UUW63

Wastewater (Quality - Treatment) Enhancement Case

October 2023

Chapter 8 supplementary document

This document sets out the service enhancement expenditure and activity that we will undertake, through our 2025-2030 business plan

This case includes:

- Case 11: Final effluent
- Case 12: WINEP Investigations

United Utilities

Water for the North West

1. Wastewater (Quality – Treatment) Enhancements

1.1 Structure

1.1.1 This document contains our Wastewater (Quality – Treatment) enhancement cases and is structured as below:

- Case 11: Final effluent
- Case 12: WINEP Investigations

UUW63

WINEP Final effluent limits

October 2023

Enhancement Case 11

United Utilities

Water for the North West

Contents

Appendices

1. Enhancement submission

<table>
<tr><th colspan="2">Enhancement submission</th></tr>
<tr><td>Title:</td><td>Ww1 WINEP Final Effluent limits</td></tr>
<tr><td>Price Control:</td><td>Ww Network +

There is investment in the bioresources price control where sludge liquor treatment has been identified as best value solution to achieve final effluent standards (See Section 0)</td></tr>
<tr><td>Enhancement headline:</td><td>Enhancement expenditure to meet the needs of the AMP8 WINEP for new or enhanced wastewater treatment works final effluent requirements. This document sets out where the Environment Agency require us to enhance service standards in order to deliver environmental benefits, which they will enforce through by varying our Environmental Permits.

This enhancement investment is driven by the following statutory drivers:
• The Water Environment (Water Framework Directive) Regulations 2017
• Urban Wastewater Treatment (England and Wales) Regulations 1994
• Environment Act 2021
• Habitats Regulations 2017
• Natural Environment and Rural Communities Act 2006
• Wildlife and Countryside Act (SSSI) 1981
• Levelling up and regeneration (nutrient neutrality)

Bathing Water Regulations 2013</td></tr>
<tr><td>Enhancement expenditure

(FY23 prices)</td><td>
<table>
<tr><th></th><th>AMP8 Capex inc TI (£m)</th><th>AMP8 Opex (£m)</th><th>AMP8 Totex (£m)</th></tr>
<tr><td>Pre RPE and Frontier Shift</td><td>949.511</td><td>16.390</td><td>965.901</td></tr>
<tr><td>Post RPE and Frontier Shift</td><td>928.607</td><td>15.912</td><td>944.518</td></tr>
</table>

The table above shows the total expenditure, inclusive of accelerated programme and transitional investment, on both a pre-efficiency (i.e. pre frontier shift and real price effects basis, consistent with the cost data tables), and a post efficiency and RPE basis (i.e. consistent with the value we propose to be recovered from price controls). All numbers referenced hereafter in this enhancement case are on a post efficiency and RPE basis.</td></tr>
<tr><td>This case aligns to :</td><td>Ww WINEP submissions Data tables CWW3, 9, 19, 20.

For full reconciliation between enhancement costs and data table lines, see enhancement mapping tabs in UUW117 – Project allocations CW3 and CWW3.</td></tr>
</table>

PCD	Yes

2. Enhancement case summary

Gate	Summary	Location reference
Need for enhancement investment	Our base expenditure only covers the cost of meeting current Environmental Permit requirements. This enhancement investment is driven by the following statutory drivers to allow us to meet future final effluent permit requirements: • The Water Environment (Water Framework Directive) Regulations 2017 • Urban Wastewater Treatment (England and Wales) Regulations 1994 • Environment Act 2021 • Habitats Regulations 2017 • Natural Environment and Rural Communities Act 2006 • Wildlife and Countryside Act (SSSI) 1981 • Levelling up and regeneration (nutrient neutrality) • Bathing Water Regulations 2013	*Section 3*
Best option for customers	We have undertaken a significant exercise to identify the most cost effective way of meeting the future permit requirements we are required to comply with.	Section 4
Cost efficiency	To ensure robust and efficient costs in our programme we have used an estimating approach based on data collected over a number of AMPs (AMP3 to AMP7) updated to reflect present market conditions under which we and the UK Water Industry are operating. Mott Macdonald provide us and other UK water and sewerage companies with an estimating service, which allows them to provide a benchmarked approach to our PR24 capital cost estimates.	Section 5
Customer protection	Customers are protected from non-delivery through the following ODIs: Improving river water quality P – the phosphorus reduction projects are built into the PCL of this performance commitment, therefore if they are not delivered the works will not achieve the required P load removal and we will incur an underperformance payment through this ODI Discharge permit compliance ODI - If we fail to deliver improvements to our discharges on time we would expect the Environment Agency to issue the revised permit which we would fail to achieve. Additional consequences of non-delivery include: • Prosecution and fines due to non-compliance with permits • Reputational impact of reducing Environmental Performance • Loss of trust with customers and stakeholders • Loss of trust with the Environment Agency leading to less support for innovative approaches to delivering environmental improvement	Section 6
Price Control Deliverable	Price control Deliverables developed for this enhancement case:	Section 6

	• Treatment for phosphorus removal (chemical and biological) (WINEP/NEP) wastewater totex • Treatment for tightening of sanitary parameters (WINEP/NEP) wastewater totex	

3. Introduction

3.1.1 This document sets out the enhancement case of £944.518m totex to allow UUW to meet more onerous Environmental Permit requirements for final effluent phosphorus, sanitary determinants and microbiological requirements as a result of drivers in the AMP8 WINEP.

3.1.2 It also covers why these requirements are outside of management control, our approach to solution development and how we have ensured that costs are robust. A total of 72 wastewater treatment works require upgrade to meet new or more onerous phosphorus limits. Additionally, 55 wastewater treatment works also require upgrade to meet more onerous sanitary determinants, 50 for enhanced limits on chemicals and three where anticipated bathing water designations will drive microbiological requirements on final effluent discharges. Our cost estimate for this programme in AMP8 is a gross totex value of £944.518m.

3.1.3 The development of the WINEP has been informed by the key regulatory guidance including; the WINEP methodology, WINEP options development guidance, WINEP options assessment guidance, WINEP driver and supporting guidance. Our approach reflects the specific context within which we operate in the North West of England

3.1.4 Where possible we are making use of phasing and adaptive planning to ensure we meet statutory requirements in a way that balances costs across the AMPs and prioritises delivery of least- low- or no-regret measures first. This ensures we capture new statutory requirements and that we continue to meet existing ones despite changes in demand and climate change. Where there is uncertainty we are proposing investigations ahead of action so subsequent investment can be best value. Further detail on wastewater investigations is available in enhancement case Ww WINEP Investigations. We are also actively seeking partnerships to help spread costs across responsible and/or benefitting parties.

3.1.5 Of the individual drivers, 28 relate to the need to meet phosphorus limits at the current technically achievable limit of 0.25mg/l on average, which requires a step change in technology compared with schemes that have been delivered historically to meet the phosphorus requirements of the Urban Wastewater Treatment (England and Wales) Regulations 1994. This enhancement case sets out how we have determined the efficient cost of meeting these new requirements. We have included sanitary determinants, chemical limits and microbiological requirements in this document alongside phosphorus as these requirements are all associated with final effluent limits. For a small number of schemes the requirements for both final effluent enhancement and storm overflow discharge reduction are within one projects. To aid clarity on these projects they have been included in the enhancement case of the lead driver. Within the data tables the cost is split between drivers, therefore the scheme counted twice. Further detail of this approach is available in the CWW20 data table commentary.

Table 1: Overview of requirements, number of schemes and associated Totex included in this enhancement case

Driver	Number of sites	Capex	Opex	Totex
Phosphorus removal	72	565.839	10.328	576.167
Sanitary Determinands	55	326.857	4.837	331.694
Chemical removal	50	1.649	0.021	1.671
Microbiological requirements	3	34.261	0.725	34.986
Total	**180**	**928.607**	**15.912**	**944.518**

Source: CWW20, CWW3

4. Need for enhancement investment

4.1.1 **This section details the environmental driver and legislation which supports the need for investment and our approach to addressing these requirements.**

4.1.2 We have followed the Environment Agency driver guidance to identify needs for enhancement investment at WwTW within the UUW area. Where there are sites which require investment to achieve new permit limits for enhancement and have likely predicted growth within the catchment (which cannot be accommodated at the works) we have included provision within the Ww Supply & Demand enhancement case (further detail is included in the Ww Supply & Demand enhancement document Ww5). Solutions have been identified to accommodate both of these requirements and investment split across these two enhancement cases accordingly.

4.1.3 We have specifically factored the impact of climate change into the development of our WINEP in several ways, for example we account for climate change in our hydraulic models when identifying the need for storm overflow improvement schemes (further detail in Ww WINEP Storm Overflows) and developing options to address the drivers. We also include for climate change when modelling the future requirements for our wastewater treatment works permits. Where impact is forecast in the near future (AMP8 or 9) we will look to factor adaptation to climate change into solutions for wastewater treatment works. This means we can deliver improvements to the resilience of water courses to climate change in an efficient way as we go about meeting other statutory drivers.

4.1.4 We have developed the AMP8 WINEP proposal within the long-term context to ensure that our plan is balancing investment across the AMPs and intervening at the most appropriate time. Where appropriate, we have made use of long-term adaptive planning approaches to plan a low regrets route to meet long-term targets whilst also meeting our statutory obligations.

