSO	326	600	326	90	7	8	0	0	6	10	0	600	600
CAMBRIDGE STREET/CSO	99	375	99	90	7	8	0	0	6	10	0	1270	1270
MARYGATE LANE/CSO	260	380	260	90	7	8	0	0	6	10	0	600	600
ST AUGUSTINES DRIVE/CSO	165	450	165	90	14	8	0	0	6	10	0	2480	2480
OLD WHITTINGTON/STW	25	600	25	90	22	8	0	0	6	10	0	1200	1200
KEIGHLEY MARLEY/STW	25	750	25	90	38	8	0	0	6	10	0	3000	3000
NORTH AVENUE/CSO	70	1800	45	630	6100	75	7.5	4	12	225	0	3200	3200
PRESTON STREET/CSO	51	2680	51	280	7300	90	7.5	4	12	150	5011	1222	1222
GEORGE ST BRADFORD/SCC	325	750	325	280	8200	90	7.5	4	12	150	5011	1050	1050
LONGSIDE LANE HALL/CSO	281	1830	281	280	12300	90	7.5	4	12	150	5011	3200	3200
CORNER CAFE/NO 2 CSO	290	2400	290	280	5147	90	7.5	4	12	150	5011	600	600
TOLL HOUSE/SPS	318	750	318	280	10718	90	7.5	4	12	150	5011	600	600
SCALBY MILLS/CSO	181	1800	181	280	23883	90	7.5	4	12	150	5011	424	424
WETHERBY/STW	25	1530	25	280	14328	90	7.5	4	12	150	5011	1200	1200
SCARBOROUGH/STW/STORM TREATMENT	25	900	25	280	23132	90	7.5	4	12	150	5011	1750	1750
BRIDLINGTON/STW	25	1000	25	280	34165	90	7.5	4	12	150	5011	600	600

We provided responses for a number of these assets in OFW-OBQ-YKY-195 and also in OFW-OBQ-YKY-166 which also detailed the above information in respect of the costing and GIS routine and with links to the DWMP documentation and enhancement case documentation which outlines our high-level strategic approach to our storm overflow plan.

We refer to our DWMP technical summary[25] that explains our approach to the geospatial query, within section 10.7.3.4.1, Offline tank solutions: Method (page 134 onwards).

We refer to our enhancement case for Storm Overflows[26], Chapter 14.3.2: 'The Need for the Proposed Investment – WFD_IMP – Intermittent Discharges' (page 190) covers the Bradford Beck schemes and page 200 onwards for examples and explanation of the automated GIS routine or as above in the DWMP.

We also highlighted throughout our submissions that the solution identified as part of this process is not necessarily the solution that would be delivered as part of our asset management cycle but did give us a consistent plan that was built up on proposed high-level strategic solutions. Chapter 11.5 of our DWMP Technical Summary[27] highlights our approach to solution design from concept through delivery and benefits realisation.

Below, we review each of the four groups identified further for our outliers as identified by Ofwat.

1. Low volume high cost cooks outlier schemes grey storage schemes in the network

There are 7 storm overflow sites which fall within this category as detailed in Table 7-9. These sites (apart from Spital Croft) are required to meet a 10 discharge target as part of the SODRP. They are also all classed as priority assets in line with the guidance provided by the EA, of which YW needed to address 38% within its AMP8 plan. Spital Croft is an inland coastal bathing impacting storm overflow and must meet 1 discharge per bathing season or a 3 discharge per year proxy. While the storage volumes for these assets are small, we have taken a consistent approach applying the same methodology to costing our strategic high-level solutions. This

[25] https://www.yorkshirewater.com/media/stbghxmd/yw_dwmp_report_final_dwmp24_technical_summary.pdf

[26] https://www.yorkshirewater.com/media/kukjfz3f/yky43_winep-enhancement-case.pdf

[27] https://www.yorkshirewater.com/media/stbghxmd/yw_dwmp_report_final_dwmp24_technical_summary.pdf

means that there is a risk the costs may be slightly elevated against Ofwat's model but follow the same methodology applied for all our storm overflow high-level strategic solutions.

Table 7-9: Low volume, high-cost Cook's outlier schemes grey storage schemes in the network.

Site Name	Total Storage (m3)	Yorkshire Water Request (£m)	Ofwat Cost Model (£m)
ST AUGUSTINES AVENUE/CSO	1.00	1.13	1.00
HIRD STREET/NO 2 CSO	1.00	3.16	1.00
SPITAL CROFT/CSO	2.00	1.11	1.04
EAST CRESCENT/CSO	7.00	1.42	1.13
CAMBRIDGE STREET/CSO	7.00	1.28	1.13
MARYGATE LANE/CSO	7.00	1.23	1.13
ST AUGUSTINES DRIVE/CSO	14.00	2.10	1.21

The cost of the schemes includes all ancillaries, a piped network route to and from a suitable land parcel capable of locating the storage shaft, a screen and a pumped return with rising main. Ofwat's modelling approach suggests that as the volume of storage is low, the costs should be lower. However, due to the total work required to deliver the defined scheme the costs are deemed to be in line with all other sites costings. Some sites also have location challenges and although we accept that a different solution may be delivered, until we progress to detailed design, we will not be able to assess the sites any further or provide an alternative costing for the sites.

The scheme costing also considers population, growth, and climate change with a design horizon of 2050 to achieve the discharge target for the life of the SODRP and hence includes storage volumes required to achieve this in the schemes.

Table 7 below includes the Bill of Quantities (BoQ) build up for these sites including required ancillaries and screen sizing to demonstrate the additional costs, beyond the requirements for storage, included within our costing methodology.

Table 7-10: Bill of Quantities detailing site specific build up

	Concrete Gravity Pipe - from weir chamber manhole to storage shaft		Rising Main - from storage shaft to pump return manhole		Offline Storage Shaft	2No. Return Pumps	Hydroejectors		MCC Kiosk	Power Supply	Odour Control Unit	Screen Chamber	Screen
Asset Name	length (m)	diameter (mm)	length (m)	diameter (mm)	volume (m3)	power kW (total)	power kW (per unit)	Number of (total)	area (m2)	power (kW)	flow (m3/day - peak flow to be returned)	diameter (mm - incoming pipe)	diameter (mm - incoming pipe)
ST AUGUSTINES AVENUE/CSO	69	1000	69	90	1	8	0	0	6	10	0	1000	1000
HIRD STREET/NO 2 CSO	724	525	724	90	1	8	0	0	6	10	0	2710	2710
SPITAL CROFT/CSO	181	600	181	90	2	8	0	0	6	10	0	600	600
EAST CRESCENT/CSO	326	600	326	90	7	8	0	0	6	10	0	600	600
CAMBRIDGE STREET/CSO	99	375	99	90	7	8	0	0	6	10	0	1270	1270
MARYGATE LANE/CSO	260	380	260	90	7	8	0	0	6	10	0	600	600
ST AUGUSTINES DRIVE/CSO	165	450	165	90	14	8	0	0	6	10	0	2480	2480

The level of efficiency applied to these schemes (£3.76m across seven schemes) means that unless alternative solutions can be sought for the allowed costs, the originally proposed and correctly scoped schemes may be non-viable, and we would be unable to design, construct and deliver the outcomes required within Ofwat's modelled allowances, without creating any adverse impacts within the local network.

Further details are provided in Table 7-18 – Summary of responses to each individual asset addressed within Ofwat's deep dive and outlier assessment.

2. Low volume, high cost Cook's outlier grey storage schemes at STWs

There are two storm overflow sites which fall within this category, as detailed in Table 7-11. Both these assets are priority storm overflows as defined by the Environment Agency.

Table 7-11: Low volume, high cost Cooks outlier grey storage schemes at STWs

Site Name	Total Storage (m3)	Yorkshire Water Request (£m)	Ofwat Cost Model (£m)
OLD WHITTINGTON/STW (YWS01363)	22.00	1.06	0.38
KEIGHLEY MARLEY/STW (YWS01048)	38.00	2.10	0.51

Our STW storm tank solutions have followed the same strategic methodology for solution development and costing of storage volume and ancillaries as detailed above to ensure a consistent approach across all assets.

Within Query OFW-OBQ-YKY-195, and OFW-OBQ-YKY-166, we detailed how the higher costs for these schemes relate to screening costs. Within Figure 7-3 below, we provided a cost breakdown for the Screen capex (Cost Driver 14), which is also provided as part of the IN2305 PCD table alongside the table submission commentary.

Figure 7-3 Screen Capex Breakdown for low volume, high cost Cook's Outlier grey storage schemes at STWs

PCDWW5
Company
Wastewater network+ - Storm Overflow spill reduction (sewage treatment works)

Line Description	Units	DPs	Capital expenditure 2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	After 2029-30	Cost driver 6 Total Equivalent Storage (m3)	Cost driver 7 Equivalent Storage delivered through Grey infrastructure (CWW20.14) (m3)	Cost driver 10 BP Spill reduction (annual spills)	Cost driver 11 Priority site (yes/no)	Cost driver 14 Company specific - Screen CAPEX (£m)
YWS01335	£m	3	0.000	0.000	0.074	0.321	0.645	0.021	0.000	22	22	18.0	Y	0.588
YWS01363	£m	3	0.000	0.146	0.637	1.301	0.000	0.000	0.000	38	38	75.0	Y	1.401

Cover | 1.Enh line groups>>> | Water | Wastewater | 2.SO data req>>> | Spill reduction - Network | Spill reduction - STW

As detailed above in Figure 7-3, the screen for Old Whittington/STW (YWSO1335) is half the value of the scheme cost (at £0.588m, which on its own is greater than Ofwat's modelled allowance) total and for Keighley Marley/STW (YWSO1365), the screen is c.60% of the total scheme cost (at £1.401m, which on its own is greater that Ofwat's modelled allowance). We have added the BoQ build up for these sites below in Table 7-12.

Table 7-12: Bill of Quantities detailing site specific build up

	Concrete Gravity Pipe - from weir chamber manhole to storage shaft		Rising Main - from storage shaft to pump return manhole		Offline Storage Shaft	2No. Return Pumps	Hydroejectors		MCC Kiosk	Power Supply	Odour Control Unit	Screen Chamber	Screen
Asset Name	length (m)	diameter (mm)	length (m)	diameter (mm)	volume (m3)	power kW (total)	power kW (per unit)	Number of (total)	area (m2)	power (kW)	flow (m3/day - peak flow to be returned)	diameter (mm - incoming pipe)	diameter (mm - incoming pipe)
OLD WHITTINGTON/STW	25	600	25	90	22	8	0	0	6	10	0	1200	1200
KEIGHLEY MARLEY/STW	25	750	25	90	38	8	0	0	6	10	0	3000	3000

An allowance for screening provision has been made at every storm overflow as per our costing methodology. Screens have been sized based on the incoming pipe diameter only. This may mean screens, and associated screening chambers, are over or under sized when local hydraulic conditions are factored in, in line with our cost model.

The level of efficiency applied to these two schemes (c£2.7m) deems them non-viable, and we would be unable to construct and deliver the outcomes for Ofwat's modelled allowances. We do not agree with the cost efficiency afforded to these sites as we can demonstrate the costs build up and require the full amount to deliver the solutions to the correct specifications.

Further details are provided in Table 7-16: Bill of Quantities detailing site specific build up– Summary of responses to each individual asset addressed within Ofwat's deep dive and outlier assessment, and Appendix YKY-PR24-DDR-31.

3. High volume high cost Cooks outliers for Bradford Beck UPM sites (4 of the 6 required storm overflows to deliver the WQ benefit)

Following an AMP7 Urban Pollution Management (UPM) study for Bradford Beck (Clayton Beck to River Aire – GB104027062862, WINEP Ref: 7YW201457), six assets were identified as requiring improvement to deliver water quality improvement. All of these assets are classified as priority storm overflows as defined by Environment Agency guidance. Of these 6 assets, 4 storm overflow sites have been identified as high volume, high cost within the Cooks outlier assessment. These detailed below in Table 7-13.

Table 7-13: High volume high cost cooks outliers for Bradford Beck UPM sites

Site Name	Discharge Frequency Target (per year)	Total Storage (m3)	Yorkshire Water Request (£m)	Ofwat Cost Model (£m)
NORTH AVENUE/CSO	10	6100.00	17.62	7.56
PRESTON STREET/CSO	10	7300.00	21.99	8.44
GEORGE ST BRADFORD/SCC	5	8200.00	20.60	9.09
LONGSIDE LANE HALL/CSO	8	12300.00	30.30	11.91

The additional two overflows identified as part of the UPM and included within our business plan submission (but not identified within Ofwat's Cooks outlier assessment) are Little Horton Lane/CSO and Frizley Gardens/CSO.

Following the UPM study, two solution approaches were reviewed:

- Option 1 – Storage only solutions
- Option 2 – Blue/green and storage solutions

Option 1 was selected as it was the least cost and best value option but has a cost benefit ratio of less than 1. As the cost benefit ratio failed to meet the criteria specified by the EA in the guidance (Cost benefit assessment <1 is not assessed as cost beneficial), we did not initially include these solutions within our proposed WINEP. Following an Environment Agency request, these solutions were included within the WINEP to allow Defra the opportunity to review the cost benefit assessment and decide whether these solutions should be included in the final plan. In the Environment Agency's 05 July 2024 WINEP, these solutions continued to remain as an obligation. We have had no further information from the Environment Agency or Defra as to why

these assets were included in the WINEP programme given their non-cost beneficial assessment. We propose to progress as instructed by the Environment Agency to deliver these schemes in AMP8 and therefore will require an appropriate cost allowance to meet these statutory obligations.

Further details on the original proposals can be found within Section 14.3.2 'The Need for the Proposed Investment' our PR24 WINEP enhancement case[28], and within our response to queries OFW-OBQ-YKY-195 and OFW-OBQ-YKY-166.

The schemes have followed the same strategic methodology for solution development and costing of storage volume. We have provided the breakdown of this within Table 7-14 below which details the Bill of Quantities for the 4 storm overflows.

Table 7-14: Bill of Quantities detailing site specific build up

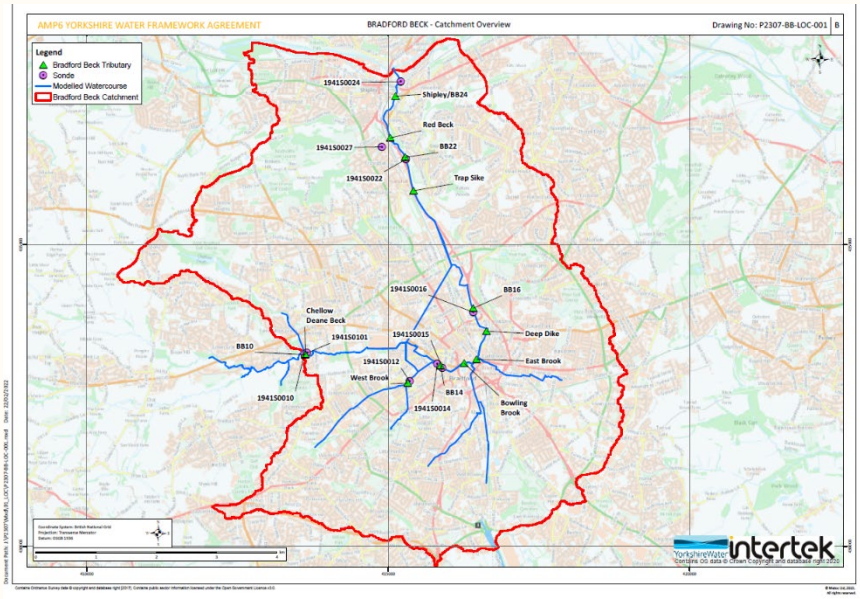
Asset Name	length (m)	diameter (mm)	length (m)	diameter (mm)	volume (m3)	power (kW - total)	power (kW - per unit)	Number of (total)	area (m2)	power (kW)	flow (m3/day - peak flow to be returned)	diameter (mm - incoming pipe)	diameter (mm - incoming pipe)
NORTH AVENUE/CSO	70	1800	45	630	6100	75	7.5	4	12	225	0	3200	3200
PRESTON STREET/CSO	51	2680	51	280	7300	90	7.5	4	12	150	5011	1222	1222
GEORGE ST BRADFORD/SCC	325	750	325	280	8200	90	7.5	4	12	150	5011	1050	1050
LONGSIDE LANE HALL/CSO	281	1830	281	280	12300	90	7.5	4	12	150	5011	3200	3200

The level of efficiency applied to these schemes (£53.5m across 4 schemes) makes them non-viable, and we would be unable to design, construct and deliver the outcomes required within Ofwat's modelled allowances. As a result, we would not be able to deliver these improvements within Ofwat's allowances. Should this be the case, we would argue, given the original cost benefit analysis, that we do not proceed with these solutions without the full cost allowance and these obligations should be removed from the WINEP. The 4 schemes cannot be dealt with in isolation and must be delivered alongside the two additional UPM solutions not identified within Ofwat's Cook's outlier assessment (Little Horton Lane/CSO and Frizley Gardens/CSO). If these solutions were to be removed, we would need to remove all six schemes at a total cost of around £107m.

Should this UPM obligation be removed from the AMP8 WINEP, there would be opportunity to optimise the overall solution for the Bradford Beck catchment (Figure 7-4 below). There are an additional 16 storm overflows that will require improvement to achieve the Storm Overflow Discharge Reduction Plan and achieve all required outcomes for improving river water quality. These total approximately £85.4m and are programmed for delivery across AMP9 to AMP12. By reviewing the entire Bradford Beck catchment and its associated overflows as a catchment solution, we believe there would be opportunity to optimise blue-green solutions and surface water removal within the catchment, thereby reducing the amount of grey infrastructure required.