4.2 Phosphorus management

4.2.1 Phosphorus is a nutrient which is essential to life and as such, is found in high concentrations in wastewater. However, if too much phosphorous is released into the environment within the final effluent from a wastewater treatment works (WwTW), its nutritional properties can cause excessive plant or algae growth and lead to an alteration of the ecosystem from the natural state. It can also cause blue-green algal blooms in some waterbodies, which can prevent people and animals from using the waterbody and can damage the wider ecology of the habitat.

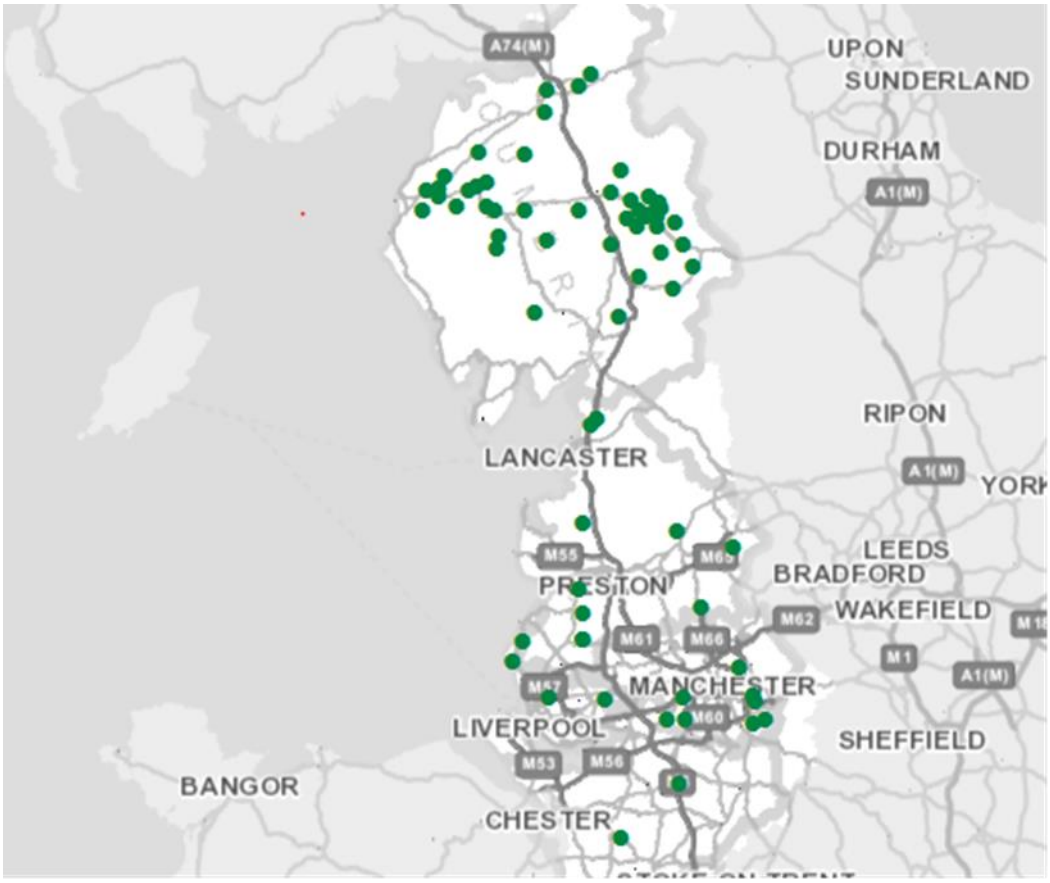
4.2.2 Reducing the concentrations of phosphorus in the final effluent reduces the risk of adverse environmental impacts. The AMP8 WINEP requires us to meet new low phosphorous limits at many treatment works in order to meet the targets of various Regulations and Acts, with the cost being driven by the Water Environment (Water Framework Directive) Regulations 2017, Urban Wastewater Treatment (England and Wales) Regulations 1994 and Habitats Regulations 2017 as well as the Environment Act 2021 and anticipated Levelling up and Regeneration legislation.

4.2.3 We have reviewed the letter received from Defra on 7th September 2023 to determine any potential implications for the seven Nutrient Neutrality schemes in our business plan. This has concluded that there may be a few opportunities to explore further catchment nutrient balancing opportunities but they are limited. In the time available we have not specifically modelled the scenario now set out in the letter so we have done a qualitative assessment which has identified that only two of the seven nutrient neutrality sites have a reasonable prospect of benefiting from these potential alternative approaches subject to the LURB being enacted and the Secretary of State bringing forward the relevant legislation. These are two of the smaller schemes in the programme (Appleby and Warwick Bridge

WwTWs) which have a combined capex estimate of £15.4m. Should these legislative changes be enacted we will continue to pursue the potential for catchment solutions where they offer best value.

4.2.4 The AMP8 WINEP includes 72 WwTW which require either a first time phosphorus limit or a tightening of an existing phosphorus limit. This includes 28 WwTW at the technically achievable limit of 0.25mg/l. Many of the sites identified have more than one driver for phosphorus removal, for example Appleby WwTW in Cumbria where there are a nutrient neutrality, Habitats Regulations 2017 and also a Water Environment (Water Framework Directive) Regulations 2017 no deterioration drivers to take the permit limit down to 0.25mg/l to protect the receiving watercourse. Schemes included within the UUW Accelerated infrastructure delivery project for Nutrient Neutrality drivers are included within this enhancement case. Figure 1 shows the location of WwTW which require enhancement for P removal

Figure 1: Location of WwTW requiring P removal in AMP8



Source: UUW representation of WwTW

4.2.5 Historically our approach to phosphorus removal has been based on chemical treatment to meet specific permit requirements. In AMP6 and AMP7, we changed our strategy to embrace biological phosphorus removal; leading the way with delivering innovative Nereda plants for four wastewater treatment works. We also successfully used catchment offsetting to achieve phosphorus targets in catchments. We have also worked with the Environment Agency on the implementation of a catchment permit for phosphorus in order to prevention deterioration in phosphorus concentrations in the Manchester Ship Canal by optimising phosphorus removal across the upstream catchment.

4.2.6 Chemical solutions are the most common intervention because they tend to have the lowest whole-life cost. However, through AMP7 and our AMP8 approach we are seeking to deliver phosphorous

reductions through innovative interventions where appropriate and economic. Below are examples from AMP7 where we have taken an alternative approach to phosphorus management, for example:

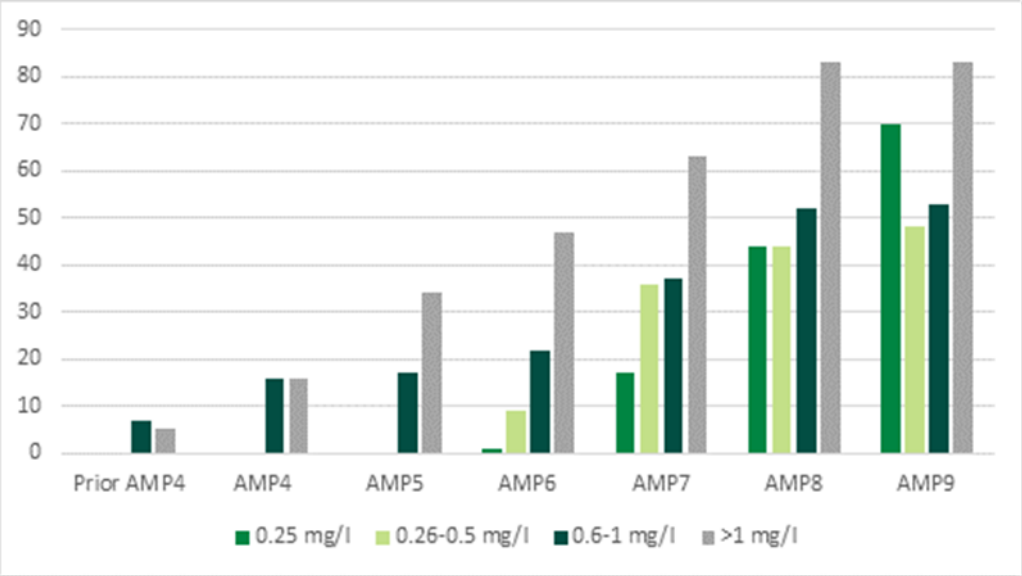
- Through nutrient catchment balancing in the River Petteril catchment;
- Through the River Irwell flexible phosphorus permit;
- Through catchment permit balancing at Bowdon and Macclesfield WwTW;
- Through biological nutrient removal at our Nereda plants; and,
- Through installation of biological nutrient removal using mobile organic biofilm (MOB) technology at Macclesfield WwTW.

4.2.7 The introduction of the Environment Act 2021 long term phosphorus target means that UUW needs to remove another 1,000 tonnes per day of phosphorus to achieve its share of the industry's target by 2038. While much of this target includes achievement of Water Environment (Water Framework Directive) Regulations 2017 standards, it will require us to implement schemes previously deemed to be disproportionately costly. This is a significant change that puts added focus on the sustainability and resilience of the chemical supply chain as well as the logistics of frequent chemical delivery to sustain wastewater treatment and the ever increasing quantity of phosphorus rich sludge that needs to be recycled to a land-bank under pressure.