[28] https://www.yorkshirewater.com/media/kukjfz3f/yky43_winep-enhancement-case.pdf

Figure 7-4 Bradford Beck catchment map



Ideally, the whole Bradford Beck catchment would be addressed at once, and all the storm overflows reviewed as part of a larger and more efficient catchment approach. Should it be the case that the requirements identified under the AMP7 UPM study remain in the WINEP for AMP8, we confirm that, as evidenced, the full cost presented in our submitted business plan are required to deliver these schemes.

Further details are provided in Table 7-16: Bill of Quantities detailing site specific build up– Summary of responses to each individual asset addressed within Ofwat's deep dive and outlier assessment, and Appendix YKY-PR24-DDR-31.

4. High volume, high-cost engineering judgement applied to our former DPC sites (inland and coastal bathing schemes)

There are 6 storm overflow sites which fall within this category as detailed in Table 75. These sites are all being driven under bathing water drivers on the WINEP and therefore have a tighter discharge frequency target.

Table 7-15: High volume, high cost engineering judgement applied to former DPC sites

Site Name	Discharge Frequency Target (discharge/bathing water season)	Total Storage (m3)	Yorkshire Water Request (£m)	Ofwat Cost Model (£m)
CORNER CAFE/NO 2 CSO - YWS01048	2	5147	12.527	6.837
TOLL HOUSE/SPS - YWS00849	2	10718	22.466	10.844
WETHERBY/STW - YWS00195	1	14328	28.447	14.359
SCARBOROUGH/STW/STORM TREATMENT - YWS02243	2	23132	44.711	18.645
SCALBY MILLS/CSO - YWS00513	2	23883	46.107	19.348

BRIDLINGTON/STW/STORM TREATMENT - YWS01453	2	34165	64.205	23.065

These schemes have followed the same strategic methodology for solution development and costing of storage volume as every storm overflow scheme within our business plan submission. However, as these schemes are to achieve the inland or coastal bathing target of 1 or 2 discharges per bathing season, they have a greater storage volume required. We have provided the breakdown of their proposed costs below.

Many of our coastal network storm overflows face geographic complexities, which results in an even greater challenge when identifying appropriate storage locations. Further detail on this can be found in section Coastal bathing waters non-statutory appendix (YKY-PR24-DDR-32) below. We believe that Ofwat has not appreciated the specific challenges with delivering such large volume storage solutions in areas of high population density, such as coastal locations, and as such, as part of our representation we believe that it would be informative and appropriate for Ofwat to carry out site visits as part of its engineering assessment to appreciate the complexity of the required solutions. Yorkshire Water would be happy to facilitate this.

The level of efficiency applied to these schemes (around £125m across 6 schemes) makes them non-viable, and we would be unable to design, construct and deliver the outcomes required within Ofwat's modelled allowances. We would challenge the certainty of Ofwat's cost model for large volume solutions, as across the industry, in recent AMPs only cost-beneficial UPM and SOAF WFD improvements have been delivered, which generally tend to be lower volume, and therefore lower cost schemes.

The Storm Overflow Evidence Project (SOEP) produced for Defra states £1,300/m^3 as the lower bound and £2,000/m^3 as the upper bound for network storage construction[29]. This cost is based on storage volumes only and is not inclusive of ancillaries. Our PR24 storm overflow storage costs per m^3 for schemes with greater than 5,000 m^3 of grey only storage, largely fall just above this upper bound. However, we have included allowances for ancillaries within our costing and the SOEP did not. If the ancillary costs are added to the storage costs in the SOEP, then our schemes would appear to be within the upper bounds and therefore we do not agree with the efficiencies applied to these schemes. Table 7-16 below includes the BoQ breakdown with ancillaries.

Table 7-16: Bill of Quantities detailing site specific build up

	Concrete Gravity Pipe - from weir chamber manhole to storage shaft		Rising Main - from storage shaft to pump return manhole		Offline Storage Shaft	2No. Return Pumps	Hydroejectors		MCC Kiosk	Power Supply	Odour Control Unit	Screen Chamber	Screen
Asset Name	length (m)	diameter (mm)	length (m)	diameter (mm)	volume (m3)	power kW (total)	power kW (per unit)	Number of (total)	area (m2)	power (kW)	flow (m3/day - peak flow to be returned)	diameter (mm - incoming pipe)	diameter (mm - incoming pipe)
CORNER CAFE/NO 2 CSO	290	2400	290	280	5147	90	7.5	4	12	150	5011	600	600
TOLL HOUSE/SPS	318	750	318	280	10718	90	7.5	4	12	150	5011	600	600
SCALBY MILLS/CSO	181	1800	181	280	23883	90	7.5	4	12	150	5011	424	424
WETHERBY/STW	25	1530	25	280	14328	90	7.5	4	12	150	5011	1200	1200
SCARBOROUGH/STW/STORM TREATMENT	25	900	25	280	23132	90	7.5	4	12	150	5011	1750	1750
BRIDLINGTON/STW	25	1000	25	280	34165	90	7.5	4	12	150	5011	600	600

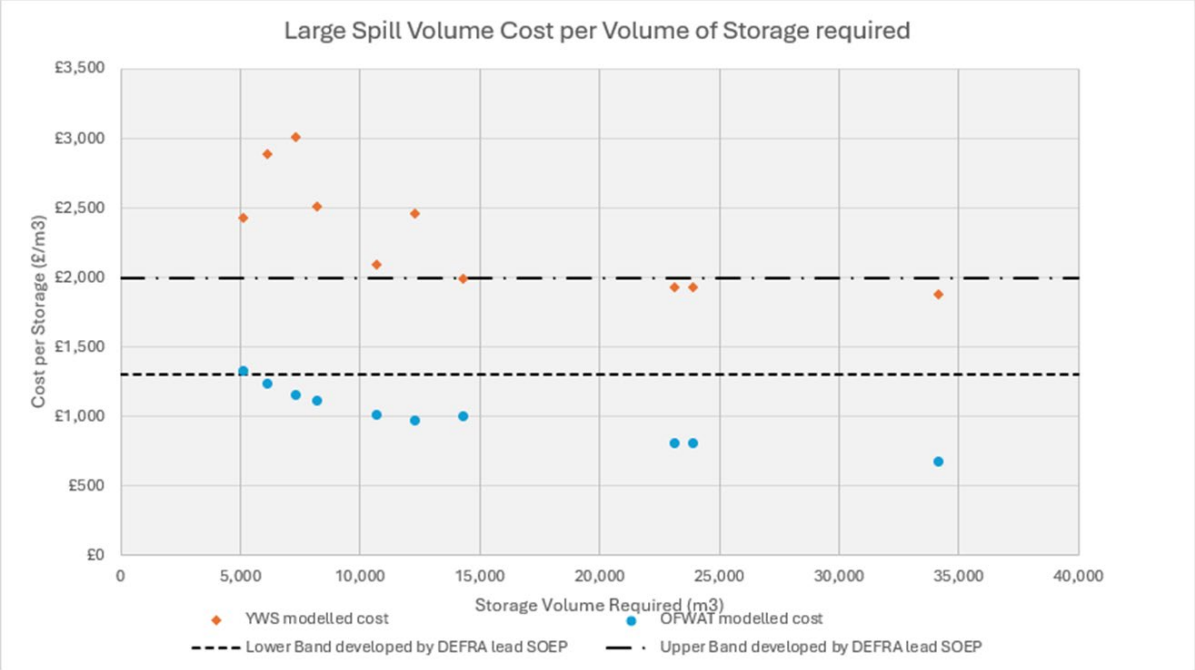
The revised Ofwat costs (£/m^3) are predominately below the capex unit costs in the SOEP, with Ofwat's lowest cost assessment at £675/m^3. This is below the lower band of the SOEP, and a lower figure than is thought deliverable due to the specific complexities of many of the sites and the required volume required to be stored to achieve the SODRP targets.

Figure 7-4 below demonstrates this graphically. The two horizontal lines show the lower and upper bound costs from the Storm Overflow Evidence Project, when only considering storage volume costs, without any allowances for ancillaries. The orange datapoints highlight our costs

[29] Table 3-5 'CAPEX unit costs' https://assets.publishing.service.gov.uk/media/6182bad4e90e07197867ecd4/storm-overflows-evidence-project.pdf

for each of the larger volume grey storage schemes, demonstrating how they compare to the upper bound. The blue datapoints show Ofwat's efficiency challenge costs predominantly below the lower bound.

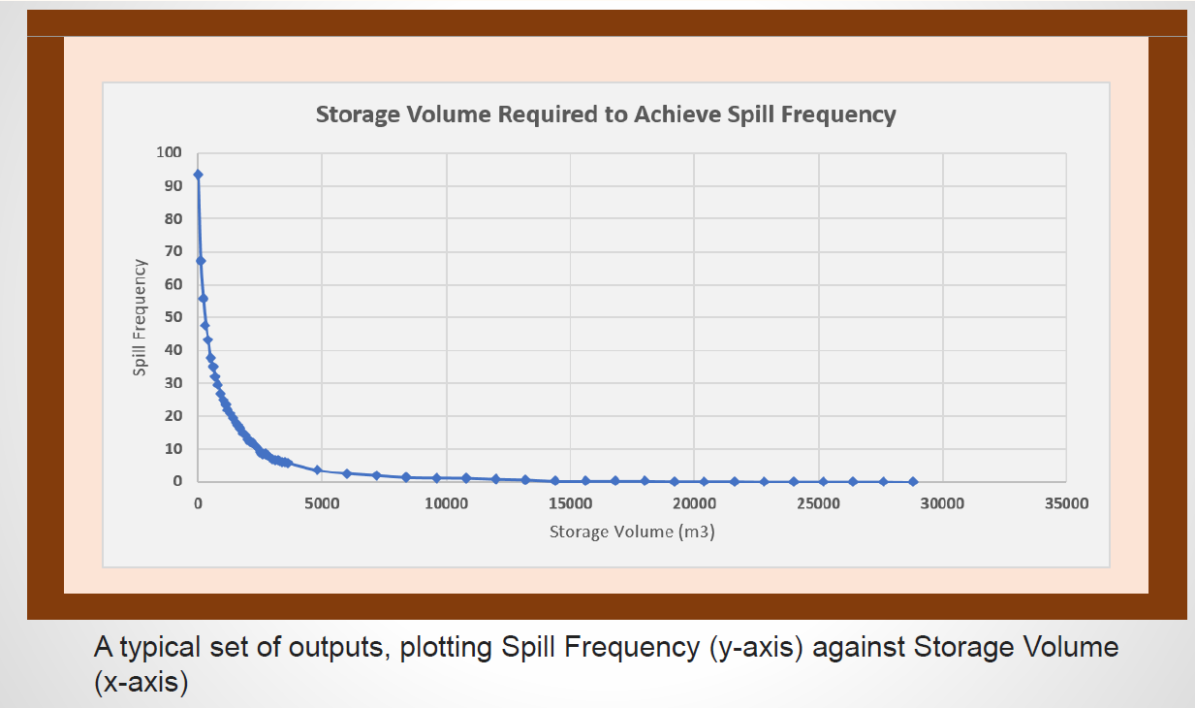
Figure 7-5 Cost Assessments compared to the Storm Overflow Evidence Project



Further details are provided in Table 7-16: Bill of Quantities detailing site specific build up– Summary of responses to each individual asset addressed within Ofwat's deep dive and outlier assessment, and Appendix (YKY-PR24-DDR-31).

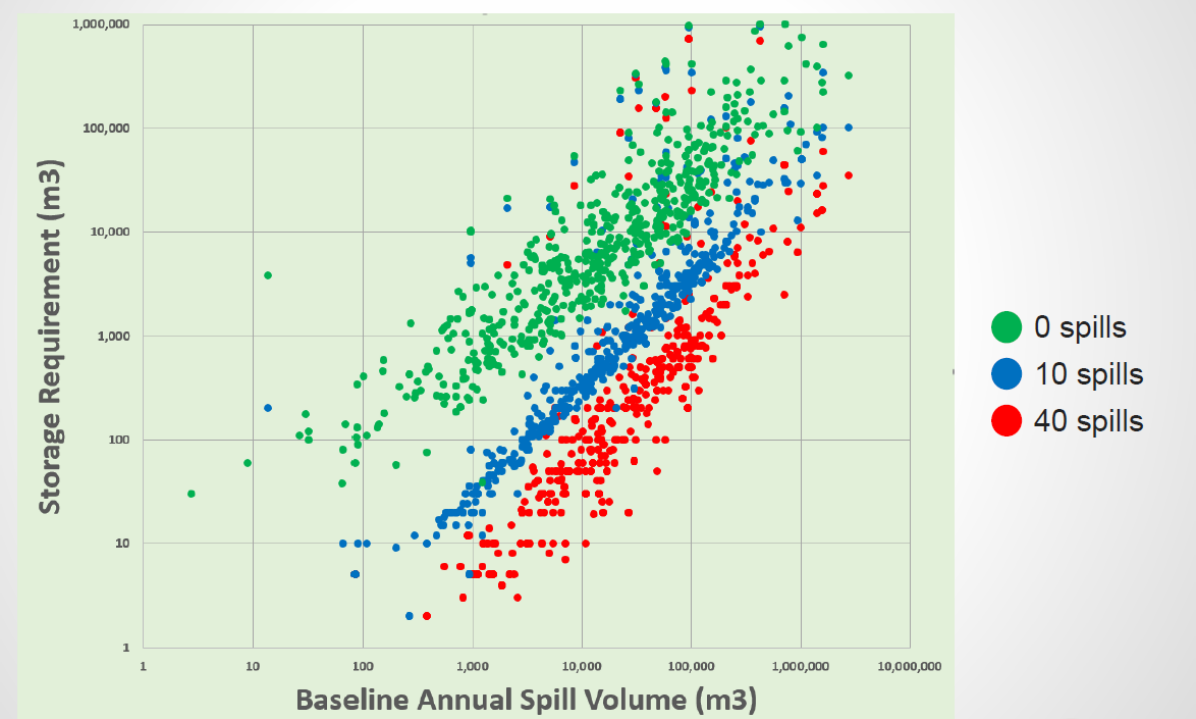
Further industry literature presented at UDG in November 2021 and closely reflects our data is shown below in Figure 7-6 and Figure 7-7. These show that the volumes required to achieve spills and highlights the higher volumes needed for lower spills associated with inland and coastal bathing targets and no local environmental harm targets.

Figure 7-6 Storage Volume v Spill Frequency



A typical set of outputs, plotting Spill Frequency (y-axis) against Storage Volume (x-axis)

Figure 7-7 Baseline annual spill volume v storage volume for different spill scenarios



7.5.8.2 FFT Deep Dive

Within Ofwat's draft determination (PR24-DD-WW-Storm-Overflows FFT), the following comments were highlighted, regarding our flow to full treatment expenditure proposals:

> *The expenditure for pass forward flow/flow to full treatment increases related to storm overflow spill reduction were separated from the scheme level data to be assessed to the grey and grey/hybrid storage models to ensure that schemes were assessed on a like for like basis.*
>
> *Cost drivers were requested for the schemes, which include number of schemes and l/s flow to full treatment increase provided. Both of these cost drivers were assessed, however neither were able to give a robust model. Data points were missing from Southern Water and Thames Water (l/s increase). This data has been requested again as part of a data submission prior to Final Determinations.*
>
> *Due to the low confidence in modelling the flow to full treatment schemes, an efficiency challenge was given based on the company level efficiency challenge provided by the grey and grey/hybrid network and STW econometric models. This approach was taken as it was considered that the level of efficiency companies showed in the delivery of grey civils works for the network and STW schemes would indicate the likely efficiency in delivery of pass forward flow/flow to full treatment schemes.*
>
> *Subject to a complete picture of the number of schemes with l/s increase, the total l/s increase and cumulative shortfall in FFT from all 5 companies, we may consider applying a modelled approach at FD.*

We have three FFT upgrades related to our storm overflow work within the following catchments, the total efficiencies applied to these assets are defined in Table 7-17:

1. Ilkley STW
2. Scarborough STW
3. Wetherby STW

Table 7-17: FFT Efficiency Summary

	YW submitted cost (£m)	Ofwat Assessment (£m)	Efficiency (£m)	Efficiency (%)
Flow to Full Treatment	91.479	72.461	19.018	21

We have provided full detail of our apportioned FFT increases within the ADD20 data table and supporting commentary. This provides the FFT increase, alongside reported totex values. Where multiple storm overflows have been assessed as requiring an FFT upgrade at the associated sewage treatment works within the catchment, we have broken this data down within ADD20. This data is also provided within CWW3.15 and CWW20.13.

It is important to note that we require the FFT upgrade to allow sufficient treatment capacity and to allow our storage tanks at our storm overflows to effectively drain as soon as is reasonably practicable. The FFT costs are a consequence of delivering storage in the network to reduce discharges. The FFT costs and work are not in place of network storage but in addition to allow the storage to operate as designed.

We do not believe it is appropriate to apply an efficiency to FFT schemes that aligns with the network solutions because they have intentionally been costed and structured differently as they present different challenges to those on the network. This is because they are not relate to the delivery of grey storage or surface water removal. Upgrading a STW to accommodate additional FFT may include amendments to inlet works, primary, secondary and tertiary treatment units alongside upsizing of interconnecting pipework and also increasing FFT has an impact on sludge production and assets, this in turn can mean changes to whole site services (such as electricity) and control systems. We recommend that Ofwat develops a FFT specific model at FD or assesses these schemes via a deep dive. If it cannot do this, a more appropriate comparator efficiency should be used which involves sewage treatment assets (phosphorus enhancement model or a Sewage Treatment base model).

Our FFT schemes have been compiled using our in-house Design and Value Engineering (DAVE) tool and costed via our unit cost database (UCD) models for the various components that are required as part of the FFT upgrade.

Ofwat has applied efficiencies of £27.5m to our three schemes. This is a significant challenge to our plan and renders our proposed schemes undeliverable. We do not believe that we can design, construct and deliver the outcomes required within Ofwat's modelled allowances, especially as they reflect storage on the network.

1. Ilkley STW

To support the return of stored flows to treatment, further enhancement to increase the flow to full treatment capacity beyond existing consent levels will be required at Ilkley STW to allow storm flows to be treated. As detailed within ADD20, this upgrade is aligned to ILKLEY/STW/3XDWF OVERFLOW.

2. Scarborough STW

In addition to the direct storm overflow reduction investment proposed in the Scarborough catchment, we have also included an expenditure allowance for increasing the capacity of Scarborough Wastewater Treatment Works. This capacity increase is required, due to the volumes of storage associated with the WINEP storm overflows in this catchment and the need to empty the storage tanks and to return any stored flows to treatment before the next storm event impacts the catchment. The timing of emptying the tanks and the treatment of the flows to facilitate safe discharge to the environment is key in making sure that we achieve the lower discharge frequency target of 2 discharges per bathing season for the targeted overflows in this catchment. As detailed within ADD20, this work supports the following storm overflows:

- WHITBY ROAD BDG/CSO
- SCALBY MILLS/CSO
- TOLL HOUSE/SPS
- CORNER CAFÉ/NO 2 CSO

3. Wetherby STW

To support the return of stored flows to treatment, further enhancement to increase the flow to full treatment capacity beyond existing consent levels will also be required at Wetherby/STW to allow storm flows to be treated. Sites being addressed as part of the bathing water work are:

- LANGWITH VALLEY/CSO
- COLLINGHAM LEEDS ROAD/CSO
- SCOTT LANE/CSO
- WETHERBY BYPASS/CSO
- WETHERBY/STW

7.5.8.3 Site Specific Deep Dive Review

Table 7- contains a summary of our responses to each individual asset addressed within Ofwat's Deep Dive and Outlier assessment.

Third Party Assurance of Costs

Based on our cost assurance activity, where third party assurance of our DWMP24 and our WINEP submissions was undertaken by Atkins, we have established a high degree of confidence in our cost estimate for these schemes. Our cost models are assured and also our PR24 plan underwent third party assurance by Turner & Townsend and KPMG. Therefore, we are certain that we cannot deliver the storm overflow schemes with the reduction in costs proposed by Ofwat. An extract from our DWMP assurance is shown below in Figure 7-8 & Figure 7-9.

Figure 7-8 DWMP Assurance Findings

Stage	Findings	Methodology		Data
		Method	Documentation	
Options Development and Appraisal - Networks	Whilst concerns remain about the simplification of the option development process and the constraints this applies to programme appraisal, between draft and final there has been a marked improvement in the granularity and robustness of option development and pricing. For example, greater use of automated approaches has provided higher confidence in the programme costs, however some outliers were noted, particularly high unit costs for smaller storage schemes. Robust benchmarking of option benefits at programme levels, against the draft outputs, has demonstrated the consistency in the approach between publications.	Amber	Green	Green

Figure 7-9 DWMP Assurance Findings

Storm Overflows Option Selection and Costing	Amber	Green	Green	An unconstrained list of potential options was developed and reviewed to remove those not considered appropriate or technically feasible for CSOs. This constrained list then further reviewed to determine which option types could be evaluated with the available data and across the programme. This has resulted in options limited to storage, and surface water management assuming 50% impermeable area reduction with additional storage where required to achieve spill frequency target. While these option types may not be the most effective or efficient for all locations they are sufficient for purposes of developing a high-level program. Costing methodology used is robust.

The substantial efficiencies applied by Ofwat at draft determination will mean that Yorkshire Water is unable to deliver the intended benefits for all schemes identified in the AMP8 storm overflow programme. To further illustrate this, the reduction in funding will specifically mean that we will be unable to construct and deliver the volumes of storage (and associated treatment) required to meet the statutory requirements set out in the SODRP and the Environment Act, to meet the specific discharge reduction targets across a range of environmentally sensitive, inland bathing and coastal assets.

It is therefore imperative that Ofwat reassess the efficiency reductions applied to this programme of work at draft determination so as not to undermine the outcomes.

Table 7-18: Summary of responses to each individual asset addressed within Ofwat's deep dive and outlier assessment

Scheme Name & YWS Ref No	Discrepancy Type	Ofwat Comments	YW Cost	Ofwat Cost Model	YW Response
YWS00266 Cambridge Street CSO	Low volume, high cost Cooks outlier (network)	Significant concerns: We have significant concerns that the cost requested is efficient. The company does not provide compelling evidence to justify an allowance above the modelled benchmark. The scheme was highlighted as an inefficient log outlier, due to the small total storage volume and high relative cost indicating a non-efficient fixed cost for the scheme. No evidence has been presented by the company to explain the inefficient costs for the small volume of storage delivered.	£1.28m	£1.13m	These sites (apart from Spital Croft) are required to meet a 10 spills target as part of the SODRP. They are also all classed as priority sites in line with the EA methodology, of which YW needed to address 38% within its AMP8 plan. Spital Croft is an inland coastal bathing impacting storm overflow and must meet 1 spill per bathing season or a 3 spills per year proxy. While the storage volumes for these assets are small, we have taken a consistent approach to scheme costing. This means that there is a risk the costs may be slightly elevated against Ofwat's model but follow the same methodology applied for all our storm overflow high-level strategic solutions. The cost of the schemes includes all ancillaries, a piped network route to and from a suitable land parcel capable of locating the storage shaft, a screen, and a pumped return with rising main. Ofwat's modelling suggests that as the volume of storage is low, the costs should be cheaper. However, due to the total work required to deliver the defined schemes the costs are deemed to be in line with all other sites costings. Some sites also have location challenges and although we accept that a different solution may be delivered until we progress to detailed design, we will not be able to assess the sites any further or provide an alternative costing. We include the Bill of Quantities for these sites in Table 7-10. The scheme costing also considers population, growth, and climate change with a design horizon of 2050 to achieve the discharge target and hence includes the storage volume needed. This was detailed for 2 overflows in response to OFW-OBQ-YKY-Q195.
YWS00279 Spital Croft CSO	Low volume, high cost Cooks outlier (network)		£1.11m	£1.04m	
YWS00463 Marygate Lane CSO	Low volume, high cost Cooks outlier (network)		£1.23m	£1.13m	
YWS00595 East Crescent CSO	Low volume, high cost Cooks outlier (network)		£1.42m	£1.13m	
YWS01802 Hird Street CSO	Low volume, high cost Cooks outlier (network)	Significant concerns: We have significant concerns that the cost requested is efficient. The company does not provide compelling evidence to justify an allowance above the modelled benchmark. The scheme was highlighted through econometric modelling to be a log outlier by applying Cook's distance. The scheme was therefore removed from the grey/hybrid model and deep dived as an outlier. The company states that the reason these schemes appear to be not as cost efficient is the volume to achieve 10 spills is 1m3 and their approach did not provide alternative solutions for large and small volume spill reductions, such as online storage or upsized manholes. The high cost for such a small storage volume therefore appears unreasonable.	£3.16m	£0.10m	
YWS01792 St Augustines Avenue CSO	Low volume, high cost Cooks outlier (network)		£1.13m	£0.10m	
YWS01855 St Augustines Drive CSO	Low volume, high cost Cooks outlier (network)	Significant concerns: We have significant concerns that the cost requested is efficient. The company does not provide compelling evidence to justify an allowance above the modelled benchmark. The scheme was highlighted through econometric modelling to be a log outlier by applying Cook's distance. The scheme was therefore removed from the grey/hybrid model and deep dived as an outlier.	£2.10m	£1.21m	

Scheme Name & YWS Ref No	Discrepancy Type	Ofwat Comments	YW Cost	Ofwat Cost Model	YW Response
		The company states that the reason these schemes appear to be not as cost efficient is the volume to achieve 10 spills is a small volume and their approach did not provide alternative solutions for large and small volume spill reductions, such as online storage or upsized manholes. The high cost for such a small storage volume therefore appears unjustified.			
YWS01335 Old Whittington STW 6x	Low volume, high cost Cooks outlier (STW)	Significant concerns: We have significant concerns that the cost requested is efficient. The company does not provide compelling evidence to justify an allowance above the modelled benchmark. The scheme was highlighted through econometric modelling to be a linear outlier by applying Cook's distance. The scheme was therefore removed from the grey/hybrid model and deep dived as an outlier. The company stated that the inefficiency is related to screen size allowance being calculated off of incoming pipe diameter which may mean the screen is oversized. However, this does not appear to relate to the overall storage cost inefficiency when compared with the modelled allowance. The storage element of the scheme breakdown is likely to be much larger than the screen, and therefore the screen being oversized is unlikely to have been the main cause for the model to highlight the scheme as inefficient.	£1.06m	£0.38m	Our STW storm tank solutions have followed the same strategic methodology for solution development and costing of storage volume and ancillaries as detailed above to ensure a consistent approach across all assets. Within Query OFW-OBQ-YKY-195, we detailed how the higher costs for these schemes are related to screening costs. Within Figure 7-2, we provided a cost breakdown for the Screen Capex (Cost Driver 14), which is also provided as part of the IN2305 PCD table alongside the table submission commentary. An allowance for screening provision has been made at every storm overflow as per our costing methodology. Screens have been sized based on the incoming pipe diameter only. This may mean screens, and associated screening chambers, are over or under sized when local hydraulic conditions are factored in. However, this risk is accepted within our cost model. The screen for Old Whittington/STW is half the value of the scheme cost total and for Keighley Marley/STW, the screen is c60% of the total scheme cost. We have provided the BoQ build up for these sites in Table 7-12.
YWS01363 Keighley Marley STW 6x High Level	Low volume, high cost Cooks outlier (STW)	Significant concerns: We have significant concerns that the cost requested is efficient. The company does not provide compelling evidence to justify an allowance above the modelled benchmark. The scheme was highlighted through econometric modelling to be a linear outlier by applying Cook's distance. The scheme was therefore removed from the grey/hybrid model and deep dived as an outlier. The company provided feedback but was unable to provide compelling evidence explaining the high costs in relation to the reported storage volume.	£2.10m	£0.51m	
YWS01677 George Street SCC	High volume, high cost Cooks outliers (UPM)	Significant concerns: We have significant concerns that the cost requested is efficient. The company does not	£20.60 m	£9.09m	Following an AMP7 Urban Pollution Management (UPM) study for Bradford Beck (Clayton Beck to River Aire -

Scheme Name & YWS Ref No	Discrepancy Type	Ofwat Comments	YW Cost	Ofwat Cost Model	YW Response
YWS01122 North Avenue CSO	High volume, high cost Cooks outliers (UPM)	provide compelling evidence to justify an allowance above the modelled benchmark. The scheme was highlighted through econometric modelling to be a linear outlier by applying Cook's distance. The scheme was therefore removed from the grey/hybrid model and deep dived as an outlier. The company says out that the scheme was assessed as an Urban Pollution Management (UPM) study alongside 6 other schemes that need to all be undertaken to meet the WFD driver requirements. It states that as these are required schemes, they are not cost beneficial. However, the response does not provide any evidence as to why the schemes are more expensive per m^3 storage than other schemes.	£17.62 m	£7.56m	GB104027062862), six assets were identified as requiring improvement to deliver water quality improvement. Of these six assets, 4 storm overflow sites have been identified as high volume, high cost within the Cooks outlier assessment: • NORTH AVENUE/CSO • PRESTON STREET/CSO • LONGSIDE LANE HALL/CSO • GEORGE ST BRADFORD/SCC These 4 schemes are related to Bradford Beck and are designed to deliver to UPM WFD requirements for the watercourse. These are being driven as WFD drivers and following an Environment Agency request, these solutions were included within the WINEP to allow Defra the opportunity to review the cost benefit assessment and decide whether these solutions should be included in the final plan. In the Environment Agency's 5th July 2024 WINEP, these solutions continued to remain as an obligation. We have had no further information from the Environment Agency or Defra as to why these assets were included in the WINEP programme given they fail the cost beneficial assessment. The schemes have followed the same strategic methodology for solution development and costing of storage volume. The 4 schemes cannot be dealt with in isolation and must be delivered alongside the two additional UPM solutions not identified within Ofwat's Cooks outlier assessment (Little Horton Lane/CSO and Frizley Gardens/CSO). All 6 schemes cost a total of c.£107m. To deliver the most efficient catchment approach for Bradford Beck, there are an additional 16 storm overflows that would need improvement to achieve the Storm Overflow Discharge Reduction Plan and achieve all required outcomes for improving river water quality. These total c. £85.4m and are currently planned for delivery in future AMPs. By reviewing the entire Bradford Beck catchment and
YWS01351 Preston Street CSO	High volume, high cost Cooks outliers (UPM)	Significant concerns: We have significant concerns that the cost requested is efficient. The company does not provide compelling evidence to justify an allowance above the modelled benchmark. The scheme was highlighted through econometric modelling to be a log and linear outlier by applying Cook's distance. The scheme was therefore removed from the grey/hybrid model and deep dived as an outlier. The company says out that the scheme was assessed as an Urban Pollution Management (UPM) study alongside 6 other schemes that need to all be undertaken to meet the WFD driver requirements. It states that as these are required schemes, they are not cost beneficial. However, the response does not provide any evidence as to why the schemes are more expensive per m3 storage than other schemes.	£21.99 m	£8.45m	
YWS01352 Longside Hall Lane CSO	High volume, high cost Cooks outliers (UPM)		£30.30 m	£11.91m	

Scheme Name & YWS Ref No	Discrepancy Type	Ofwat Comments	YW Cost	Ofwat Cost Model	YW Response
					its associated overflows as a catchment solution, we would be able to optimise blue-green solutions and surface water removal within the catchment, thereby reducing the amount of grey infrastructure required. Ideally the whole Bradford Beck catchment would be addressed at once and all the storm overflows reviewed as part of a larger and more efficient catchment approach. If this is not the case, then the cost and volume requested within our business plan submission is required to deliver these schemes.
YWS00195 Wetherby STW	High volume, high cost engineering judgement	Significant concerns: We have significant concerns that the cost requested is efficient. The company does not provide compelling evidence to justify an allowance above the modelled benchmark. This scheme was previously a DPC scheme, that has been moved to be delivered in house. Based on the late change in process, the scheme was moved to outlier assessment instead of being included in the econometric model. When compared against the modelled allowance for the volume of storage included in this scheme, this scheme is considered inefficient.	£28.45m	£14.36m	These schemes have followed the same strategic methodology for solution development and costing of storage volume as every storm overflow scheme within our business plan submission. However, as these schemes are to achieve the inland or coastal bathing target of 1 or 2 spills per bathing season, they have a greater storage volume required, as highlighted within Table 7-15 and Table 7-16. Many of our coastal network storm overflows face geographic complexities which result in a greater challenge when identifying appropriate storage locations. The level of efficiency applied to these schemes (c.£125m across 6 schemes) makes them non-viable, and we would be unable to design, construct and deliver the outcomes required within Ofwat's modelled allowances. We would challenge the certainty of Ofwat's cost model for large volume solutions, as across the industry, in recent AMPs only cost-beneficial UPM and SOAF WFD improvements have been delivered, which generally tend to be lower volume, and lower cost schemes. The Storm Overflow Evidence Project produced for Defra states £1,300/m^3 as the lower bound and £2,000/m^3 as the upper bound for network storage construction16. This cost is based on storage volumes only and is not inclusive of ancillaries. Our PR24 storm overflow storage costs per m^3 for schemes with greater than 5,000 m^3 of grey only storage, largely fall just above this upper bound. However, we have included allowances for ancillaries within our costing and therefore we do not agree with the efficiencies applied to these schemes.
YWS00513 Scalby Mills CSO	High volume, high cost engineering judgement		£46.11m	£19.35m	
YWS00849 Toll House CSO	High volume, high cost engineering judgement		£22.47m	£10.84m	
YWS01048 Corner Café CSO	High volume, high cost engineering judgement		£12.53m	£6.84m	
YWS02243 Scarborough STW	High volume, high cost engineering judgement		£44.71m	£18.65m	
YWS01453 Bridlington STW 6x Short Sea Outfall	High volume, high cost engineering judgement		£64.21m	£23.07m	

7.5.9 Customer protection

Please refer to our Price Control Deliverable document (YKY-PR24-DDR-07) for our detailed response on the Storm Overflow customer protection mechanism.

7.6 Concluding points

In this representation we set out these changes to our proposed storm overflow programme and we provide additional evidence to address the challenges set out by Ofwat at draft determination relating to efficiencies applied.

Regarding the amendments, we have:

- Added an additional six named storm overflows to our plan following completion of Storm Overflow Assessment Framework (SOAF) investigations, and the identification of cost-beneficial solutions. This is aligned with WINEP and expectations confirmed by the Environment Agency in letters dated 28 February 2024 (Ref EA/UWWTR/YWS/1) and 01 March 2024 (Ref EA/UWWTR/YWS/2.
- Added an allowance for any additional SOAF cost-beneficial storm overflow schemes which may arise from the completion of the remainder of the AMP7 SOAF Investigation programme which are due to complete in 2025. Any cost beneficial solutions will be added to the WINEP to be delivered in AMP8.
- Added the originally proposed Direct Procurement for Customer WINEP storm overflow schemes back into our totex plan, accepting Ofwat's decision that DPC is not appropriate for these schemes.