4.2.8 In order to efficiently address the requirement of the Environment Act 2021 we have proposed to only intervene to achieve theses limits where there is another driver at a site and it makes achieving these targets cost effective within AMP8. This is not always the case and the journey towards the technically achievable limit is part of our adaptive plan for the Manchester Ship Canal catchment and the Douglas catchment. In these cases and in cases where there are no other environmental drivers we have delayed the implementation to AMP9 or 10 with the plan to achieve all Environment Act 2021 requirements by 2038. This approach has resulted in 23 Environment Act 2021 schemes for P removal being included in our AMP8 plan (two schemes are included in a separate enhancement case *UUW43 WINEP Optimisation*).

4.2.9 Figure 2 shows the number of wastewater treatment works with phosphorus permit limits banded by the permit requirement. This shows the step change between AMP6 and AMP7, and then the change again between AMP7 and AMP8 with the introduction of the technically achievable limit of 0.25mg/l phosphorus in AMP7 and the Environment Act 2021 requirement of 80 per cent reduction in phosphorus from WwTW by 2038 against a 2020 baseline.

Figure 2: Number of WwTW with total phosphorus permits by AMP



Source: Historic NEP and future WINEP

4.2.10 To deliver an efficient step up in phosphorus removal by 2038; we will need to learn from the innovative solutions delivered in AMP7 and deploy a multifaceted approach to achieving catchment phosphorus targets through:

- Chemical phosphorus removal;
- Catchment interventions;
- Balancing of catchment permits;
- Biological phosphorus removal; and
- Phosphorus recovery.

4.2.11 Each of these approaches has both advantages and disadvantages as detailed in Table 2, so there is no one solution that we are choosing to deploy.

Table 2: Advantages and disadvantages of various phosphorus reduction technologies

Phosphorus management approach	Advantages	Disadvantages
Chemical phosphorus removal	Low capex, relatively short delivery timeframe, tried and tested	Relies on resilience of chemical supply chain with limited UK production facilities, increases tanker movements, creates more phosphorus rich sludges for disposal (North West soils are phosphorus rich so adding to landbank pressure) High opex cost, may also be a requirement for tertiary solids capture for very low phosphorus limits

Phosphorus management approach	Advantages	Disadvantages
Catchment interventions	Delivers wider environmental outcomes. Can offset requirements at WwTW, relaxing the permit and reducing Opex	Legislative barriers apply to Environment Act 2021 phosphorus removal and nutrient neutrality schemes. Monitoring costs can be high thereby limiting applicability. Requires time to understand the opportunity and identified the partners and exact locations for intervention
Catchment permits	Allows optimisation across a suite of assets to meet the standard in the most efficient way.	Only applicable where there are multiple wastewater treatment works
Biological phosphorus removal	Enables phosphorus recovery, reduces reliance on chemical supply chain, reduces tanker movements, may need supplementing with fermenter or chemicals if sewage too weak	High capex cost, particularly if the existing plant is a trickling filter plant Phosphorus re-releases readily therefore locking in with chemicals may be required
Phosphorus recovery	Removes phosphorus permanently from the treatment cycle thereby reducing the phosphorus load in sludge and avoiding re-release. Creates a product which can be returned to the supply chain	High capex cost.

Source: UUW assessment

4.2.12 There is a global shortage of rock phosphorus with a heavy reliance on Morocco for resources and biological phosphorus removal presents an opportunity in the longer term to build a circular economy to put phosphorus back into the supply chain through phosphorus recovery. At the same time the North West has a surplus of phosphorus that contributes to the growing pressure we see around recycling biosolids to land thereby making the ability to move phosphorus out of the North West is attractive.

4.2.13 Biological phosphorus removal is most cost effective at scale and in particular when the sewage strength is strong enough to sustain the bacteria. We have therefore evaluated our largest wastewater treatment works with phosphorus removal requirements and developed an option for biological phosphorus removal for those that are best suited. This has resulted in the preferred option for Ashton Under Lyne, Dukinfield and Partington WwTW being biological phosphorus removal for phosphorus drivers within AMP8 and the installation of new processes aligned to achieving the longer term targets for phosphorus at Salford and Eccles WwTW (further detail on the solutions for these sites is available in section 4.3.13 . We will also continue to drive innovation through AMP8 and beyond to see whether more of the Environment Act 2021 target can be met through biological phosphorus removal.

4.2.14 Although biological treatment to remove phosphorus does have the potential for lower chemical operational costs, it does have a relatively high initial capital outlay. Where there are no other environmental drivers, investment in biological phosphorus removal is not usually the preferred solution as it has a higher whole life cost than chemical precipitation. Also, to robustly achieve the technically achievable limit of 0.25mg/l phosphorus, a chemical 'trim' plus tertiary solids removal may be needed in addition to the biological removal process. Biological phosphorus removal requires an activated sludge process. At Ashton under Lyne WwTW we are proposing to retrofit mobile organic biofilm (MOB) into the existing ASP and at Dukinfield WwTW build a new MOB activated sludge plant. Further detail of the

solution and how we built up the costs for Ashton under Lyne WwTW are included within Section 6.2.1 Case Study 1.

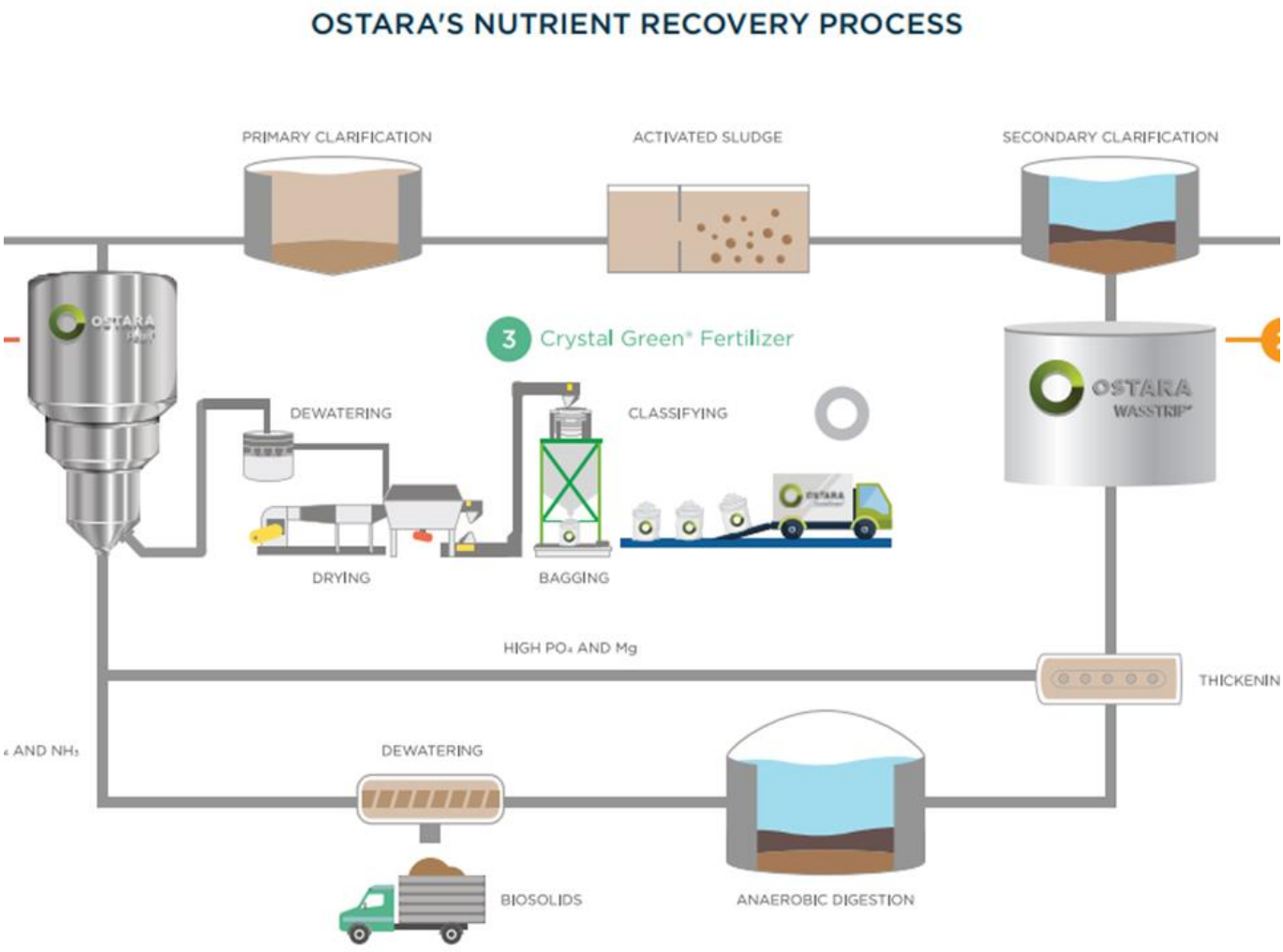
4.2.15 MOB itself is not the biological phosphorus removal technology, it intensifies the activated sludge process and frees up space so that the additional capacity and volume required by a biological phosphorus removal process can be accommodated in either an existing or a reduced size activated sludge plant. The MOB media itself is plant based, making it more sustainable than plastic based media. The additional ASP capacity created allows for the anoxic and anaerobic zones to be created within the existing footprint of Ashton under Lyne WwTW and on a smaller footprint than conventional bio phosphorus removal activated sludge plant at Dukinfield WwTW.