We have then split and reprofiled our plan into two parts:

- **Statutory WINEP Enhancement plan:** this part of our plan is aligned with the statutory WINEP enhancement plan, submitted in our plan in October 2023, with the addition of the WINEP storm overflows that were proposed to be delivered via a DPC route and the Environment Agency's additional WINEP requirements to deliver to the SOAF cost beneficial known and named outcomes.
- **Storm Overflow Optimised Discharge plan:** this second part of our plan repurposes our proposed coastal bathing enhancement expenditure, to drive a more effective plan to help us achieve our overall 20 spills PCL. This may mean that we do not achieve the full SODRP targets, rather we will reduce the largest number of discharges for the most optimal investment. This component of the plan focusses on discharge reduction and proposes the delivery of the SODRP targets in a phased manner. Where the discharge or harm target is not fully delivered in AMP8, further intervention in future AMPs will be required to achieve the statutory targets in line with the requirements of the SODRP. AMP8 interventions will be designed with this adaptive approach in mind.

While we have optimised our plan to drive a greater discharge frequency reduction, we recognise the importance of bathing water quality to support a thriving Yorkshire and understand that our customers support improvements to bathing water quality. Our desire to achieve the bathing water quality SODRP ahead of the statutory target of 2035 remains, and as such, we continue to explore potential funding and delivery routes and have resubmitted these sites as a separate 'choice option'.

We challenge the efficiencies made by Ofwat on our storm overflow investment proposals. We do not consider Ofwat's approach to cost modelling storm overflows to be appropriate due to three key modelling flaws:

- The current use of Cook's distance analysis to remove outliers.
- The potential for bias.
- The application of a stringent benchmark based on poor quality modelling.

We have also reviewed in detail Ofwat's 'Deep Dive and Outlier' assessment and provide additional asset specific evidence for the relevant schemes.

The substantial efficiencies applied by Ofwat at draft determination will mean that Yorkshire Water is unable to deliver the intended benefits for all schemes identified in the AMP8 storm overflow programme. To further illustrate this, the reduction in funding will specifically mean that we will be unable to construct and deliver the volumes of storage (and associated treatment) required to meet the statutory requirements set out in the SODRP and the Environment Act, to meet the specific discharge reduction targets across a range of environmentally sensitive, inland bathing and coastal assets.

It is therefore imperative that Ofwat reassess the efficiency reductions applied to this programme of work at draft determination so as not to undermine the outcomes of these schemes.

8 WINEP: Continuous water quality monitoring

8.1 Overview

Our original PR24 business plan submission, included an expenditure allowance for 1,803 water quality monitors. In August 2023, the Environment Agency (EA) revised their PR24 driver guidance, which resulted in a reduction to the number of monitors required. This was too late to reflect in our October 2024 business plan submission. As such, within our representation, we have reduced our expenditure proposals for the number of monitors based on the EA's guidance and current WINEP position and have reduced our requested funding to £97.491m.

This representation only relates to EnvAct_MON4 and EnvAct_MON5.

8.2 Ofwat action reference

Not applicable as this is an Environment Agency change to guidance which has resulted in a reduction in the requirements for Yorkshire Water.

8.3 Key messages

- Revised guidance issued by EA in August 2023 was too late to include within the original business plan submission in October 2023.
- The revised guidance has resulted in the new, lower, number of monitors required to meet the EnvAct_MON4 requirement.
- Within our draft determination representation, we have reduced our expenditure proposals, based on the reduced number of monitors to meet the EnvAct_MON4 requirement.

8.4 Change requested

The EA have published revised guidance, which changes the requirements for delivering EnvAct_MON4. This has reduced the number of monitors required from 1,803 to 736, and the EA have updated the WINEP with the reduced number of 736 monitors.

Table 8-1: Summary of changes to the WINEP: continuous water quality monitoring enhancement allowance

	Allowance (£m)
October 2023 business plan submission	150.06
January 2024 business plan resubmission	150.06
Ofwat's draft determination	240.11
YKY draft determination representation	97.491

This change will impact line CWW3 and CWW20

8.5 Yorkshire Water's response to Ofwat

8.5.1 The need for investment

The need for this investment remains as set out in our original submission, the change is the scale of the investment required as a result of revised WINEP guidance from the Environment Agency.

8.5.2 Customer protection

The reduction in the requirement is not great enough to require the removal of the PCD to protect the customer. The PCD will need to be amended to the reduced requirement to install 736 monitors rather than the 1,803 it currently contains.

8.6 Concluding points

As a result of the revised guidance issued by the Environment Agency and the subsequently updated WINEP, the scale of investment required in this area has reduced. As such, this representation is to align with the latest WINEP requirement.

9 WINEP: PR19 WINEP carryover

9.1 Overview

Yorkshire Water proposes to challenge and amend the PR19 WINEP reconciliation model as it is presented within the draft determination for PR24. We believe that the current model will result in inappropriate claw-back of funding where environmental outcomes are delivered by alternative solutions to the original PR19 actions. That claw-back should not be applied where WINEP alterations associated with solution change and unforeseen delays are agreed with the Environment Agency (EA).

In addition, there are amendments required to model further WINEP alterations submitted to the Environment Agency since the data for the draft determination output was collated in February-March 2024. We have amended a draft version of the model with recent changes to the timing and scope of the original PR19 actions.

The following summarises the main points of our proposed amendments and our projected impact on both the permanent claw-back and the carry-over of funding to PR24. Further detail of the proposed amendments to the model is provided in our past delivery and reconciliation commentary (YKY-PR24-DDR-62).

9.2 Ofwat action reference

On 8 August 2024 Ofwat requested us to prepare a full response to query “OFW-IBQ-YKY-020” explaining in full our challenges to the draft determination outputs from the PR19 WINEP reconciliation model, specifically in relation to the Pudsey Beck schemes. This was submitted to Ofwat on 15 August 2024 with a revised copy of the model.

9.3 Key messages

Yorkshire Water has reviewed and amended a draft version of the PR19 WINEP reconciliation model with recent changes to the timing and scope of the original PR19 actions. These WINEP alterations are still awaiting approval from the Environment Agency.

We believe that the some of the changes, if reported as required by the model data conventions, will generate inappropriate claw-back of funding. This is because our revised proposals are still delivering the original environmental improvement but via alternative and relocated solutions that reduce embedded carbon while improving biodiversity. Therefore, the revised solutions are not compatible with the model metrics.

We project the following outputs from our revised model:

- Claw-back will increase slightly from £3.42m in DD to £ 5.71m at PR19 Price Base[30]
- Carry-over will reduce from £33.99m to 31.56m at PR19 price base (£37.26m at PR24 price base[31]).
- If the model was updated without an agreement to a manual over-ride of key metrics then we project that the claw-back would be £26 million at PR19 price base.

[30] The Conversion factor to the PR24 Price base for inflating CPI(H) 2017-18 to 2022-23 FYA is 1.1806.

[31] The figures quoted are from a further review after our Post DD Response tables were closed using a value of £35.2 m @PR24 Price base

9.4 Change requested

Our changes relate to the draft determination model

"PR24-DD-PR19-WINEP-recon-model-YKY.xlsm" and its outputs.

We will submit a revised model named:

Reconciliation-Model (YKY-PR24-DDR-78) and the full narrative response can be found in the past delivery and reconciliation commentary (YKY-PR24-DDR-62) and a focus on Pudsey Beck in OFWAT Query OFW-IBQ-YKY-020.

The figure below lists the PR19 WINEP Actions and the final out-turn where we propose to amend or confirm the metrics in the original draft determination output model.

Table 9-1: PR19 WINEP Actions

WINEPID	Unique ID	Scheme category / name	Actual Claw back	Carry Over	Comment
YOR00042	7YW100098	River Burn Catchment Scheme			Restored From DD erroneous Removal
YOR00044	7YW100098	River Burn Catchment Scheme			Restored From DD erroneous Removal
YOR00045	7YW100098	River Burn Catchment Scheme	(0.52)	-	Removal
YOR00122	7YW200070	Cononley Weir Fish Passage	(1.72)	-	Removal
YOR00123	7YW200071	Farnley Beck Fish Passage	(0.12)	-	Removal
YOR01524	7YW300059	Bentley Mill Stream intermittents - BentleyMill Rise SPS	(1.14)		Removal
YOR01525	7YW300060	West Bretton storm tank discharge Transfer to NGF	-		Removal BUT cost on other driver
YOR01527	7YW300062	West Bretton Final Effluent Transfer to NGR 42988	(2.20)		**Removal [LORI corrected from 4.1 to 0.75 km)**
YOR01002	7YW200946	TUPTON/STW			Carry Over-Cost on Main Driver
YOR00063	7YW100129	TUPTON/STW	-	(7.96)	CARRY OVER (Badgers)
YOR01536	7YW200641	Pudsey intermittents (Farnley Ring Road)		(2.95)	CARRY OVER
YOR01533	7YW300068	Pudsey intermittents - Hough Side Works		(14.75)	CARRY OVER -Assume no claw back for Design Change
YOR01535	7YW300070	Pudsey intermittents - Smalewell Reach 1	-	(4.43)	CARRY OVER -Assume no claw back for Design Change
YOR01531	7YW300066	Pudsey intermittents - Dick Lane	-	-	Carry Over Removed From DD
YOR01532	7YW300067	Pudsey intermittents - Dale Farm	-	-	In AMP-Assume no claw back for Design Change
YOR01534	7YW300069	Pudsey intermittents - Kent (Gaint) Road	-	(1.48)	CARRY OVER -Assume no claw back for Design Change
YOR00793	7YW200737	CARTHORPE WPC WORKS	-	-	Carry Over Removed From DD
YOR00799	7YW200743	THORNTON LE BEANS	-	-	Carry Over Removed From DD
YOR00804	7YW200748	Rainton STW	-	-	Carry Over Removed From DD
YOR00812	7YW200756	KILLINGHALL STW	-	-	Carry Over Removed From DD
YOR00840	7YW200784	HAROME/STW	-	-	Carry Over Removed From DD
YOR00846	7YW200790	BISHOP WILTON WPC WO	-	-	Carry Over Removed From DD
YOR00866	7YW200810	EMBSAY/STW	-	-	Carry Over Removed From DD
YOR00867	7YW200811	EAST MARTON	-	-	Carry Over Removed From DD
		TOTAL	**(5.71)**	**(31.56)**	**Totals @PR19 Price base**
			(6.74)	**(37.26)**	CPI(H) Inflae 2017-18 to 2022-23 FYA=1.1806

The two tables below summarise the WINEP actions where we propose changes to their status within the DD WINEP reconciliation model.

Table 9-2: Single Action/Impact Change Proposals to the Draft Determination Model

WINEP ID	Unique ID	Scheme or Site Name	Draft Determination judgement	Yorkshire Water Commentary
YOR00042	7YW100098	River Burn Catchment Scheme	Removal	Challenge- These 2 drivers still exist in the WINEP Schedule. We believe removal of these two drivers is an error caused by the ID 7YW100098 being shared between the 3 drivers, only one of which has been removed by the EA.
YOR00044	7YW100098	River Burn Catchment Scheme	Removal	
YOR01525	7YW300060	West Bretton storm tank discharge Transfer	New -Removal	LORI corrected from 4.1 to 0.75 km – discrepancy appears the result of a double count with the LORI associated with the

YOR01527	7YW300062	West Bretton Final Effluent Transfer	New -Removal	Clayton West Scheme, which serves the same stretch of the River Dearne.
YOR00063	7YW100129	Tupton/STW	Refer 7YW100129	New - Carry over - six month extension to 30 June 2025 sought due to unforeseen factors outside of our management's control. New badger setts have appeared within last 12 months and after the required Site Survey - Appropriate and compliant badger relocation measures now have to be undertaken before the scheme can be completed.
YOR01002	7YW200946	Tupton/STW	New - Carry Over	
YOR00793	7YW200737	CARTHORPE WPC WORKS	Carry Over	Changed Since DD-*No longer Carry Over*. Since March 2024 the integrated catchment proposal has been rejected and the treatment is now to be on site rather than catchment wide solutions for Phosphorus removal. The 8 sites are now proposed to switch to an in AMP7 date of 31/03/2025 and will no longer be "carry over".
YOR00799	7YW200743	THORNTON LE BEANS	Carry Over	
YOR00804	7YW200748	Rainton STW	Carry Over	
YOR00812	7YW200756	KILLINGHALL STW	Carry Over	
YOR00840	7YW200784	HAROME/STW	Carry Over	
YOR00846	7YW200790	BISHOP WILTON WPC WO	Carry Over	
YOR00866	7YW200810	EMBSAY/STW	Carry Over	
YOR00867	7YW200811	EAST MARTON	Carry Over	

The table below summarises our proposed changes to the WINEP actions for Pudsey Beck. These actions are considered together as the six original storage actions collectively delivered the water quality outcome in Pudsey Beck. We now propose alternative solutions to meet water quality outcomes.

Table 9:3: Proposed changes to Pudsey Beck actions (to the draft determination model)

WINEP ID	Unique ID	Scheme or Site Name	Draft Determination judgement	Yorkshire Water Challenge Commentary
YOR01536	7YW200641	Farnley Ring Road CSO	Carry over	Relocate outfall downstream of reach to Farnley balancing reservoir via transfer tunnel with reduced storage from 5000m³ to 2,000m³. Increase Capacity of Farnley Balancing Reservoir by raising top water level. Deliver wetland within Farnley Balancing Reservoir Outfall relocation downstream of reach reduces overall requirement for storage. Revised solution at Farnley Ring Road CSO meets downstream water quality outcomes.
YOR01531	7YW300066	Dick Lane CSO	Carry over	Carry over removed from DD - original storage delivery currently programmed to be delivered by 31/03/25
YOR01532	7YW300067	Dale Farm SPS/CSO	Carry over	Carry over removed from DD - design change (optimisation of existing storage and pumping) to be delivered by 31/03/25
YOR01533	7YW300068	Hough Side Works CSO	Carry over	Current storage of 400m³ to be removed and replaced by Integrated Constructed Wetland to deliver equivalent water quality outcome to 25,400m³ total.
YOR01534	7YW300070	Pudsey Smalewell CSO	Carry over	Due to change in solution at Farnley Ring road to relocate CSO discharge, reduction in storage

				is required to meet water quality outcomes at Pudsey Smalewell CSO from 7,500m3 to 3,500m3.
YOR01535	7YW300069	Kent Road CSO	Carry over	Storage no longer required to meet Environmental Outcome in Pudsey Beck. Investment carry over to deliver alternative solutions requiring extensions to AMP8 for Farnley Ring Road.

Table 9-4: Summary of changes to the WINEP: PR19 carryover enhancement allowance

	Allowance (£m)
October 2023 business plan submission	00.00
January 2024 business plan resubmission	00.00
Ofwat's draft determination	38.78
YKY draft determination representation	35.52
YKY Changes made After Post DD Representation (Not in CWW3 Table)[32]	*37.26*

9.5 Yorkshire Water's response to Ofwat

9.5.1 The need for investment

We fully accept that mechanisms should exist to return funding to customers where we have not met our PR19 obligations. However, the PR19 WINEP reconciliation model was developed five years ago when some solution metrics were in "draft" form having been defined from outputs from AMP6 investigations. As we have progressed solution development, from draft to final we have attempted to identify more efficient options where we can adopt nature-based solutions and reduce embedded carbon while delivering overall environmental outcomes. For the Pudsey Beck UPM scheme, this has involved changing the original six overflow storage tank schemes to a catchment solution integrating wetland, outfall transfer, storage via tunnels and open water and operational changes. The current reconciliation model format penalises us for this approach.

9.5.2 Best option for customers

We believe that our reconciliation model amendments are the best option for both customers and the environment as the uncorrected claw-back would remove funding to deliver an alternative solution that delivers the required outcome.

An example of this is the review of the programme to deliver the water quality objectives in Pudsey Beck, which deliver the aim of achieving water quality objectives, as well as delivery of wider benefits and overall environmental betterment such as reducing carbon and energy use, increasing biodiversity, reducing flood risk by working in partnership with others and reducing disruption to customers.

9.5.3 Cost efficiency

Not applicable as these schemes will have been assessed under PR19 procedures.

[32] This is our final estimate of fair carryover and was calculated after the lockdown of our YKY Draft Determination Representation value of £35.52m (after initial changes to delivery dates and solution scope).While the proposed difference of £37.26m compared to £38.78m is a slight reduction of 4%, we believe that, without the moderation we propose, we would project a carry over of only £8.35m at PR24 price base and a punitive claw back of £26m at PR19 price base.

9.5.4 Customer protection

Not applicable as these schemes will have been assessed under PR19 procedures.

9.6 Concluding points

Yorkshire Water has amended the PR19 WINEP reconciliation model provided as part of the draft determination (YKY-PR24-DDR-78) to align the model with post-March 2024 change requests made to the Environment Agency.

We have requested an over-ride of some of the model metrics to avoid claw-back for the Pudsey Beck UPM scheme. Our proposals for the six original actions for Pudsey Beck are to be discussed in a formal query response to Ofwat to support its final decision-making (Query Reference “OFW-IBQ-YKY-020”).

Our proposed amendments to column CT- “Quantity Delivered” and Column CY “Water Company Comment” are in our returned model: WINEP-Reconciliation-Model (YKY-PR24-DDR-78).