4.2.16 Implementing biological phosphorus removal requires end to end optimisation of the wastewater and bioresources system. It will therefore require, where appropriate, increases in investment and operating costs in the bioresources operations. Given that PR24 funding for the two price controls will have different models, it is important that there is not a negative financial impact on delivering the best overall solution.

4.2.17 An alternative to biological removal is phosphorus recovery. Our adaptive plan for Davyhulme WwTW, our largest treatment works, includes the construction of a phosphorus recovery plant for the sludge liquor stream in AMP8. This first step of our plan will satisfy the requirement to prevent deterioration in phosphorus concentrations in the Manchester Ship Canal by reducing the phosphorus loading on the treatment works. This process will reduce phosphorus by removing it from a combined flow of WwN+ liquors and sludge liquors, therefore reducing the load back to the head of the works. Figure 3 and Figure 4 show the proposed nutrient recovery process. We describe in Section 0 how we are proposing to treat the regulatory accounting for these assets.

4.2.18 Following the installation of the proposed phosphorus recovery process at Davyhulme WwTW we have identified biological phosphorus removal with a chemical trim as the best approach to meet the longer term Environment Act 2021 phosphorus target in AMP9/10.

Figure 3: Proposed Ostara nutrient recovery process at Davyhulme WwTW



Source: Ostara

Figure 4: Further detail on the Ostara phosphorus recovery process proposed at Davyhulme WwTW

Source: Ostara

4.2.19 At the other end of the spectrum, finding sustainable solutions for smaller wastewater treatment works has been challenging. We will continue to explore catchment nutrient balancing for small works and look to innovative ways to achieving lower phosphorus limits at small WwTW which serve fewer than 2,000 people. Although our plans for AMP8 include these sites in the chemical removal category for phosphorus removal we will continue to look for alternative, sustainable options to sustainable achieve the new permit limits. Our winning bid through the Ofwat innovation fund[1] to explore alternative approaches to phosphorus removal at rural WwTW is providing this opportunity, we will implement the learning from this within AMP8.

4.2.20 The proposal through the innovation fund is to work collaboratively looking at three packages of work; electro-coagulation, natural coagulants and reactive media, the aim being to accelerate the adoption of close to market technologies which do not rely on chemical coagulant for phosphorus removal. This £3.15m project will enable trials of technologies under these three categories to commence in FY24 with the aim to:

(a) Improve the quality of rivers; reducing the amount of phosphorus in discharges to protect watercourses against eutrophication;

(b) Reduce carbon impact; to drive down the expected increase in carbon from the implementation of traditional phosphorus removal solutions;

(c) Reduce impact on rural communities; from noise and traffic as well as required footprint for construction; and,

(d) Provide operational resilience; reduce reliance on chemicals and impacts of metals in sludge transferred to agriculture.

4.2.21 In our WINEP submission in January 2023 we identified the low phosphorus (0.25mg/l) and ammonia (1mg/l) requirements for Wigan and Skelmersdale WwTW as AMP9 drivers. By delivering them in this

[1] Ofwat (2022) *Alternative approaches to phosphorus removal on rural wastewater treatment works.* Available here

timeframe it would allow us to deliver to our adaptive plan that would give us AMP8 to exploit rainwater management opportunities before having to lock in the final design for a new biological phosphorus removal wastewater treatment works taking flows from both Wigan and Skelmersdale WwTW. However, it was confirmed by the Environment Agency on 24th August 2023 that these requirements were to be included in the AMP8 WINEP. Due to the late nature of the confirmation of this addition to the WINEP we have outlined these costs and solutions in a separate enhancement case – *UUW43 WINEP Optimisation*. The Urban Wastewater Treatment (England and Wales) Regulations 1994 requirements for these sites are included in this case.

Catchment opportunities for phosphorus reduction

4.2.22 Our submission include the opportunity for catchment nutrient balancing encompassing nine WwTW, the location of which are illustrated in Figure 5. Following our AMP7 award-winning Petteril Project and the UK's first catchment nutrient balancing trial at Calthwaite WwTW in 2019, which achieved a 63% reduction in phosphorus load in the catchment, we have identified opportunities for catchment nutrient balancing in the Eden and Derwent catchments.

4.2.23 This approach will allow us to deliver the phosphorus removal required, while supporting the rural economy with on farm investment and capture multiple additional benefits such as; natural flood management, soil improvement, biodiversity gain and reduced carbon emissions. We are currently exploring opportunities to work with partners to initiate catchment solutions, these will offset the phosphorus removal required at WwTW. The outcome for the water environment is the same improvement, but the more relaxed permits allow for reduced grey infrastructure with lower costs and carbon impacts, reducing the totex required to achieve the catchment target.

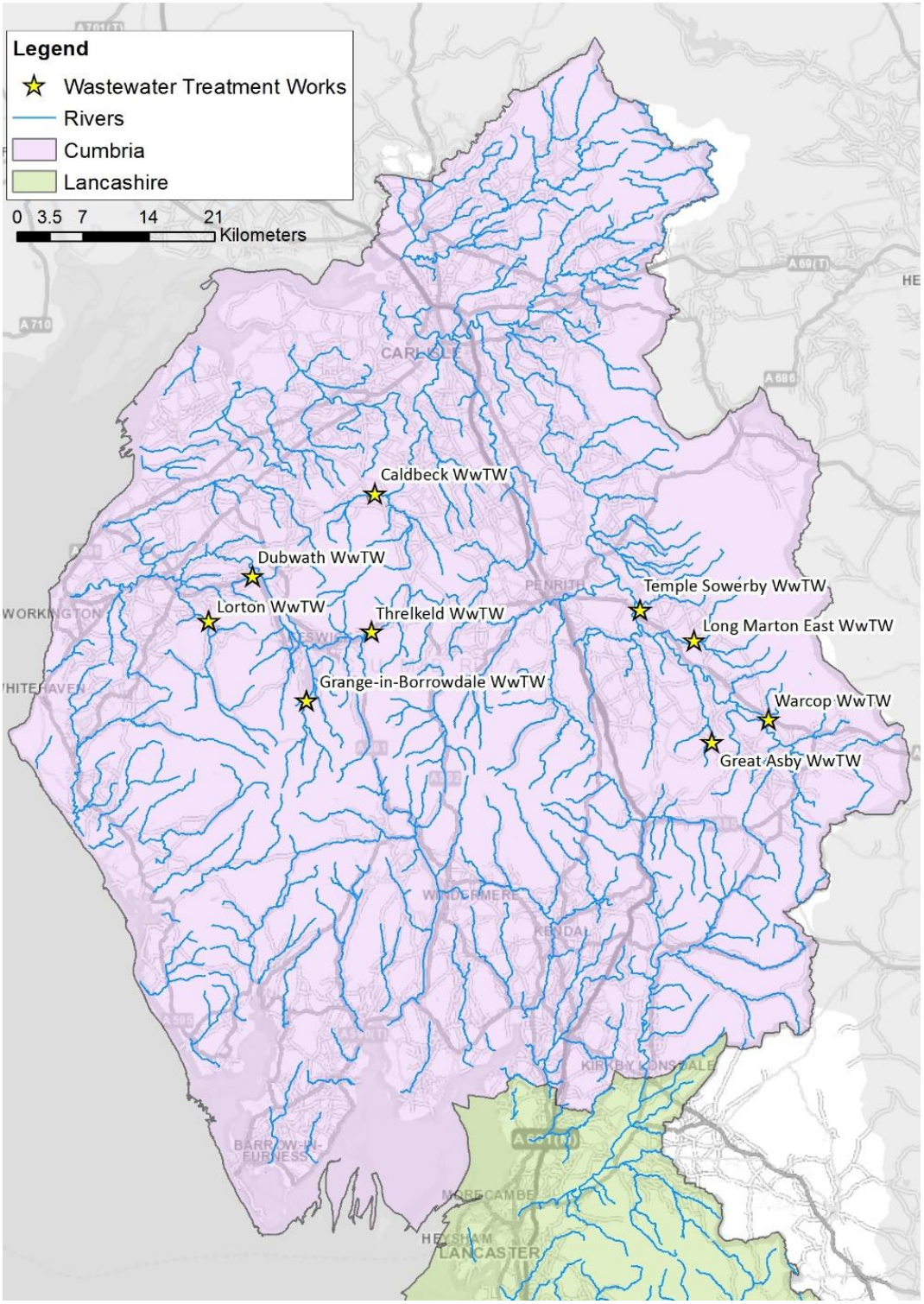
4.2.24 Integral to the approach is working with partners. It's too early to confirm specific partners but we are already working with the Environment Agency and the Eden Rivers Trust to establish joint working through a community interest company which will support the delivery of these interventions.

4.2.25 The tight timeframes we have to deliver nature-based solutions can present specific risks including:

- The ability to work with partners and communities to ensure solutions are viable and provide multiple benefits within the time pressure of regulatory dates;
- The distributed nature of some of the solutions which means that implementation activity could be spread much more widely without the ability to use statutory powers to carry out some of the work; and,
- The very site specific nature of some of the costs and benefits which can impact the viability of schemes at a detailed design stage.

4.2.26 We will be factoring these specific risks into our plans for AMP8 and will where possible attempt to mitigate them.

Figure 5: Location of the proposed catchment nutrient balancing sites



Source: UUW representation of WwTW

4.3 Sanitary determinands including septic tanks

Sanitary determinands

4.3.1 In order to protect and enhance the environment 19 WwTW have been identified as requiring investment to achieve new permit limits for sanitary determinands BOD and/or ammonia[2]. These have various drivers including U_IMP1 for UWWTR population threshold drivers, WFD and HD_IMP for improvements to meet Water Framework (WFD) Regulations or Habitats Regulations 2017 targets, and no deterioration drivers, WFD and HD to protect the current river classification. Additionally, 10 of these sites also have a new phosphorus permit requirement. Three sites have the requirement to move to best available technique (BAT) standards requiring a 6mg/l BOD and at 1mg/l ammonia permit at Eccles and Salford WwTW and an AMP8 6mg/l BOD at Davyhulme. These three sites discharge to the Manchester Ship Canal, this system operates in a very different way to a usual river catchments. More detail about the Manchester Ship Canal is available in 4.3.1.

4.3.2 We have included a separate enhancement case for the Davyhulme WwTW BOD requirement. Following significant interaction with the Environment Agency over an extended period of time to ensure the 8mg/l BOD opportunity for Davyhulme received full consideration, it was confirmed by the Environment Agency on 24th August 2023 that the 6mg/l BOD requirements was to be included in the AMP8 WINEP. This requirement drives a significantly different solution for this WwTW. Due to the late nature of the confirmation of this addition to the WINEP and the associated costs, we have detailed these in a separate enhancement case – *UUW43 - WINEP Optimisation*.

4.3.3 There is also a separate enhancement case *UUW43 - WINEP Optimisation* for those schemes being put forward for Direct Procurement (DPC). The Ww WINEP Final Effluent enhancement case includes DPC management costs to resolve BOD drivers at Sale, Stockport, Salford WwTW.

Manchester Ship Canal

4.3.4 The requirements for the Manchester Ship Canal are driving significant investment as it is not and does not act like a natural river system. This canal is a key part of the industrial legacy of Manchester, which is considered to be the world's first industrial city. As a result of the canal's construction to support rapid industrialisation virtually all urban run-off, storm discharges and treated sewage effluent from the city region drain through a water body that lacks the natural characteristics to reaerate the water flowing through it. Since demonstrating in AMP6 that it is infeasible to practically aerate a key section of the canal, to address dissolved oxygen water quality issues, the Environment Agency requires us to plan alternative solutions to get as close to the standards as possible.

4.3.5 The establishment of the Mersey Rivers Trust hosted Manchester Ship Canal Partnership Forum, with support from the Environment Agency and other key catchment stakeholders, is intended to lead the co-design and co-deliver of a long-term multi beneficial environmental improvement strategy for the Canal. This strategy will include a multi-AMP, adaptive approach to discharge enhancements driven through WINEP development.

4.3.6 As a result of this, we are required to develop solutions to improve Davyhulme, Salford and Eccles wastewater treatment works to meet Best Available Technology (BAT) standards. This represents a very significant step change in permit requirements and for Salford and Eccles leads to the need to rebuild a significant part of the treatment works as it is not feasible to reliably meet 6mg/l BOD permit limits with a trickling filter plant (which they both are).

4.3.7 To ensure the best long term approach for customers to this challenge, in collaboration with the Environment Agency, we have developed an adaptive plan for the Manchester Ship Canal to support

[2] This excludes schemes with a U_IMP7 septic tank driver

meeting emerging and existing water quality challenges in an integrated way. Through aligned investment we believe it is possible to achieve far greater integrated and connected delivery of multiple environmental needs. This can be achieved in a phased and co-ordinated way that introduces multiple benefits for people; improving place, the environment and reducing costs to deliver.

4.3.8 Adaptive planning to manage water quality in the Manchester Ship Canal is not a new approach. We have worked to develop and update a shared evidence base to inform long term catchment based decision making since early in AMP3. This plan is underpinned by the robust Manchester Ship Canal Water Quality study – 2008. We have already delivered the innovative MSC Catchment Flexible Permit for Phosphorus and developed strategies for alternatives to aerating the Canal which have directly influenced the AMP7 WINEP and AMP7 UUW Green Recovery programmes of work, and form the basis of future wastewater adaptive planning for the Canal.

4.3.9 Through the development of an adaptive plan for the drainage systems associated with the Manchester Ship Canal we aim to ensure that short-term decisions are made within the context of a long-term plan. That investments made in the short-term are low regrets and that integrated, systematic approaches are used to drive multiple benefits and manage multiple risks (for example SuDS improve natural and social capital, whilst resilience to climate change and reducing flood risk).

4.3.10 Our overarching ambition in developing solutions is to follow a hierarchy for solution development:

(1) prioritising solutions which reduce demand on the system, managing rainfall at source and working with customers

(2) exploring options to better manage the system and optimise existing assets; and lastly

(3) investigating options to increase capacity using more traditional approaches and hard engineering.

4.3.11 An adaptive approach means:

- Addressing problems where there is evidence of impact in the short-term;
- Developing solutions to meet a combination of requirements driving best value;
- Prioritising low regrets investment;
- Implementing monitoring of uncertain needs to identify appropriate timing and approach for investment; and
- Planning upfront through no and low regrets activities to keep future options open.

4.3.12 Overview of the plan for MSC:

- Low phosphorus is a key driver within the adaptive plan – this plan takes significant steps towards the 80% phosphorus removal by 2038. The interventions outlined here, across the linked catchments, contribute approximately 40% reduction in UUWs Phosphorus load by 2038;
- AMP7 investment – phosphorus improvements in the River Irk, Medlock and Irwell plus phosphorus off-setting at Oldham and Eccles, have started to benefit the watercourse, and this will continue beyond 2025;
- Manchester Ship Canal direct discharges for AMP8 – it is proposed to deliver Best Available Technique (BAT) solutions at both Eccles and Salford WwTWs (BOD and Ammonia) with a phosphorus recovery plant at Davyhulme WwTW (Figure 3), which will address the phosphorus no deterioration driver. Detail of the AMP8 BOD scheme at Davyhulme WwTW is included in the separate enhancement case *UUW43 WINEP Optimisation*.

- The adaptive plan targets a 0.25mg/l technically achievable limit removal of phosphorus by 2038 for Davyhulme WwTW through a process conversion to Enhanced Biological Phosphorus Removal (EBPR/Bio-P).
- The upper River Mersey has AMP8 WINEP requirements at the key sites of Sale WwTW (BOD improvements) and Stockport WwTW (BOD, ammonia improvements), with the additional focus on storm storage improvements to at least Water Framework standards within AMP8. We are taking a direct procurement approach for these schemes and further detail is available in Section 3 of DPC final effluent programmes enhancement case. The adaptive plan for these sites will see the low phosphorus solutions for Environment Act targets implemented by 2038.
- AMP8 improvements proposed within the lower end of the Upper Mersey in AMP8 include low phosphorus solutions at Partington WwTW and Altrincham WwTW, and Hazel Grove and Low Marple which discharge into the River Goyt and Etherow. These schemes support the progression towards the Environment Act 2038 80% removal target.

4.3.13 Assessments of Salford WwTW and Eccles WwTW indicate key contributions that are vital to the success of this adaptive plan, and the value in delivering these early in the 25-year plan. Furthermore, many assets at these sites are reaching the end of their asset life making the timing in AMP8 optimal. Our proposal for Salford and Eccles WwTWs is to replace the end of asset life trickling filters at each site with a biological phosphorus removal activated sludge plant (BioP ASP) and new deep final tanks. BioP ASP is the best option to achieve the new 6mg/l BOD and 1mg/l ammonia requirements, which are unachievable with the current trickling filters. As part of the adaptive plan we anticipate low phosphorus drivers at both of these sites in AMP9 to meet the requirements of the Environment Act 2021 by 2038. Delaying the low phosphorus requirement until PR29 allows optimisation of the process ahead of construction of tertiary solids removal and additional phosphorus dosing. Potentially giving an opportunity to optimise the new plant as much as possible to the low phosphorus requirements.

4.3.14 The start of the physical works at Davyhulme WwTW our largest works, covers the construction and commissioning of a phosphorus recovery plant with potential removal capabilities of up to 1000 kg/d - this provides a process that breaks the cycle of phosphorus re-introduction, supporting increased sludge imports and the Bioresources adaptive plan. As a minimum this supports the no deterioration requirement that will introduce a permit limit of 3mg/l phosphorus. In addition, with available land at a premium, the demolition of redundant assets and ground preparation creates the space for new assets in time for key decision points.