We project the following outputs of the model at PR19 price base:

- Claw back will increase from £3.42m in DD to £5.71m at PR19 price base
- Carry Over will reduce from £33.99m to £31.56m at PR19 price base (£37.26 m at PR24 price base)

Our projections using the draft determination WINEP reconciliation model as returned from Ofwat has highlighted constraints of the original PR19 model in interpreting claw back when several WINEP outputs are integrated into delivering a single environmental outcome or when a solution type changes. The optioneering design process for multi-output UPM schemes may replace or reduce the original storage defined within an output by alternative sites, wetlands, transfer pumping or operational changes. This may result in removal of specific storage metrics in the model even though the enhancement outcome of the amended or removed driver is being delivered. The reconciliation model will present this as a permanent claw back unless a manual override is agreed.

10 Loss of landbank

10.1 Overview

The risk that Yorkshire Water (and other WASCs) will no longer be able to recycle sludge to agriculture has now become highly likely. Therefore, it is necessary to begin investing and planning for alternative sludge destruction solutions. The water industry has no direct control over the continuing practice as it relies on third party farmers, who are not obligated to take the material, to recycle the sludge on their land. Currently, there are numerous threats to this practice, including potential regulatory changes, media campaigns and public perception changes.

The expected duration for which recycling sludge to agriculture will remain a viable option is now less than the time required to convert our existing facilities to accommodate for the destruction of sludge through alternative technologies. It is therefore imperative that we begin to invest in alternatives to minimise the duration in which we are at risk of not having a viable route for sludge disposal or recycling.

10.2 Key messages

There is an imminent threat to the continuing practice of recycling sludge to agriculture.

The time taken to deploy alternative solutions, namely destruction technologies, could mean the remaining capacity of sludge recycling and disposal solutions over this period is exceeded and there is no viable outlet for sludge disposal.

Yorkshire Water proposes modest investment to prove advanced thermal conversion technologies at full scale and to begin planning for the deployment of full-scale destruction solutions.

10.3 Change requested

This is a new submission at draft determination representation.

Table 10-1: Summary of changes to the loss of landbank enhancement allowance

	Allowance (£m)
October 2023 business plan submission	0.000
January 2024 business plan resubmission	0.000
Ofwat's draft determination	0.000
YKY draft determination representation	10.00

10.4 Yorkshire Water's response to Ofwat

10.4.1 The need for investment

Currently Yorkshire Water recycles over 98% of its sludge to agriculture each year, in 2023 this was over 73,500 tonnes of dry solids (tds) which is approximately 300,000 wet tonnes of material. Of this, typically around 75% is incorporated into the land by farmers in the autumn as part of their normal cultivation operations. This is replicated across the UK with over 3.5m tonnes produced annually by the wastewater industry of which a similar percentage – c. 80% – is recycled to agricultural land in the autumn.

The water industry has no direct control over the continuing practice as it relies on third party farmers, who are not obligated to take the material, to recycle the sludge on their land. Currently there are numerous threats to this practice including potential regulatory changes, media campaigns and public perception changes.

Landbank modelling work carried out recently on behalf of Water UK[33] indicated that in the best-case scenario if recycling to agriculture was lost as an outlet that alternative outlets, predominantly landfill. The expected timescales to obtain the necessary permits, planning consents, land purchase and construction phase for an incineration plant is thought to be around 10 years, meaning it is imperative that action is taken in AMP8 to prepare for this outcome.

Most recently the High Court judgement in River Action UK v Environment Agency on 24th May 2024 has altered the legal status of the practice of recycling sludge to agriculture in the autumn, making it highly likely as it stands that the practice cannot continue. The court decided that regulation 4(1)(a)(i), which provides that an application of organic manure or manufactured fertiliser to agricultural land should be planned so that it does not "exceed the needs of the soil and crop on that land", should be interpreted as referring to needs at the time of application, rather than over an annual crop cycle or a crop rotation. The National Farmers' Union (NFU) had intervened in the proceedings to (unsuccessfully) argue the latter interpretation[34].

The water industry, including Yorkshire Water, relies on the latter interpretation to recycle sludge to agriculture, with around 80% recycled in the autumn. The practice is able to continue under Defra's statutory guidance, 'Applying the farming rules for water', updated 16 June 2022[35].

River Action UK have publicly stated that they intend to challenge Defra's guidance, given the High Court ruling in respect of application of organic manures. It is not yet known how Defra will respond to the High Court ruling, but if they remove their guidance to align with the Court ruling or River Action UK's challenge, it would bring about an almost immediate end to the practice of recycling sludge to agriculture, with insufficient land available to accommodate the sludges at other times of year.

With this new threat materialising since the High Court ruling on 24 May 2024, Yorkshire Water is proposing this modest but critical investment needed to begin work proving alternate technologies at scale, alongside land selection, planning permission, environmental permitting, technology selection and detailed design work to create a feasible plan for construction of destruction technology prior to the exhaustion of outlets for sludge disposal.

There was no driver available to Yorkshire Water within the PR24 WINEP to make investments of this nature. The EA told us: "the sludge driver has a presumption for there to not be support in principle for options involving thermal destruction technologies"[36]. The PR24 WINEP does not provide a driver which covers wholesale changes to landbank availability triggered by changes in the implementation and enforcement of sludge regulations such as Farming Rules for Water, which would result in changes to recycling practices and therefore loss of landbank were not included in Yorkshire Water's plans for PR24 as it was not recognised as a requirement.

We are including them now in recognition of the change in circumstances since the High Court judgement and likely change in enforcement position in relation to the practice of recycling sludge to agriculture in the autumn.

10.4.2 Best option for customers

Yorkshire Water proposes modest investment to prove advanced thermal conversion technologies at full scale and to begin planning for the deployment of full-scale destruction solutions. We believe these solutions deliver quickest and most environmentally-beneficial alternative to recycling sludge to agriculture. Not investing now in the development of alternative solutions will lead to lower value, less sustainable disposal options in the future or at worse case

[33] 'National Plan B – A review of the resilience of Biosolids outlets in England, Wales and Scotland' AtkinsRealis 14th June 2024
[34] 'Environment Agency's enforcement of Farming Rules for Water not unlawful (High Court)', Practical Law Environment. Case report, published 30th May 2024
[35] https://www.gov.uk/government/publications/applying-the-farming-rules-for-water/applying-the-farming-rules-for-water
[36] Letter from the EA to Yorkshire Water dated 22 June 2023, subject 'Yorkshire Water WINEP Options Assessment decision challenge on two Sludge Driver WINEP rows Action ID:8YW100081a Provide standby UV and 08YW100084a Future planning of destruction technology, AMP8 planning and design investment for AMP9'

total loss of a viable disposal route. For more details please refer to the loss of landbanks enhancement case (YKY-PR24-DDR-40).

10.4.3 Cost efficiency

Where possible, budget quotations obtained from contractors have been used to inform capex cost estimates. Opex costs have been estimated based upon industry expertise and previous experience of similar projects delivered within the Kelda group. For more details please refer to the loss of landbanks enhancement case (YKY-PR24-DDR-40).

10.4.4 Customer protection

There is no applicable performance commitment, and the level of investment is below the Ofwat materiality threshold for a PCD.

10.5 Concluding points

Yorkshire Water is responding to the new and imminent threat to the continuing practice of recycling sludge to agriculture by requesting funding to begin creating sustainable future solutions to this significant risk.

It is imperative we act now, as the time taken to deploy alternative solutions, namely destruction technologies could mean the remaining capacity of sludge recycling and disposal solutions over this period is exceeded, leaving no viable outlet for sludge disposal.

Yorkshire Water proposes modest investment to prove advanced thermal conversion technologies at full scale and to begin planning for the deployment of full-scale destruction solutions. These solutions we believe deliver quickest and most environmentally beneficial alternative to recycling sludge to agriculture.

11 Growth at sewage treatment works: Growth allowance including Ingbirchworth DWF

11.1 Overview

This chapter sets out our views on Ofwat's cost-allowances for WWTW growth. We broadly agree with Ofwat's approach to modelling growth but we do not agree with the past-delivery adjustment applied at draft determination. It also sets out an additional scheme to our proposed WWTW growth that has emerged as a result of a reassessment of dry weather flow assessments since October 2023. The expenditure increase associated with this is an additional £1.44m.

Our original growth at sewage treatment works enhancement case from the October 2023 submission can be found here.

11.2 Key messages

We do not believe that a past-delivery adjustment is appropriate to be applied to the AMP8 requirements. We disagree with the methodology which uses company requests rather than Ofwat allowances to calculate the adjustment, but more importantly we do not believe that the adjustment is appropriate at all and is not in line with Ofwat's totex and outcomes methodology in place since PR14.

We have identified a growth requirement for a further site, Ingbirchworth No 2 WWTW, following an update of our Dry Weather Flow (DWF) compliance assessments. The additional investment requirement is £1.44m.

11.3 Change requested

Ingbirchworth has been added to the original growth requirement as new data has suggested that its DWF permit will need to be increased in the AMP8 period. We have reflected this data for cost assessment in table ADD19 and show the cost implications in the table below. This includes the removal of the past-delivery adjustment.

Table 11-1: Summary of changes to **the WWT growth enhancement allowance**

	Allowance (£m)
October 2023 business plan submission	37.60
January 2024 business plan resubmission	37.60
Ofwat's draft determination	22.30
YKY draft determination representation	39.14

As set out below, we do not believe the past-delivery adjustment is appropriate and therefore our full requirement of WWTW growth costs should be allowed.

11.4 Yorkshire Water's response to Ofwat

11.4.1 Past Delivery Adjustment

Ofwat models Yorkshire Water's costs as efficient but reduces our allowances with 'a past delivery adjustment'.

This is based on the difference between companies' requested allowances at PR14 and PR19 and the outturn spend against this investment line in AMP6 and AMP7 respectively. While we have not invested to the level we had intended at each of those price reviews, we do not believe the adjustment proposed is appropriate for the following reasons:

> **Company requested allowances were not company final allowances**. Ofwat applied catchup and frontier shift efficiencies to the costs, which were assessed using wider totex models. The adjustment calculation is based on a company requested cost, not an allowed cost which exaggerates underspend. If this approach were to be taken, an implicitly funded growth allowance would need to be calculated.
>
> **As these WWTW growth costs were allowed as part of an allowance in-the-round, companies did not have specific outputs (PCDs) to deliver**. We were asked to deliver our service outcomes with a totex allowance. We have spent our totex allowance (and more) across this period and have had to make asset management decisions on where to focus our allowance in response to the incentives. Ofwat acknowledges this argument by making a 50% reduction to the adjustment, however there is no justification that this adjustment should be applied at all.

As we set out in our section on the cost/outcomes disconnect in our Cross-cutting issues appendix (YKY-PR24-DDR-05)], setting of totex allowances independently of service levels has led to an unrealistic stretch on service (and/or costs), and this combined in the early 2020s with the input price shocks seen on energy, chemicals and materials, to which companies were only partially protected. In our view, we have appropriately reallocated totex investment to target the PCs that customers value within our financial constraints. We have particularly focussed on Internal Sewer Flooding (ISF); ISF is ranked 3rd in terms of customer priorities and has a particularly stretching targe in AMP7 so we have prioritised activity in this area. Pollution, ranked 4th, has also been a focus area in AMP7 and for significant parts of the period we have maintained an upper quartile performance position. The ability to do this was a major part of the benefits case of moving from outputs to outcomes regulation and companies should not be penalised for this going forward into AMP8.

11.4.2 Additional Scheme Requirement

This section details the growth requirement for a further site, Ingbirchworth No 2 WWTW, which was identified following an update of our Dry Weather Flow (DWF) compliance assessments. The additional investment requirement is £1.44m.

The need for investment

Ingbirchworth No 2 WWTW has a current Dry Weather Flow (DWF) permit to achieve a flow of 102 m³/d with a permitted FFT of 10l/s. The Q90 DWF measured for 2019-23 is 90 m^3/day, with a Q90 fail in 2023. DWF is predicted to increase to 102.3m^3/d by the start of the AMP8 period meaning the permit will be breached.

There has been significant housing growth in the area since the treatment works was commissioned in 2015. 2016 data shows a resident population of 437 against a 2023 population of 637, with population predicted to grow to 659 by 2029/30. There are no significant trade customers in the catchment and as such the site has no trade allowance.

At current flows and loads, the site is meeting both the current permit requirements and the load standstill predicted permits.

To maintain compliance at the predicted future flows and loads, additional treatment capacity is required – a Submerged Aerated Filter (SAF) is the preferred solution.

The site is currently being modified to meet a new phosphorus limit of 1mg/l under AMP7 WINEP investment.

Best option for customers

Yorkshire Water have reviewed flow data from all sites with MCerts flow measurement, using measured Q90 data and projections of population growth to forecast future Q90. If forecast future Q90 was within 5% of the permitted DWF or measured Q90 exceeded the permitted DWF in any of the years 2019-2021, then the sites were taken forward for further investigation. This initially identified 18 sites which may require new DWF permits based upon population growth within each STW catchment. The sites were reassessed in spring 2024 and Ingbirchworth was identified as a new requirement. This long list was then challenged using efficient per capita water consumption values, an assessment of likely infiltration rates, multiple trade scenarios and refined population growth characteristics provided by Edge Analytics. Discharging additional flow at the same residual contaminant concentrations during dry weather would result in detriment to the receiving watercourse and as such a reduction in the permissible residual effluent concentrations has been allowed for, pro-rata to the increase in DWF, using a 'Load standstill' effect to have no detriment upon the watercourse.

Further to this, an updated FFT was calculated, based upon a multiplier of 3 times the DWF, or the ratio between current consented FFT to DWF, whichever is the greater, such that there would be no deterioration in the operation of the storm route. No additional parameters (for example new phosphorus consents if no current ones are applied) have been allowed for. The combination of additional population in the catchment, an increase to DWF, potential increase to FFT and decreases to the permitted contaminant concentrations results in a substantial step change in requirements of the sewage treatment works performance. Each site has been assessed using the existing performance data and YWS Design Guidance to review existing performance and model the future performance. Shortfalls in capacity have been addressed through the PR24 Growth at Wastewater Treatment Works enhancement case or the single additional site identified in this document.

Cost efficiency

We have followed a robust optioneering process supported by our Strategic Planning Partner, Stantec, and have developed a list of preferred options that includes nature-based solutions, grey infrastructure solutions, and feasibility studies to seek to deliver the best value to our customers. For our grey infrastructure solutions, our costing estimates have been largely developed using our Unit Cost Database and our Decision-Making Framework (DMF) processes. Options were developed into site-specific scopes which went through our Design and Value Engineering (DAVE) process which provides an outline of the site needs. These needs were then costed using our Unit Cost Database. Below are two extracts from our DAVE process for the Ingbirchworth scheme. Figure 11.1 shows the input data for the scheme, Figure 11.2 shows the costing process with the model references and input units for the scheme. This demonstrates our costing process is based on sound engineering processes which are consistently applied to each scheme

Figure 11-1 DAVE extract showing input data

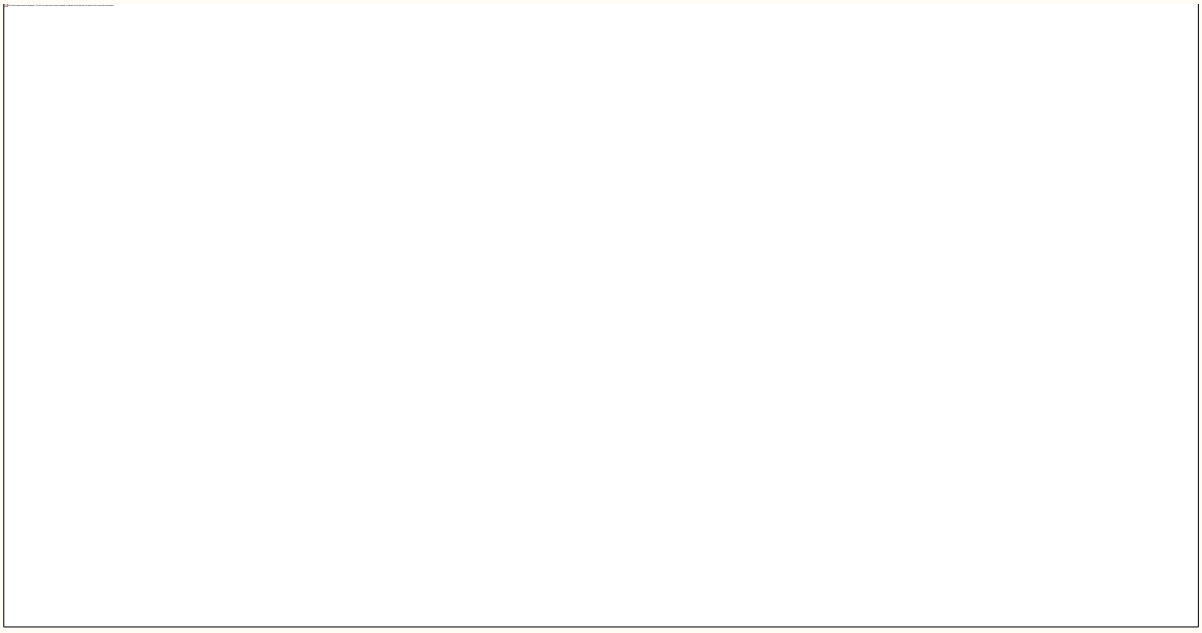
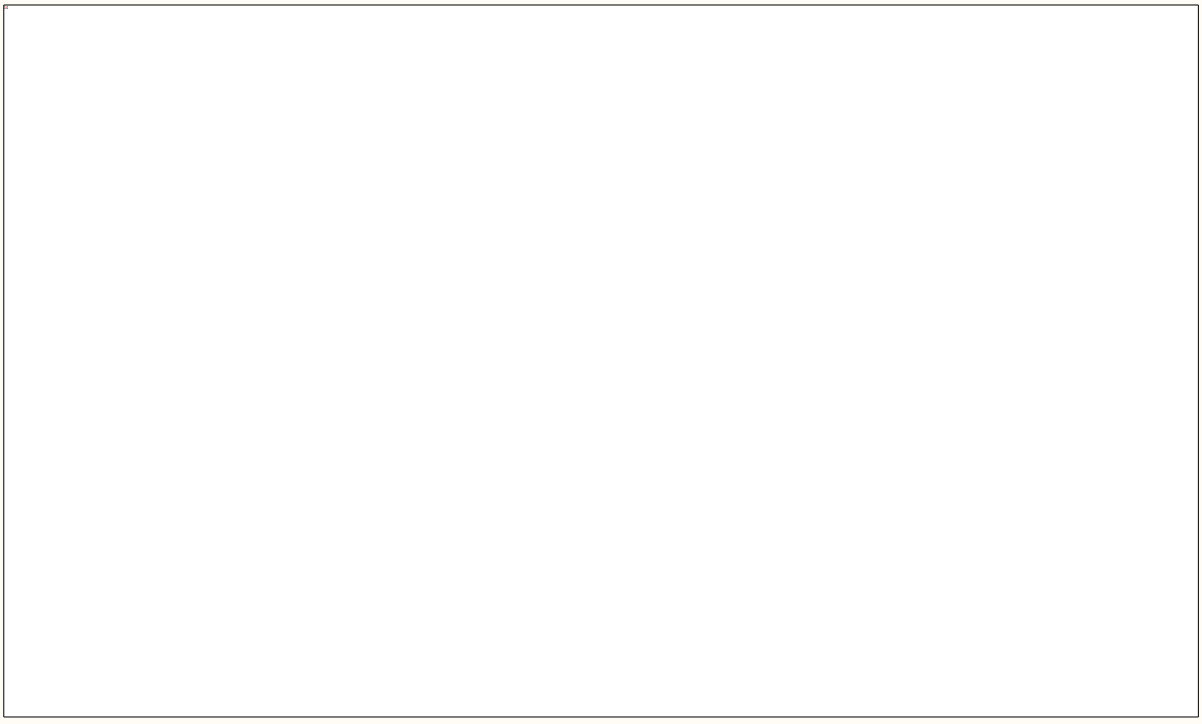


Figure 11-2 DAVE extract showing costing process



Further details on how we have applied these tools to develop cost estimates are provided in section 7.3 of our Business Plan.

The outcomes of the cost optioneering process and solution put forward were based on least cost and where possible most value. We propose a standard 'grey' process capacity increase in most cases, apart from Maltkiln which has the green nature-based element. These choices represent best value to customers.

Customer protection

The Growth PCD provides customer protection on a scheme-by-scheme basis, so Ingbirchworth WWTW will be added to the list of growth schemes in the PCD mechanism. This includes a partial claw-back mechanism based on any reduction in the Population Equivalent served by the final scheme.

11.5 Concluding points

We have included the full amount for our WWTW growth requirements in our DD representation. We do not believe the past delivery adjustment aligns with Ofwat's totex and outcomes approach since AMP7 and that, given the excessive stretch on costs and PCs, that we have acted rationally and appropriately in reallocating historic costs to areas that customers value to maintain service. This should not be compounded by the application of unfunded obligations (through PCDs), going forward.

We propose an increase to our WWTW growth programme of £1.44m, associated with a forecast DWF increase at Ingbirchworth WWTW. The cost assessment data for this site has been added in ADD19.

12 WINEP: Flow monitoring at STWs - First time P schemes (U_MON3/4 requirements)

12.1 Overview

In June 2024, the EA confirmed that any wastewater treatment works (WwTW) receiving first time numeric limits on a currently descriptive permit would require an additional U_IMP1 driver to enforce treatment to achieve 60 mg/l suspended solids and 40 mg/l BOD at those sites, together with U_MON3 and U_MON4 flow monitoring requirements, where this is applicable. This was a new and additional requirement to the business plan submission.

When WwTW are required to engage in new phosphorous removal schemes for the first time, they incur new costs that require enhancement funding. We have identified several instances of this to occur in AMP8, and set out the additional funding required for our sites to comply with these requirements in this representation.

There are now 15 WwTWs which require 60 mg/l suspended solids and 40 mg/l BOD permit limits, two of which also require flow monitoring permit limits. The environmental permits will also need to be updated to include these requirements.

12.2 Key messages

Wastewater treatment works receiving first time numeric phosphorus limits must also achieve 60 mg/l suspended solids and 40 mg/l BOD limits applied to their environmental permits. In June 2024, we identified 15 WwTW that will receive a U_IMP1 driver in the WINEP. The formal U_IMP1 drivers for these sites were listed in the 5 July 2024 release of the WINEP PR24 Schedule from the Environment Agency (EA). Prior to this, the only U_IMP1 driver cost request was for permitting at Embsay WwTW.

Wastewater treatment works receiving first time numeric phosphorus limits must also have U_MON3 and or U_MON4 flow monitoring where applicable. This will affect sites where dry weather flow is greater than 50 m^3/d and where there is a storm overflow at the WWTW. Following further assessment, an initial list of 10 additional WwTWs were identified as potentially requiring U_MON3 and U_MON4 flow monitoring. A subsequent, more detailed review has found that only two WwTWs meet the criteria for flow monitoring.

The initial assessment of a projected 10 sites requiring U_MON3 and U_MON4 installations was costed and has been included in our draft determination representation (DDR) business plan tables as a further cost allowance of £3.357m. Our detailed assessment has since reduced this number to two sites at a cost of £0.468m. This reduction of £2.888m was identified too late in the process to be reflected in our tables for the DDR. Similarly, Tables CWW20 reflect the higher number of 10 sites.

12.3 Change requested

- The inclusion of expenditure to deliver WINEP requirements to meet U_IMP1 drivers at 15 WWTWs that have been identified post submission of PR24 business plan (£0.044m).
- The inclusion of expenditure to deliver WINEP requirements to meet U_MON3 and U_MON4 drivers at two sites identified post submission of the PR24 business plan (£0.47m)

NOTE: At the time of the final preparation of the DD representation tables, we anticipated and costed for 10 additional u_MON3 and U_MON4 sites, and these costs remain in our submitted

Tables, although more recent assessment has reduced these requirements to two sites . As such, we expect further allowance adjustments after this DD representation, as shown in the table below.

The table below summarises the business plan submission requirements for U_IMP1, U_MON3 and U_MON4, the identified additional requirements identified in the DDR arising from application of these drivers to schemes covered by the first time phosphorus driver, followed by the subsequent reductions resulting from further investigation post DDR data preparation.

Table 12-1: Amendments to TOTAL U_IMP1,U_MON3 and U_MON4 Actions

	U_IMP1	U_MON3	U_MON4
Oct23/Jan 24/April 24	£0.003m (1 No scheme (Embsay))	£1.303m (230 No schemes)	£7.992m (24 No schemes)
DDR Submission To Ofwat	£0.047m (16 No schemes)	£1.347m (240 No schemes)	£11.305m (34 No schemes)
Proposed Reduction	£0.0m	Remove £0.036m (8 No schemes)	Remove £2.853m (8 schemes)
Final Value (corrected)	£0.047 m	£1.311m (232 No schemes)	£8.452m (26 No schemes)

The table below shows in more detail the DDR table adjustments that are required to reflect the updated position for U_MON3 and U_MON4 requirements associated with the 15 new U_IMP1 designations.

Table 12-2: Summary of changes to the WINEP: first time P schemes Enhancement allowance

	Allowance (£m)
October 2023 business plan submission	0.00
January 2024 business plan resubmission	0.00
Ofwat's draft determination	0.00
YKY draft determination representation (10 further U_MON3/4 schemes)	3.35
Proposed adjustment to draft determination representation tables (2 U_MON3/4 schemes)	0.47

12.4 Yorkshire Water's response to Ofwat

12.4.1 The need for investment

Wastewater treatment works receiving first time numeric phosphorus limits, must also achieve 60 mg/l suspended solids and 40 mg/l BOD limits applied to their environmental permits. In June 2024 we identified 15 WwTW that will receive a U_IMP1 driver in the WINEP. The formal U_IMP1 drivers for these sites were listed in the 5 July 2024 release of the WINEP PR24 Schedule from the Environment Agency. Prior to this, the only U_IMP1 driver cost request was for permitting at Embsay WwTW.

The following 15 sites will require 60 mg/l suspended solids and 40 mg/l BOD permit limits and are identified as requiring such within the WINEP. However, these sites are either already designed to achieve these limits, or they will do so with the planned phosphorus removal scheme. Therefore, there is no funding required for treatment improvements beyond the permitting costs for transition to compliance with the U_IMP1 driver:

ATWICK/NO 2 STW
BALDERSBY/STW
BECKWITHSHAW/STW
CARLTON HUSTHWAITE/STW
CLAXTON/STW
DANBY WISKE/STW
FARLINGTON/STW
GREAT SMEATON/NO 1 STW
HOLTBY/STW
INGLEBY ARNCLIFFE/STW
KIRKLINGTON/STW
SAND HUTTON/STW
SUTTON WHITESTONECLF/STW
WARTHILL/STW
YEARSLEY/STW

We have included £43,700 to cover the additional costs required to vary the environmental permit at the 15 new U_IMP1 sites, which is included in the costs represented in the table above. Under the UWWTR, where Dry Weather Flow is greater than or equal to 50 m^3/d, flow monitoring is required to be included in the environmental permit. Using currently available information and data, two sites have been identified for potential flow monitoring requirements. The following sites have been identified for both U_MON3 and U_MON4 flow monitoring drivers:
INGLEBY ARNCLIFFE/STW
DANBY WISKE/STW

These two sites do not currently have flow monitoring requirements in their environmental permits. The costs included in this enhancement case allow us to undertake the flow monitoring work required to ensure compliance with the new flow permit requirements. INGLEBY ARNCLIFFE/STW has a current permitted dry weather flow of 64 m^3/d and will proceed with the necessary flow monitoring. DANBY WISKE/STW has some uncertainty regarding the flow monitoring requirement, as the population equivalent is approximately 170. Usually, a population equivalent of 250 is required to generate sufficient volume to achieve greater than or equal to 50 m^3/d flow. A flow survey will be conducted at Danby Wiske to understand if the Dry Weather Flow is greater than or equal to 50 m^3/d. If it is not, then flow monitoring will not be required and we would anticipate a cost adjustment to return any unspent allowance. Flow monitoring cannot be installed on flow less than 50 m^3/d as there is insufficient flow to ensure the monitoring equipment remains wetted.

Best option for customers

We have not requested additional funding to deliver the U_IMP1 60:40 suspended solids:BOD element of the driver, other than the additional cost of the Environment Agency's fee to update the environmental permit. We have used available information to identify which of the sites are likely to require flow monitoring U_MON3 and/or U_MON4 drivers to limit impact to customers. Where there is uncertainty (applies to one site), we have included the site but will undertake further data collection to confirm if the investment is required, or not. The selection processes have been set by the Environment Agency with little or no scope for optioneering. Cost efficiency The costs applied for the two new U_MON3 and U_MON4 and environmental permit updates have been applied using the same approach as that for the existing U_MON3 and U_MON4 schemes.

Estimates were developed using the expertise of our Strategic Planning Partner to determine scope and using UCD models to create efficient cost estimates. Our UCD approach involves building detailed cost estimates that are developed using historic cost information on individual components of an overall solution.

We also reviewed the costs already in the plan for 230 U_MON3 sites and 24 U_MON4 sites. We used an average unit cost calculated from the existing U_MON3 investment to generate the costs for the final 2 U_MON3 sites. For the 2 small U_MON4 sites we applied an average cost derived from the smaller sites in the group of 24.

Section 7.3 in 'Introduction to Enhancement Cases' outlines our approach to cost efficiency in enhancement cases, and how our internal process and delivery decisions are designed with

efficiency in mind. This section outlines the application of this approach to this specific enhancement case.

12.4.2 Customer protection

The scheme value is below the threshold to be relevant for inclusion of a PCD. However, as this is a WINEP requirement, the company will be held to account for timely delivery by the Environment Agency, therefore customers are protected from late or non-delivery.

12.5 Concluding points

There are 15 WwTWs which require 60 mg/l suspended solids and 40 mg/l BOD permit limits, two of which also require flow monitoring permit limits. The environmental permits will also need to be updated to include these requirements. Further clarification is required for Danby Wiske WwTW due to the low population, the site may not be suitable for flow monitoring. A flow survey conducted as part of the AMP8 scheme will be undertaken to identify and confirm this detail. If Danby Wiske is confirmed as having insufficient flow to meet UWWTR flow monitoring criteria, we fully expect the Environment Agency to remove the driver and to reconcile any unspent funding allowance.

This requirement was confirmed in June 2024 post-submission, and as a result we have included it here. Following further analysis of the affected WwTWs, the cost allowed by Ofwat in the draft determination is greater than we believe we need, as identified in this paper. However, the associated tables had been closed to editing at this time, so there will be a discrepancy between commentary and tables for first time phosphorus schemes requiring numeric permit limits.

13 WINEP: Monitoring certification scheme for pumping stations and emergency overflows (U_MON6 requirements)

13.1 Overview

On 7 August 2024 Yorkshire Water received notification from Defra by email that there would likely be a need to increase the monitor installation coverage in AMP8 from 25% to 50% of emergency overflows. It was stated that a letter confirming this position would be issued to all companies shortly. This change takes the number of monitoring installations from 215 to 430 and doubles the cost from £19.127 million to £38.254 million.

Due to the late instruction from Defra, there has not been sufficient time to include the additional costs in the relevant tables, as the tables were already undergoing assurance procedures.

Subject to formal instruction from Defra, we request that Ofwat makes an appropriate allowance as part of its final determination.

13.2 Change requested

Yorkshire Water has 860 permitted emergency overflows that meet the criteria for the U_MON6 driver, installations can be split into two main types. For those that the overflow is also permitted as a storm overflow then pass forward flow monitoring for the storm discharge activity is required. For those overflows that only operate in an emergency then only EDM monitoring is required.

401no (47%) U_MON6a MCERTS EDM only – no requirement for flow monitoring, costs are only for EDM installation, certification and permitting.

181no (21%) U_MON6c MCERTS EDM and MCERTS pass forward flow monitor – existing monitor or there is a suitable location to install one (requires sufficient accessible pipe lengths to ensure monitor accuracy)

278no (32%) U_MON6d MCERTS EDM and MCERTS pass forward flow monitor and civils – for these installations a new chamber needs to be constructed of sufficient size to allow the installation of a monitor and safe access for calibration and maintenance work on the monitor.

Costs in the business plan are based on delivering a proportionate number of each complexity type, the values below are for 100% delivery. When directed to reduce to 25%, the costs were based on a delivery of 25% of each type. To get to the new value for 50% delivery we have assumed the same principle i.e. 50% of each type. This allows for a simple doubling of costs from the business plan to calculate the new funding allowance required.

Table 13-1: Summary of changes to the WINEP: Monitoring cert scheme for sewage pumping stations

	Allowance (£m)
October 2023 business plan submission	76.51*
January 2024 business plan resubmission	19.12
Ofwat's draft determination	13.39
YKY draft determination representation	19.12
YKY value covered in text	38.25**

*100% monitor coverage prior to direction to reduce to 25%
** CWW3 Table currently shows £19.12m for 25% reductions but this would be £38.25m if YW are required to do 50%

13.3 Yorkshire Water's response to Ofwat

13.3.1 The need for investment

No change. The need for this investment remains as set out in our original submission, the change is the scale of the investment required as a result of revised guidance from Defra.

13.3.2 Best option for customers

No change. Ofwat carried out a deep dive into this area of investment and concluded: "The company provides sufficient and convincing evidence that the investment is the best option for customers".

13.3.3 Cost efficiency

In its deep dive into cost efficiency, Ofwat made a 30% adjustment. Justification for the efficiency is reproduced below (from PR24-DD-WW-Monitoring-cert-scheme-for-sewage-pumping-station);

Significant Concerns: We have significant concerns as to whether the investment is efficient. The company has not provided sufficient and convincing evidence that the cost estimation approach and activity cost breakdown are efficient.

The company has stated that third-party assurance has been completed, but only on select cost data tables. The company has not provided evidence of industry benchmarking being completed. When completing our cost assessment, the company is significantly above the industry benchmark for MCERTS EDM and Pass Forward Flow and Civils, which makes up the majority of its cost request.

The efficiency challenge is centred around the costs for U_MON6d MCERTS EDM and MCERTS pass forward flow monitor and civils.

The majority of the costs for U_MON6d are the construction of a chamber to house the flow meter.- Having carried out an industry review of the modelled cost drivers for UMON6, it appears that our MCERTS and PFR Civils are not incomparable to similar company submissions. In fact, we are significantly cheaper than Thames, Southern or Northumbrian water. The complexity of the permitting conditions almost means that the installation of such flowmeters and chambers is often complex to carry out.