4.3.15 Whilst for Salford and Eccles WwTW any significant change to the permit limit drives substantial investment as they are both trickling filter plants with no tertiary treatment; the same is not true for Davyhulme. Davyhulme WwTW already has two activated sludge plants, including a modern one built in AMP6 (ASP3) and a biological aerated flooded filter (BAFF) tertiary ammonia removal process. Further detail on the plan for Davyhulme BOD is included in the separate enhancement case *UUW43 WINEP Optimisation.*

4.3.16 In addition, an AMP8 liquor treatment plant will be introduced working alongside the phosphorus recovery process to maintain performance of existing secondary treatment processes through improved ammonia management.

Consequential investment in the bioresources price control

4.3.1 Co-located at Davyhulme WwTW is our largest sludge treatment centre, Manchester Bioresources Centre (MBC). Our WINEP options development has taken a holistic approach across the integrated wastewater and bioresources production line in order to identify the lowest cost and best value solution in AMP8. This integrated approach will drive £26 million investment in the Bioresources price control to deliver the optimal solution to meet WINEP outcomes. Investment is required to deliver a digested

liquor treatment plant to maintain performance of existing secondary treatment processes through improved ammonia management.

4.3.2 A consequence of the division of activity between Bioresources and Wastewater Network Plus price controls is that the bioresources control fails to account for this additional activity being undertaken. Historically, the costs of meeting a new obligation have been accounted for within the price control that the costs are incurred i.e. where the asset is built. Now some investment is now being delivered within a different price control than the point of compliance. The consequence of this change is that is there is no route to recover efficiently incurred costs in the Bioresources price control. We are potentially penalised for undertaking the most efficient investment route to achieve statutory compliance, compared to investing only in Wastewater Network Plus where cost recovery would be guaranteed. In addition, the changing form of the Bioresources control creates additional risks associated with over spend, as opposed to expenditure within the Wastewater Network Plus price control which has a customer cost sharing mechanism.

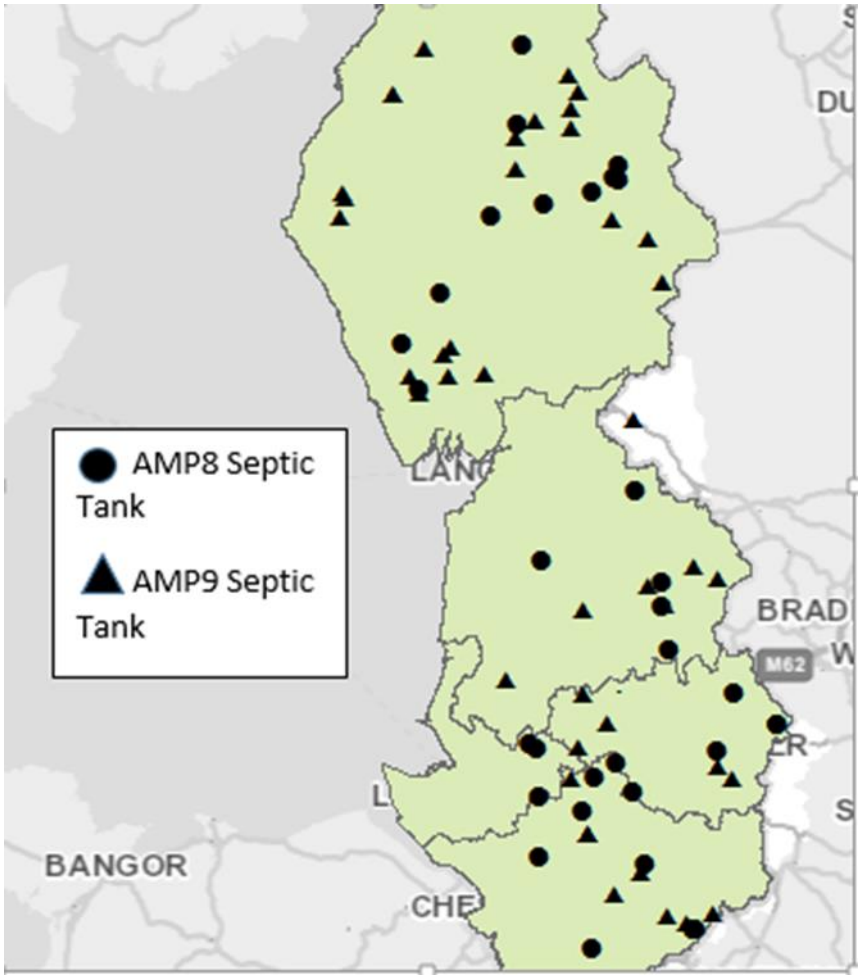
4.3.3 We would like to work with Ofwat to look at options to update Regulatory Accounting Guidelines to reflect this and similar activity and ensure that companies are able to recover efficient costs for delivery of their statutory obligations. An alternative solution would be to identify obligations to specific controls and therefore the associated costs with meeting those obligations would also be identified to the particular control.

4.3.4 This issue has the potential to create a distortion in the bioresources market as it will be difficult to compare controls where expenditure sits in different controls. Inclusion of additional bioresources activity resulting from obligations in the Wastewater Network Plus control is not a fair comparison of the efficiency of bioresources assets. Moreover, this additional obligation being assigned to bioresources will impact the potential for competition as it places an obligation on bioresources for which a comparable third party provider would be expected to be paid.

4.4 Septic tanks

4.4.1 The WINEP includes a requirement for the removal of discharges from septic tanks to surface waters under driver code U_IMP7. This requires septic tanks which discharge to surface waters to provide secondary treatment capable of achieving 40:60 BOD:suspended solids. Using this driver guidance and the recent recommendations for phasing from the Environment Agency we have identified 75 septic tanks which we have phased across AMP8 and AMP9. Following this guidance provided by the Environment Agency in July 2023, we have included 36 sites within our PR24 plan. Figure 6 shows the regional spread of these assets and the phasing of them across AMP8 and AMP9.

Figure 6: Location of Septic Tank improvement sites AMP8 and AMP9



Source: UUW representation of WwTW

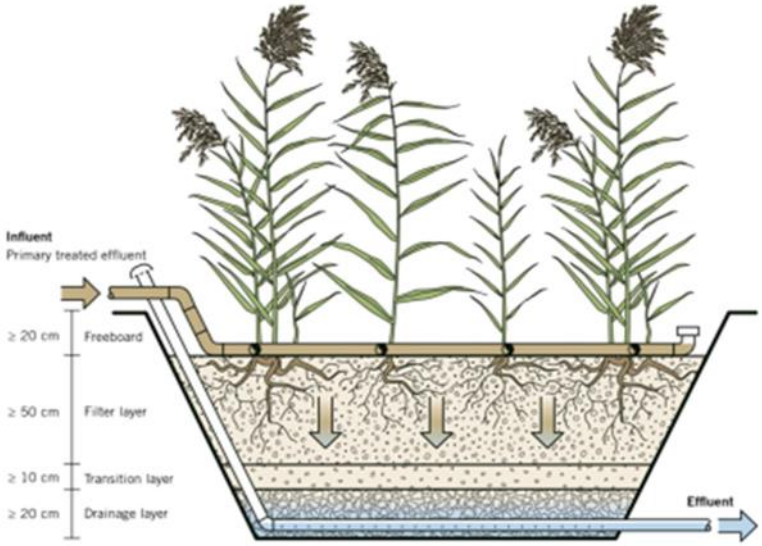
4.4.2 Through solution development we have identified various ways of approaching these very small wastewater treatment works to meet the requirements including the transfer of flows to the closest wastewater network, installation of a soakaway, green solutions and more conventional secondary treatment processes. We scored these options to identify which solution would provide the lowest whole life cost. We are also looking at alternative technologies to the conventional SAF (Submerged aerated filter) such as a contact filtration process which has the potential for solar or battery power, providing secondary treatment at remote locations which do not have access to power. We plan to trial this within AMP7 and if successful implement in AMP8. An example of an alternative approach which demonstrates a natural solution for secondary treatment is in section 4.4.2, this shows our innovative approach to these very small wastewater treatment works.

Septic tank reedbed treatment

4.4.3 Our current proposal to address the environmental driver at 26 of these septic tank sites is to add a reed bed for treatment. Here we would install a vertical flow aerated reed bed treatment process downstream of a new septic tank. This will provide low maintenance, chemical free nature based secondary treatment. These wetlands provide secondary treatment by wastewater loaded onto the surface of the wetland percolating vertically through the wetland. This is collected by an under-drain system following treatment. Aeration of the system is provided by a blower and air distribution pipework. The benefit of these wetlands over more conventional horizontal wetland treatment is they

have less tendency to clog and they are able to treat higher loads, there is also a lower land footprint required. Figure 7 shows a cross section of a vertical flow wetland.

Figure 7: Vertical flow wetland



Source: Dotro et.al 2017

4.5 Chemicals

4.5.1 The PR14 and PR19 chemical investigations programme (CIP2 and CIP3) have informed the chemical permit requirements for PR24. The majority of the UUW chemicals programme in AMP8 is the addition of chemicals, primarily cypermethrin and nonylphenol, into WwTWs permits from 2027. In three cases new permit limits under driver code WFD_IMP_CHEM[3], have been included with the plan.