13.3.4 Customer protection

At our October business plan submission, in YKY43 WINEP Enhancement Case Appendix, this area of investment did not trigger a PCD. Following the revision of guidance, the expenditure has decreased, therefore a PCD is not required. However, as this is a WINEP requirement, the company will be held to account for timely delivery by the Environment Agency, therefore customers are protected from late or non-delivery.

13.3.5 Concluding points

Defra have indicated that there is a likely need to increase monitor installation coverage in AMP8 from 25% to 50% of emergency overflows. Ahead of revised Defra guidance, we ask that Ofwat makes an appropriate allowance to fund this activity. This change takes the number of monitoring installations from 215 to 430 and doubles the cost from £19.127 million to £38.254 million.

14 Net Zero (Greenhouse Gas Reduction)

14.1 Overview

In our business plan we submitted an enhancement investment case for greenhouse gas (GHG) emission reduction including capex investment of £40.463 million for reduction of wastewater process emissions nitrous oxide (N2O) and methane (CH4), and solar renewables (for the benefit of both water and wastewater price controls)[37]. In the draft determination, Ofwat has reduced our investment case to zero, citing a range of reasons for exclusion of our requested investment.

Having reviewed Ofwat's feedback and assessments (*PR24-DD-WW-Net-zero.xlsm and PR24-DD-W-Net-zero.xlsm (Phase 1, 2 and 3 assessments))* we believe CH4 Vacuum Degassing and N2O digital optimisation remain appropriate candidates for enhancement investment, and we outline our rationale for this, including:

- technical clarifications
- cost efficiency
- customer support.

We have accepted Ofwat's determination and assessment with respect to (i) solar renewables, (ii) the investments related to CH4 leak detection and (iii) digester upgrades to implement 'in series' configuration and make no further representation on these.

In this response to the draft determination, we propose a revised enhancement case for:

1. Investment of £10.01 million for CH4 vacuum degassing to deliver 13,903 tCO2e reduction/annum by Year 5 and a cumulative 41,709 tCO2e across AMP8.

2. Investment of £13.20 million for N2O process emissions reduction to deliver 5,418 tCO2e reduction per year by Year 5 and a cumulative 16,254 tCO2e reduction across AMP8 (noting also that it is understood in the industry that N2O emissions are understated potentially by up to four times, due to a low emission factor used at present).

The basis for resubmitting our enhancement case is to:

1. Clarify our intention to deploy real-time N2O control, which includes digital optimisation through applying emerging digital twin, machine learning/AI data driven and mechanistic modelling approaches within ASP lanes to effect process emission reduction. We emphasise that our intended investment in this regard is not for basic real-time controls, which we agree are a standard technology. Rather, our proposal is aligned to those approved enhancement cases submitted by Severn Trent, at what we have determined to be a similarly efficient cost/tCO2e reduction (see also Ofwat's Phase 3 assessment, per the link above).

2. Make a representation on the assessment and determination with respect to CH4 vacuum degassing, which we will demonstrate is not addressed via the requirements of the Industrial Emissions Directive (IED), is not a discrete financially beneficial investment, and the benefit of which is not negated through use of energy to power the equipment.

More broadly on emissions, Ofwat's assessment indicates the Yorkshire Water has been one of the most efficient companies in terms of emissions compared to the suite of assessed parameters and accepted that we have low emissions in respect of fossil fuel use and vehicle related emissions, and limited scope for additional base reduction. Ofwat's phase 3 assessment

[37] yky38_net-zero-enhancement-case.pdf (yorkshirewater.com)

also highlights that our proposed interventions were at a relatively efficient cost compared to those proposed by other companies.

We maintain our commitment to leading on efficiency and emissions reduction, but investment in hard to abate process emissions (both N2O and CH4) is essential to make ongoing emission reduction progress. Both these greenhouse gases have a significant global warming potential and not addressing these early is out of alignment with the approach to science-based target setting, and the Government's long-term reduction targets both of which Ofwat has cited in its *Overview of Yorkshire Water's P24 Draft Determination (page 8)*, and Creating *tomorrow, together: Our final methodology for PR24 Appendix 7 – Performance commitments (pages 43-51). The principles enshrined in the Paris agreement, which underpin these standards and legal requirements also call for early action to ensure we can hold a 1.5 degree increase in global average temperature by 2050.*

We argue for investment on the basis that we will deploy recommended technology as set out in the Net Zero Technology review:

These technologies meet the UKRI technology readiness levels and yet have little deployment in the UK to date. Significant specific learning in application remains, and hence these solutions offer both ready technology at a suitable level of maturity and learning potential to share across the sector.

14.2 Key messages

Our enhancement case amendment
Our amended enhancement case sets out plans for CH4 vacuum degassing (using Elovac) and N2O process emission reduction using real time N2O control comprising methods of digital optimisation including machine learning/AI, data driven and mechanistic modelling solutions to reduce N2O – demonstrating these schemes are cost efficient and not appropriate for base funding. It also confirms we do not intend to challenge in this representation, Ofwat's decision to remove the enhancement case for renewables, in series digestor upgrades (Ephyra) and CH4 leak detection.

Our key representations for our updated enhancement case
This updated enhancement case provides Ofwat with additional technical clarity, setting out why vacuum degassing does not relate to the IED; is not negated by the IED investment; offers financial benefit and does not have its benefit negated by energy use. We will also provide greater context on our intention to reduce N2O using digital twin/digital optimisation similar to that supported in the net zero enhancement challenge to Severn Trent (see PR24 Draft Determinations: Expenditure Allowances pages 126-129) – and highlight the low state of maturity in the UK to address N2O and that this is far from a proven technology applicable to base investment, rather one that requires tailoring to each deployment with significant specific learning.

The compelling need
Process emission reduction (scope 1 emissions) are critical to net zero delivery, and our customers are supportive of this essential investment. Given our significant upwards pressure on emissions due to our exceptional WINEP programme in AMP7 that overhangs into AMP8, and our limited potential for base reduction as modelled/assessed by Ofwat – net zero enhancement investment is essential to align to a net zero emissions glide path. In the absence of investment, we will be set up to fail, particularly given the stretching targets which we will make separate representation on in our outcomes document (YKY-PR24-DDR-06) and supporting tables.

14.3 Change requested

We are proposing the following changes in our draft determination representation:

Table 14-1: Clean water changes for Net zero

Change requested water	Updated investment required (£m Totex)
Removing the investment (£17.58m for solar renewables CW21-1 as we have accepted the draft determination	0.00
Total enhancement requested	**0.00**

Table 14-2:Waste water changes for Net zero

Change requested wastewater	Updated investment required (£m Totex)
Removing the investment (£17.58m) for solar renewables CWW22-1 as we have accepted the draft determination	0.00
Removing the investment (£9.70m) in line CWW22-2 in part including those interventions for digester upgrades to in series configuration (Ephyra) and leak detection as we have accepted the draft determination	0.00
Retaining the investment in CWW22-2 related to vacuum degassing, which we represent as part of this updated enhancement case (This is equal to the amount in our October submission less costs associated with the digester upgrades and leak detection, plus a small adjustment for inflation).	10.009
Retaining the investment in CWW22-3 related to N2O reduction, which we represent as part of this updated enhancement case based on the clarification of our intention for the delivered solution (This is per our October submission plus a small adjustment for inflation).	13.201
Total enhancement requested	**23.211**

As set out in the table above for certain items, we are not making any enhancement requests related to the water price control – all reductions will come from base or other standard enhancement expenditure. Removed enhancement investment for both water and wastewater will be progressed in base e.g. we are currently proposing to upgrade digesters using Ephyra technology at three sites, and this may be expanded to additional sites if commercially viable. We will continue to undertake periodic leak detection and repair to reduce methane losses as part of base maintenance. Increased renewable use will be progressed using a combination of private wire arrangements where feasible.

The PCD for N2O will remain unchanged, while the PCD for CH4 interventions will be reduced to reflect the reduced investment in vacuum degassing only. The details of our proposed Price Control Deliverables can be found here (YKY-PR24-DDR-07).

For final determination, we request Ofwat take into consideration that our N2O reduction proposed was not for standard real time control (RTC) with N2O monitoring, which is not proven for N2O reduction anywhere globally; rather it was for real-time N2O control using digital twin approaches including digital optimisation with data driven, machine learning/AI and modelling methods as is currently applied in technology vendor solutions on the (emerging) market. Our proposal in effect was the same approach as supported for Severn Trent who also note their proposal wasn't for simple process set point changes but for digital optimisation for N2O

comprising machine learning, AI and mechanistic modelling which is currently part of the available market solutions for N2O optimisation.

For Ofwat to take into consideration that the Environment Agency have not included covering cake barns in their requirements and only passive methane collection from covered tanks. Our view is these activities will not deliver any reportable CH4 emission reductions, and in the absence of approving this enhancement case, CH4 emissions will remain unabated.

Addressing these emissions using vacuum degassing has no commercial benefit, as the biomethane collected and used in our CHP plants would match that required to power the system. As this is biogas derived energy it would be low carbon, so would not negate the methane reduction benefit.

We disagree with Ofwat's phase 2 assessment (see cells P94 and Q94 in PR24-DD-WW-Net-zero.xlsm) suggesting there is a commercial benefit and that energy use for the equipment negates the benefit. We also disagree that the solution is not innovative and has no learning potential as the solution has not yet been deployed int he UK and the extent of the benefit has not yet been determined and shared across the industry. The solution presents a strong carbon reduction opportunity at an efficient cost/tCO2e, and overall, a compelling case.

Our updated enhancement case investments can be found as follows:

CW21 – All enhancement investments have been removed.

CWW22 – investments related to solar energy CWW22-1 have been removed.

CWW22 – investments related to CH4 reduction CWW22-2 have been amended to remove capex and opex associated with digester upgrades and leak detection and to retain only the capex and opex for vacuum degassing. As mentioned above – use of in series digester using the Ephyra technology will be progressed at three sites, and leak detection will be implemented periodically as part of base maintenance.

CWW22 – investments related to N2O reductions CWW22-3 remain unchanged.

Associated with these amendments are data table OUT4 and 5 that reflect the emissions reduction with enhancement. It should, however, be noted that other changes have been implemented to re-forecast the impact of growth (as indicated in our business plan) and this affects these tables and OUT2. Additional information about these changes can be found in outcomes for customers (YKY-PR24-DDR-06)

Table 14-3: Summary of changes to the Net Zero Enhancement allowance

	Allowance (£m)
October 2023 business plan submission	40.463
January 2024 business plan resubmission	40.463
Ofwat's draft determination	00.00
YKY draft determination representation	23.211

14.4 Yorkshire Water's response to Ofwat

The table below presents Ofwat's commentary from the PR24-DD-WW-Net-zero.xlsm, alongside a summary of the rationale underpinning this representation, which is further detailed in the following chapters.

Table 14-4: Evidence to support the rationale for the Net zero representation for Nitrous oxide reduction

Ofwat concerns	Representation rationale and supporting evidence

1. This scheme proposes using existing proven technology to manage and improve the operations of the asset. This comes under general maintenance and Base *spending. (See PR24-DD-WW-Net-zero.xlsm Phase 2 sheet cell Z95)*	**Our plan is fundamentally different to standard set point control:** • Operating assets efficiently is not synonymous with nitrous oxide (N2O) reduction - real time N2O control (RTC) as defined in the Ofwat Net Zero Technology (Ofwat NZT) Report[1] differs substantially from current RTC implementation which focuses on effluent quality and energy usage. While we agree optimising facilities for effluent quality and energy is business as usual, this is not the same for N2O optimisation. • Our inclusion of real time N2O control has been based on work to date within the Process Emission Community of Practice - measuring N2O and working with leading providers of N2O optimisation solutions such as Royal Haskoning (RHDHV) – whose Pure system has been used at two Dutch wastewater treatment works to optimise process control for N2O while maintaining effluent quality. These solutions are digital and are based on implementing new control methods which can reduce N2O while balancing regulatory requirements and energy use. • Real time N2O control may not *require* digital twin solutions or may themselves be referred to as *digital twin enabled solutions* – however the evidence from global work is for advanced process control to minimise N2O, without necessarily requiring more costly digital twin solutions (which themselves remain unproven as N2O abatement solutions). • Real time N2O control differs from business as usual or manual set point optimisation for N2O and is not base maintenance. • Real time N2O control is fundamentally different from business-as-usual real time control – involving control logic to minimise N2O while also balancing effluent quality (within safe permit limits) and aeration energy. It commonly requires additional sensors and may require structural changes to facilitate the required control actions (e.g. ability to turn aeration up or down or to modify return/recycle rates or dissolved oxygen (DO) set points). • There is evidence that we can introduce real time N2O control which changes facilities operation to maintain compliance, minimise energy and N2O but this requires new control logic, N2O measurement as well as potentially other process sensors. **Our plan uses digital optimisation including machine learning/AI, data- driven and mechanistic modelling solutions to reduce N2O with continuous monitoring** • Real time N2O control options which remain emerging, globally, include a spectrum of tools from typical control algorithms to predictive machine learning models. They are at times defined as digital twins, but this term is often used generically, including for real time N2O control options. Several proprietary solutions are emerging (such as Veolia Hubgrade (Denmark), RHDHV Pure (Netherlands), and Hach RTC) but these remain unproven globally and for the substantively different UK asset base with respect to N2O. • Based on developing global evidence, these emerging solutions will move from trial and innovation scale to implementation scale over the course of AMP8. • These real-time N2O control solutions are our best opportunity to reduce N2O. Costs for instruments, control software and hardware is not currently base expenditure. Hence, we represent our enhancement case for this cost allocation both on the grounds that it follows the approach approved for Severn Trent (encompassing both learning and innovation), and that our cost and carbon models show that this is at an efficient cost relative to proposals put forward by other companies. See also our section on cost efficiency and independent assurance. • Severn Trent make the differentiation of *simple process optimisation* which Ofwat also did not fund. Even if simple set point changes can mitigate N2O unless the measurement is funded there would be no means of proving this. • Our proposal for N2O control is fundamentally different to this including digital optimisation technology and machine learning for N2O optimisation linked to continuous monitoring to ensure emissions are baselined and reductions can be assured. Jacobs (2022). Net zero technology review **RTC for N2O is innovation.**

2. *Real time control: developing technology, improvement in operations more than innovation (See PR24-DD-WW-Net-zero.xlsm Phase 2 sheet cell Q95)*	Despite supplier enthusiasm, from published and unpublished evidence, these solutions – including a spectrum of digital tools, digital twins and advanced process control or real time N2O control, remain in the development phase, and significant learning will come from each deployment. They are far from plug and play proven technologies and require tailoring to the needs of individual sites bringing significant learning to N2O optimisation best practice. The reasons for this are: - Very limited work has taken place globally, to date. This has been largely limited to Denmark, Netherlands where real-time control for N2O has been trialled. See UKWIR and Defra publications for details of this. This work is extremely limited and only a handful of cases show modified control for N2O being sustained to reduce N2O. All this work has been for asset types which are completely mixed and/or fully nitrifying and denitrifying. This body of work is (a) extremely limited and not well proven and (b) not of direct relevance for UK assets which are typically plug flow and nitrifying only. - Various proprietary real time and advanced process control platforms are emerging to reduce N2O. Two currently or soon-to-be applied for N2O are described as 'real time optimisation' 'online digital twin' 'advanced process control' and 'predictive self-learning control'. These are being marketed and trialled as advanced control for N2O as differentiated from standard optimisation approaches (for effluent quality and energy). They all attempt to apply real time control (RTC) solutions to N2O. They are all digital solutions and include attributes of digital twins, though this term has an extremely broad definition. Digital twins may include data-driven, mechanistic or hybrid models and may include full process and hydraulic plant models or one partial model. While more extensive real-time control solutions which combine data driven and mechanistic models (or use one or the other), are an emerging solution for N2O, none have been proven yet for N2O optimisation beyond academic and pilot work which remains ongoing in academia and industry innovation project work. - Machine learning offers a promising solution for N2O – either itself or in conjunction with mechanistic modelling. These approaches form part of real-time control and advanced process control platforms which are already available (but not yet proven for UK asset types). These are referred to as digital twins in some cases by vendors though given the very wide definition of DTs, vendors typically provide more context in describing their digital solutions and these remain emerging for N2O. - No combination of machine learning and mechanistic models has yet been developed that demonstrates sustained N2O abatement. In contrast, real-time control that seeks to optimise process parameters which are known to reduce N2O risks has been proven in (emerging) full scale work. Optimising Dissolved Oxygen (DO) set points, solids retention time, recycle rates and cycle times (where batch processes) have all been shown to reduce N2O, though none of these has utilised machine learning and mechanistic models.

Methane reduction – Vacuum Degassing

Table 14-5: Evidence to support the rationale for the Net zero representation for Methane reduction – Vacuum Degassing

Ofwat concerns	Representation rationale and supporting evidence
1. Ofwat's view is that anything dealing with pollutants from bioresources is an IED driver. The scheme is considered to be driven by IED requirements.	**Ofwat is wrong to consider that this methane reduction will be delivered by the IED driver. This essential methane reduction will not be delivered elsewhere.** Yorkshire Water are not required to deliver methane reductions as part of the IED driver. The vacuum degassing installations proposed under net zero enhancement are designed to remove methane from the post digested sludge before the post digestion storage with the aim to reduce all downstream methane emissions via an active process and draw out the maximum entrained methane from the digestate. This is not an IED requirement, however we believe this may support IED compliance, and would be a point of innovation and learning for the industry. While the Environment Agency (EA) has recently asked Yorkshire Water to cover pre and post digestion tanks or provide evidence that this is not required under IED, this is not specifically for the purposes of capturing and treating

	methane, and we believe will deliver no discernable reduction in reportable methane emissions. The EA has not required Yorkshire Water to cover cake pads under IED, and we have not put forward investment for cake barns, so there will be no methane recovery or treatment at that or subsequent stages. Whereas we believe the methane released at this stage would be reduced by installation of vacuum degassing as a solution, which can be tested by pre and post installation using solutions including residual biogas potential and use of portable gas analysers. IED approaches target reduction in typical odorous compounds (primarily targeting Hydrogen (H2S), Volatile Organic Compounds (VOCs), ammonia etc.) and significant levels of CH4 reduction are typically not achieved. Targeting CH4 reduction specifically due to IED drivers only, rather than broader considerations, would be unlikely to be deemed the best value approach for IED compliance, whereas fugitive CH4 emissions from STC assets are one of the main contributors to ongoing operational GHG emissions. This is why the funding for these interventions has been proposed under net zero enhancement and not for future IED compliance.
2. "The scheme is considered to be driven by commercial benefit of capturing biogas for biomethane either for consumption by the company or for export"	**There is no commercial benefit to vacuum degassing and the carbon benefit of methane recovery is not eroded by operational carbon emissions.** Our cost assessment determined that there is a net operating cost for running the equipment after considering the benefit of the biomethane. The equipment would be operated principally using energy from CHPs (although at two sites where we plan biogas export to grid this will come from adjacent private wire energy from waste facilities), so low or zero carbon. The carbon benefit of the methane capture would not be negated using electricity to power the vacuum degassing system. Although operational costs outweigh cost benefits, the carbon benefits are positive, and we disagree with Ofwat's assessment that energy use to power systems negates the methane emission reduction benefit. The reason for this is the use of low or net zero energy to power the system. By way of illustration – in our enhancement case we included the model we developed for methane interventions in Figure 1.3 for our Knostrop WWTW site. This showed that the operating costs of c. £29,000 annually and operational carbon as 14 tCO2e/year set against a carbon reduction from methane recovery of 3664 tCO2e/year. This shows that there is no commercial benefit, and that the carbon benefit of methane recovery is not eroded by operational carbon emissions. This applies to all sites with proposed vacuum degassing interventions. Costs and carbon benefit for our enhancement case were developed with support and assurance of a team from Royal Haskoning DHV and Stantec.

14.4.1 The need for investment

Process emission reduction is critical to net zero delivery, and customers are supportive of our investment in solutions that deliver emission reductions.

Given significant upwards pressure on our GHG emissions due to our exceptional WINEP programme in AMP7 that overhangs into AMP8, and our limited potential for base reduction as modelled/assessed by Ofwat, net zero enhancement investment is essential to align to a net zero emissions glide path.

In the absence of investment, we will be set up to fail, particularly given the stretching targets which we will make separate representation on in our outcomes document (YKY-PR24-DDR-06) and supporting tables.

Scope 1 process emissions are hard to abate and not associated with any tailwind reduction from other actors in the national decarbonisation. Both CH4 and particularly N2O are potent greenhouse gases with global warming potential many times greater than that of carbon dioxide.

Addressing these is essential to align with a net zero glide path. And is important to ensure a thriving Yorkshire, right for customers and the environment.

14.4.2 Best option for customers

We included a detailed overview of our consideration of the best option for customers in our net zero enhancement case (section 1.4)[38]. This detailed our work on capital optioneering, modernisation and integrated planning to ensure efficiency and, where possible, reduce emissions from base investments in an efficient manner.

For our enhancement case we reviewed a wide range of options, including but not limited to:

- Fleet transition to electric or other low emission vehicles (e.g., those using Hydrotreated Vegetable Oil (HVO) or other low carbon fuels).
- Renewable energy (including solar, wind, hydroelectricity, heat recovery, district heating and hydrogen).
- Wastewater process emission reduction options including Final Settlement Tank (FST) capacity expansion, Return Activated Sludge (RAS) denitrification, addressing mixed liquor suspended solids (MLSS), chemical dosing (various solutions), Real Time Controls (RTC), Expansion of Anoxic capacity, covering ASP lanes, liquor buffering, Ferric dosing, and Final Effluent (FE) recirculation.
- Bioresources process emission reduction options, including cooling digestate, modification of digester to plug flow, vacuum degassing, covering post-digestion sludge storage tanks, leak monitoring and control, biogas recovery and gas to grid.
- Increased use of nature-based solutions within our capital programme to deliver reductions in operational carbon from new or replacement assets while meeting wider service needs e.g., reducing sewer flooding.

On balance our proposals for CH4 and N2O reduction offered the most significant reduction for the lowest cost. We tested the cost of these options and the additional cost to the customer bills, and this was deemed acceptable to customers, recognising the importance of addressing climate change.

Our amended enhancement case is at significantly lower cost to customers yet offers a material reduction in emissions.

We have removed the costs for water enhancement case from CW21 in entirety, accepting Ofwat's determination with respect to renewable energy. As highlighted above, the emissions reductions associated with this will be moved into base costs. These costs have also been removed from the wastewater enhancement case CW22-1, as have the costs for digestor upgrades and CH4 leak detections (included in CWW22-2). These emissions will also be addressed in base with digester upgrades at three sites initially (with more if deemed beneficial) and leak detection and repair on a periodic basis.

We have amended our enhancement case in CWW22-2 and CWW22-3 as follows:

> CWW22-2 For an amended investment of £10.01 million for CH4 vacuum degassing to deliver 13,903 tCO2e reduction/annum by Year 5 and a cumulative 41,709 tCO2e across AMP8. This allows for additional cost for monitoring of methane baseline and reduction.
>
> CWW22-3 For an amended investment of £13.201 million for N2O process emissions reduction using real-time N2O control and continuous monitoring to deliver 5,418 tCO2e reduction per year by Year 5 and a cumulative 16,254 tCO2e reduction across AMP8 (noting also that it is understood in the industry that N2O emissions are understated potentially by up to four times due to a low emission factor used at present).

We have amended the carbon benefit to cumulative in CWW22-2 and CWW22-3 to align with the approach we have understood from Ofwat's draft determination and evaluation of enhancement costs.

[38] yky38_net-zero-enhancement-case.pdf (yorkshirewater.com)

As detailed below, we would deliver this benefit with protection for the customer through price-controlled deliverables (PCD) for each site/scheme.

We continue to have our operational emissions audited annually by BSI providing a view of emission outturn which provides assurance that all emissions reductions would be evidenced as verifiable emissions reductions.

We also have an annual PAS 2080:2023 audit of our whole life carbon undertaken independently by Atkins this provides assurance of both embedded and operational emissions in year and forecast for our AMP7 and 8 investment performance. This would include evaluation of emissions associated with delivery of the CH4 and N2O interventions and ensure that the benefit is not eroded through increased embedded emissions.

14.4.3 Cost efficiency

For our proposed implementation costs, estimates were developed using the expertise of our Strategic Planning Partner (SPP) to determine scope and using UCD models to create efficient cost estimates. Our UCD approach involves building detailed cost estimates that are developed using historic cost information on individual components of an overall solution. Further information on the efficiencies embedded within our modelling approach were provided in section 7.3 of the Introduction to Enhancement Cases appendix[39] in our business plan submitted in October – these remain applicable for both our proposed CH4 vacuum degassing and N2O interventions for which the costs remain unchanged.

We have tested our cost efficiency in several ways:

1) Our costs for CH4 and N2O interventions were built up by Royal Haskoning DHV, Stantec with cross assurance and review by our internal cost and modelling team including addition of internal costs where appropriate. This drew on direct solution experience from RHDHV on N2O real time control using their Pure solution, and from Stantec on their engagement across the sector and with the vendor (Elovac) of the vacuum degassing and system sizing to meeting individual site complexity.
2) We have consulted with peers from across the sector through our active engagement in the process emission community of practice and have determined that for the N2O interventions we propose, the costs per site vary dependent several factors. These factors include number and type of ASP lanes, but values in the range of £0.5-1m per site are typical from sector experience along with the on-going costs for N2O monitoring. We have requested a totex of £13.201 million to deliver reductions at 13 sites and so are within the stated range.
3) We have also now compared the cost of the solution put forward by Severn Trent in their successful net zero bid challenge, which deploys an approach aligned to our own N2O RTC digital optimisation using a ‘digital twin’ approach for 32 sites, and their unit cost per site is £1.19 million per site.
4) Our indicative costs are included in our PCD and highlight that Knostrop (due to its exceptional scale and complexity) requires significantly greater investment for N2O than smaller sites such as Calder Vale and Aldwarke.
5) There is a similar cost impact linked to scale for CH4 vacuum degassing with Knostrop, Blackburn Meadows and Hull requiring proportionally larger investments than other sites that require smaller-scale systems.

Invested costs were collated by our third-party supplier and cost curves created using our SIC cost models and unit cost database.

The costings for the N2O interventions for each site included the following items:

- An intelligent digital optimisation solution for N2O real time control linked to and machine learning from:
- 4 liquid phase N2O instruments per ASP installation.
- 3 DO probes per ASP lane. The capex cost for these items were then produced based on existing curves within the YW SIC estimating tool.
- 1 NO2 (nitrite) probe per ASP installation.
- 3 ammonia probes per ASP installation.

[39] yky25_introduction-to-enhancement-cases-public.pdf (yorkshirewater.com)

- 1 air flow meter per ASP installation.
- All other standard instrumentation and the systems were assumed to have a nominal opex impact.

The costings for the vacuum degassing interventions for each site included the following items:

- Main vacuum degassing package plant, provided by 3rd party external supplier (including all pumping but excluding civil elements).
- Additional sludge pipework to transfer feed sludge to package plant unit and remove processed sludge from unit.
- Additional biogas pipework to transfer retain biogas captured from unit to existing on site biogas storage.
- Allowances for additional Mechanical and Electrical (M&E) instrumentation that would help determine volume of recovered biomethane. Allowances for additional monitoring using portable gas analysers and ex-situ residual biomethane potential.

14.4.4 Customer protection

We have reviewed our forecast enhancement totex and found that it does not meet the 1% materiality threshold for PCDW18 or PCDWW34. However, we acknowledge there is not regulatory oversight of the implementation of our GHG reduction programme. Accordingly, we propose to implement a price control deliverable (PCD) to protect customers from non-delivery of our various schemes across our water and wastewater sites.

We also considered whether additional customer protection mechanisms were in existence or should be introduced to complement the PCD.

PCD

For information on the methodology, we have used, and the central assumptions we have applied for our PCDs please see section 8.2 in Introduction to Enhancement Cases[40] in our business plan, and amendments to align to the PCD as set out here (YKY-PR24-DDR-07).

14.5 Concluding points

We have accepted Ofwat's draft determination to remove funding for renewables, digester upgrades and CH4 leak detection, and will address associated reductions through our base programme.

We disagree with Ofwat's draft determination for N2O removal and have made representation of our enhancement case to address N2O process emissions using real time N2O control. We have explained how our plan is fundamentally different to standard set point control, and uses digital optimisation including machine learning/AI, data driven and mechanistic modelling solutions to reduce N2O with continuous monitoring, and that this was all covered in our original enhancement case request.

We have reduced the enhancement case for CH4 reduction to cover the investment required for CH4 vacuum degassing post digestion. We disagree with Ofwat's view that IED interventions make this unnecessary, and that there is a commercial benefit to operating the system (our cost model indicates an ongoing operational cost for maintenance, consumables and energy), and finally that the energy use by the system leads to operational emissions that are unquantified. We modelled the operational emissions and determined these to be small due to the use of biogas derived energy to power the system. We have made representations to demonstrate why Ofwat are wrong in these beliefs.

We have updated the enhancement case to show cumulative benefit in emission reduction across AMP8 and have demonstrated that while we are requesting a lower enhancement case expenditure, that this provides a significant delivery of emissions reductions (focusing on N2O

[40] yky25_introduction-to-enhancement-cases-public.pdf (yorkshirewater.com)

and CH4, two key process emissions) at an efficient cost. We believe this is right for our customers and right for the environment, that these investments do not overlap with other drivers and that both investments require significant innovation and learning to shape the efficient delivery of our and the sector's emission reductions. We are mindful that the water sector contributes 1% of national emissions, and as we have demonstrated, process emissions form a significant proportion of these national emissions. We believe a proactive industry response is needed to bring credibility to our decarbonisation claims – however these reductions cannot come from base spend alone. Support for this enhancement case is therefore essential.

Our enhancement case will be supported by a specific PCD and through our rigorous ongoing ISO14064-1 audits and PAS 2080 audits via independent third-party assessment that provide assurance of efficiency of options in capital project design and delivery, and evidence of operational performance for which monitoring of baseline and throughout will be a key element.

15 Resilience (wastewater)

15.1 Overview

In its draft determination, Ofwat proposed a sector-wide enhancement uplift (using 0.7% of base allowances) for companies to prioritise and address their biggest risks due to climate change impacts. Ofwat has requested companies set out what they will deliver for the additional funding in their responses to the draft determination, with a focus on addressing additional flood and power resilience requirements from climate change.

Climate change is already impacting Yorkshire and further escalating impacts are expected in future. In particular, projected increases in the severity and frequency of rainfall events will have implications for flooding risk across the region.

Due to the nature of our business, many of our wastewater assets are located close to the river systems that drain our region, and as such those assets and equipment are increasingly vulnerable to climate-related hazards beyond management control, such as flooding and power loss.

An increase in back to back storm events has highlighted opportunities to further enhance the resilience of our existing assets. We propose to invest in a platform which will allow us to utilise real time monitoring and weather forecasting to enhance resilience by increasing availability of storage in our network.

Maximising storage in the existing network and increasing the resilience of our network pumping assets to power outage will reduce the risk of external and internal flooding events.

The detail in resilience wastewater appendix (YKY-PR24-DDR-38) explains our approach to improving our resilience from climate related events, including flooding and power interruptions.

15.2 Ofwat action reference

For the draft determination, Ofwat proposed a sector-wide enhancement uplift (using 0.7% of base allowances) for companies to prioritise their biggest climate-related risks.

15.3 Key messages

We are proposing c.£15m of investment to build resilience to climate-related risks across our wastewater asset base, specifically focusing on enhancing resilience to the increasing impact of climate induced storm events and resulting flooding and power outages.

We will take a targeted approach to improving flood resilience at our highest risk assets (based on their operational criticality, hazard exposure, and impact on customer service and the environment), informed by our previous work to understand fluvial and tidal flood risk in detail across our asset base. To ensure efficient costs, we will seek to work in partnership where possible to leverage external funding and manage flood risk holistically but will also deliver schemes directly where no suitable alternative delivery route can be identified.

We propose to invest in schemes to provide more resilience in the event of an unplanned power outage. These include installing enhanced brown out timers, additional uninterruptible power supply (UPS) equipment and enhancement of ICA systems to allow sites to automatically reset to allow an automatic restart.

15.4 Change requested

We support Ofwat's draft determination to award 0.7% of base allowance to improve resilience and have included this within our representation.

Table 15-1: Summary of changes to the Resilience (wastewater) Enhancement allowance

	Allowance (£m)
October 2023 business plan submission	0
January 2024 business plan resubmission	0
Ofwat's draft determination	15.0
YKY draft determination representation	15.0

15.5 Yorkshire Water's response to Ofwat

15.5.1 The need for investment

Our customers highlight resilience as a top priority, with the most important issue being able to receive reliable, uninterrupted services. However, our resilience is particularly stretched when hazards beyond our control impact on our activities. Risks that impact the resilient supply of our services are increasing in the face of climate change.

We are already seeing the impact of climate change on our natural environment, which in turn affects our customers, the communities we serve, and the way we operate our business. Five of the 10 wettest years for the UK have occurred in the 21st century, and we have experienced widespread flooding across both our water and wastewater assets on several occasions, in recent years. The winter of 2023 was the second wettest on record for the UK. Storm Babet resulted in fluvial flooding which breached Environment Agency defences and exceeded the level of protection previously installed on our asset base. Repetitive storm incidents resulted in sustained, saturated ground conditions, resulting in repeated high river levels, pluvial flood events and significant ground water impacts.

During Storm Babet, wastewater assets in South Yorkshire were flooded, with sites previously defended seeing flood levels which exceed these levels.

As well as the physical risks posed by climate change (such as flooding), we also face a number of risks related to the process of transitioning away from reliance on fossil fuels and toward a low-carbon economy. Increasing demand for electricity and volatility in renewable energy generation and loads places strain on electricity transmission systems and increases the risk of unexpected outages. In discussions with our Distribution Network Operator (Northern Power Grid (NPG)) it is expected that future investment by NPG targeted at power network automation will lead to a greater number of short duration power outages bringing the majority of the outages below the threshold where they need to be reported to Ofgem to count against their Customer Lost Minutes KPI. These short duration power outages are just as impactful to our assets as long duration power outages.

15.5.2 Best option for customers

A long list of solutions was considered, the most cost beneficial solutions have been selected and are outlined in our Resilience wastewater appendix (YKY-PR24-DDR-38). Options that were discounted are also briefly covered within the appendix supporting this case.

15.5.3 Cost efficiency

Further information on cost efficiency is provided within the Resilience wastewater appendix (YKY-PR24-DDR-38) as well as evidence of third-party assurance to provide evidence of efficient costs.

Third party assurance

Independent external assurance was undertaken over the resilience uplift expenditure. The assurance concluded that we have established the credibility of the case, options and customer

protection by showing the data gathered and processes followed. It found that cost efficiency was based on the best available data to the team in the limited time available.

15.5.4 Customer protection

We do not propose any customer protections for this base adjustment, over and above the existing sharing mechanisms.