4.5.2 Sites which have been identified for improvement rather than load standstill requirements for chemical removal are Rossendale, Glossop and Chapel-en-le-Frith WwTW. Solution development to identify technology to remove chemicals at these sites to the river needs levels (cypermethrin in these cases) has taken the learning from the CIP2 investigation which identified a similar technology to low phosphorus (requirements to meet 0.25mg/l) as the most suitable solution. In the case of Rossendale there is a future requirement under the Environment Act 2021 to achieve the technically achievable limit of 0.25mg/l by 2038. As the solution for both requirements is the same, and as the cost benefit assessment has indicated that removal of cypermethrin at Rossendale meets the threshold, there is the additional benefit that the low phosphorus permit will also be achieved. This allows the same solution to address multiple drivers.

4.5.3 To ensure efficiency in delivery we have put two chemical removal schemes forward for a flexible permitting approach (Glossop WwTW and Chapel-en-le-Frith WwTW) these sites are yet to have their AMP7 phosphorus removal schemes completed and therefore we do not have any data on the performance of the sites for chemicals. A flexible approach will allow us to monitor the site following AMP7 project completion to understand the performance, we will then understand if the site required additional investment to achieve the standards or if the AMP7 scheme has the additional benefit of reducing chemicals. This is aligned to the EA 'Approach 4' maximising the benefits of WINEP3. Which

[3] To meet either good ecological status or good chemical status. Needed where an EQS is exceeded downstream of a wastewater treatment works discharge. Measures that fail economic tests will receive standstill limits under WFD_NDLS_CHEM1

require monthly discharge and environmental samples over a 3 year period then an assessment of compliance and next steps agreed. This protects customers from the costs of additional investment being included in PR24 when we don't have certainty over need.

4.5.4 For sites with no deterioration load standstill (NDLS) requirements we have only included costs for the monitoring of chemicals ahead of the regulatory date with a view to reassessment of permit limits if changes since CIP2 or CIP3 have changed the concentration of chemicals in the catchment, this protects customers from investment at sites which may not be required.

4.6 New designations of inland bathing waters

4.6.1 Within our plan we have included schemes to make improvements to WwTW and overflows which impact on bathing waters which are not yet designated. Although currently not statutory it is our understanding following liaison with the applicants that they intend to re-apply for designation. Applications were submitted to Defra to designate bathing waters at Coniston Water and Edisford Bridge on the River Ribble ahead of the 2023 bathing season. At the time these were assessed by Defra as not being suitable for designation and the applications rejected. Following consultation Defra have recently provided updated guidance on the application process and information and criteria required for a successful bathing waters designation application.

4.6.2 We have therefore included schemes in our plan to add microbiological treatment to the continuous discharges at Coniston WwTW which discharges to Coniston water and to Barnoldswick and Settle WwTW which discharge upstream of the Edisford Bridge site on the River Ribble. We have also had confirmation from Coniston Parish Council and Ribble Rivers Trust that they intend to reapply for bathing waters status and have included this in Appendix A.

4.6.3 Including these sites within our plan, although not currently statutory requirements, will allow enhancements to be made to these works to protect public health in the event that the sites are designated as bathing waters within AMP7 or AMP8. If these sites were excluded from our plan and bathing waters designated ahead of the 2024 or 2025 bathing season they could have the potential to be de-designated due to 5 years of poor bathing water status before any investment to make improvements was made.

4.7 Impact of the programme on our ability to sustain high levels of operational performance.

4.7.1 During the AMP8 period we will need to integrate a significant level of change into our assets, systems and processes in order to deliver on the proposed actions in the WINEP submission. This places inevitable pressure on the operational business, for example operational staff need time away from their day job for training, familiarisation and to input into the project design itself. Due to the scale of the wastewater WINEP, this is a particular pressure in this part of the business, although the interface with bioresources will also require careful management due to the changes in the nature and amount of sludge that will be produced. At the same time as delivering the WINEP, we need to sustain high levels of operational performance aligning to our priority to maintain our long term environmental performance. The scale of change we need to manage is highlighted in Table 3, which shows the number of assets impacted for key types of interventions.

Table 3: Key types of interventions

Project type	Number of assets impacted	Geographical distribution
WwTW - Phosphorus removal	72	Mainly Cumbria and Greater Manchester
WwTW - Sanitary det removal	19	Across North West
First time secondary treatment	36	Focused in rural areas
Total number of WwTW with improvement or no deterioration drivers	50	Across North West

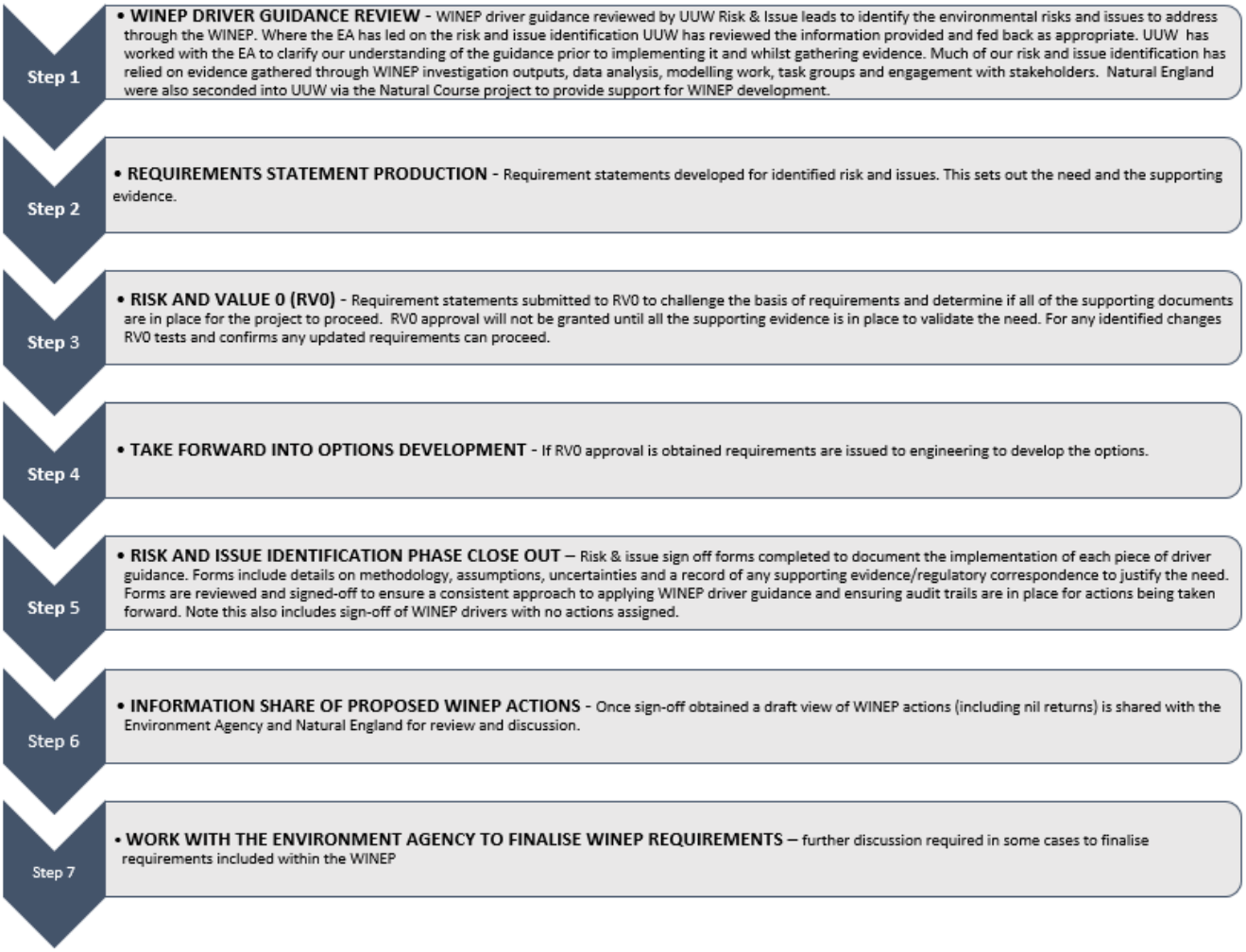
Source: CWW20

4.7.2 In order to deliver such a large programme, it will warrant full time operational support, which we would back fill leaving less strain on the operational community. We intend to use the next two years to build and start to run pilot teams for AMP8, which include an increased operational input to the project teams to minimise negative impact on the operation of our assets.

4.8 Approach to risk and issue identification

4.8.1 The approach we have taken to identify WINEP actions is in line with Stage 2 of the Environment Agency's WINEP methodology. This involves collaboratively identifying environmental issues that need addressing and risks that require further monitoring/investigation through the WINEP. Our Risk and issue identification process follows a stage approached, shown in Figure 8, which has enabled us to identify where action is required to deliver compliance with our environmental obligations

Figure 8: Risk and issue identification process stages



4.8.2 This collaborative process has ensured that we are prioritising and investing in areas which have a well evidenced environmental need, and that we are meeting those needs in the most efficient way. Where evidence of environmental impact is uncertain, we have proposed AMP8 investigations to ensure that any interventions are based on good evidence. We have also sought to identify opportunities for partnership working, such that the best value for customers and the environment is secured.

4.9 Customer support

4.9.1 Customer research indicates protecting the environment is a key priority. Research for the Drainage and Wastewater Management Plan and Water Resources Management Plan carried out in April 2021 showed that 21% of those customers surveyed ranked removal of wastewater in the top 3 greatest long term challenges. It was also noted that aspects such as maintaining the network and wastewater treatment are often fairly easy for people to envisage, but happen in the background. When asked what people themselves feel is important; 'the impact on the environment is a constant concern' and customers 'love living in an area with lots of countryside and green space (perhaps heightened by COVID-19 pandemic) and want this to be preserved'. We consider this to be evidence that customers support UUW's continued compliance with its environmental obligations.

4.9.2 United Utilities Water (UUW) hold a library of customer insights for projects we have delivered within AMP 7 (currently in progress from 2020 – 25). Each insight and research project has used an appropriate method to capture a variety of customer and stakeholder opinions, ensuring a representative view of

the diverse customer base across the North West. This insight has been incorporated in to the options development and selection process undertaken. Further information can be found in the UUW's WINEP approach to WINEP development and our insight and research library[4].

4.10 Management Control

4.10.1 Enhancements to performance included in the WINEP are outside of management control. Base totex allowance maintains compliance with current permits. To enable compliance with new, more onerous permits, investment to enhance current assets or to deliver new assets is required. In certain cases sites can be optimised to achieve new limits with no or very little additional cost. An assessment of where this can be achieved has been undertaken and these schemes are included in the schemes listed in Appendix 3.

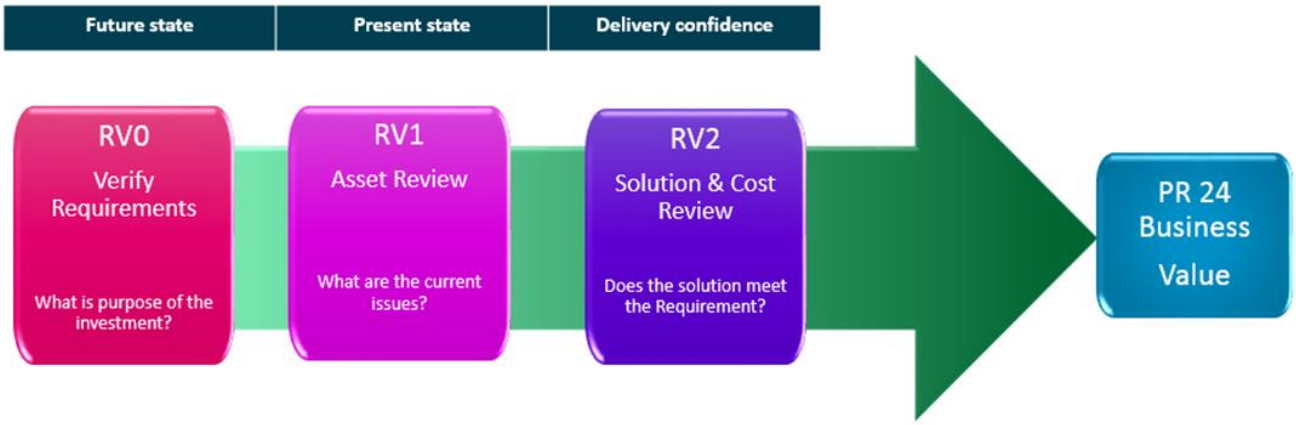
[4] 2023 (UUW) Customer insight and research library. Available here: https://www.unitedutilities.com/insight-and-research-library

5. Best option for customers

5.1 Options development

5.1.1 PR24 options development followed the fundamental principles UUW defined value management process. Risk and Value for PR24 (RV) was a three stage process (shown in the diagram below), aimed at positively challenging our projects to ensure we have sufficient evidence behind decisions. It provides UUW with confidence that they are proposing the right projects for the AMP8 Programme and therefore managing and maximising the value for their customers from their investments. It also ensures that the organisation adopts the correct approach to option identification, development and selection to maximise the realisation of benefits associated with these investments.

Figure 9: PR24 Risk and value



5.1.2 Once the requirements have been clearly verified RV1 was completed in order to understand the current asset condition and performance. Without this understanding there is significant risk that proposed solutions will fail to deliver the value intended and may even fail to satisfy the requirements. This initial baselining was essential in order to allow identification of possible options against the generic high level solutions (GHLS).

5.1.3 Options to address PR24 requirements passed through a series of stages before the agreed solution was confirmed, from an initial 'un-constrained' list of options through to confirmation of the defined and estimated scope associated with a preferred solution.

5.1.4 Within the options development process, un-constrained options were identified against a list of GHLS categories. If un-constrained options were deemed viable then additional screening was carried out to identify 'constrained' options, with further screening taking place to refine the feasible solutions and determine those to be progressed to detailed scope development and estimating. In developing feasible options the engineer will always have taken which solution could represent the best value to the customer into consideration.

Table 4: Generic High Level Solutions

GHLS	Description
Monitor & Respond	Accept risk with agreed contingency plan
Operational Intervention	Solve need by identifying targeted maintenance to restore performance
Optimise Asset	Solve need by improving performance of existing equipment

GHLS	Description
Partnership	Solving need by assistance of third parties, i.e. assisting farmers reduce pollution of watercourses
Refurbish Asset	Major asset refurbishment to restore asset life and performance
Replacement	Replace asset(s) on like for like basis
New Asset	Build new asset when all other options are not possible (this could be a NBS)
Integrated Approach	Integrated solution across asset boundaries e.g. network, process, bio-resources or catchment level solutions. An integrated solution is a systems thinking response and could be a combination of the above solution types.
Combination of generic high level solutions	Example - SuDS and a storage tank to address CSOs

5.1.5 Should a refurbishment, replacement or new asset solution be identified, a number of design tools were used to develop the requirement through to an estimated solution. Base design data was gathered from United Utilities' corporate systems to inform the design, including flow, quality and treatment performance data. In the majority of cases a 2050 design forecast was used, the exception being when there was a high level of uncertainty in the design forecast thus ensuring the most efficient design for the future.

5.1.6 A standardised methodology to solution identification was developed for wastewater treatment works to ensure a consistent approach. The 'Process Decision Support Tool' cross referenced permit values, population and flow data with United Utilities' treatment processes and asset standards to identity and size interventions to meet the requirements. Solutions proposed by the tool included conventional (including chemical and biological phosphorus removal, innovative and nature based solutions.

5.1.7 In addition to this generic option identification tool we developed tools tailored to specific drivers for example the septic tank screening tool which assessed each site against 5 different types of options suitable for delivery of small secondary treatment plants in rural areas. Similarly the decision tree for chemicals defined the options suitable for removal of specific chemicals based on the results of the CIP2 trials.

5.1.8 If nature-based solutions were identified these were investigated further using a GiS constraints tool. The aim was to interrogate the NBS opportunities within the catchments, using a basic data set to include topographical information, land availability, soil type etc. alongside Farmscoper and SIMCAT SAGIS models. The opportunity was screened against the layers to identify if the NBS was a viable option. Widespread use of this methodology was adopted across the programme in order to maximise NB opportunities.

5.1.9 Where a potential partnership opportunity was identified by the United Utilities' strategy managers, a partnership-based option was developed using the UU partnership framework. The framework sign posts tools that can be used to support the assessment of suitable potential partnerships and formation of successful partnerships. This will have been developed in collaboration with the strategy managers to identify relevant partners, seek opportunities for co-funding and assess technical feasibility.

5.1.10 Catchment opportunities were also identified by the United Utilities' strategy managers based on water quality modelling and if feasible would have been developed into detailed solutions.

5.1.11 Use of these optioneering tools ensured the process was proportionate to the scale of the risk to be addressed. They provided a quick and effective way of ruling out unsuitable options and identifying

feasible solutions over a range of different option types. For the larger, more complex schemes a more bespoke approach was adopted for example P recovery at Davyhulme.

5.1.12 A detailed engineered design was then developed for all the feasible solutions identified during this screening process in order to provide comprehensive cost and carbon data. The exception to this would have been for some of the simple, repeatable options for which the cost and carbon estimates were extrapolated based on data from previous projects of similar size and complexity.

5.1.13 It is at this stage that the options were also assessed for deliverability. A review was undertaken by the Planning, Land & Environmental Team and United Utilities' Construction Services which allowed identification of risks and potential mitigation measures. This will have improved the cost accuracy associated with implementing the PR24 solution, it also allowed elimination of options which are not deliverable thereby confirming feasibility. This also included an assessment of the likely delivery route (including Direct Procurement for Customers) which was then used as the basis for the Contractor add-ons in the cost estimate.

5.2 Innovation

5.2.1 Throughout AMP7 United Utilities' has taken learning from AMP6 innovation roll out (such as that demonstrated with Nereda and Typhon) to deliver a new Technology Approval Process. This process identifies opportunities for innovative technologies and nature based solutions and provides a methodical approach to due diligence, innovation risk identification and mitigation planning. The approved technologies/solutions include:

- those we have identified ourselves;
- those suggested by our construction partners;
- those identified by other WaSCs but not yet progressed by United Utilities in AMP7 i.e. I-PHYC Algal bioreactors; and,
- global innovation insights such as that secured through our engineering service provider Jacobs and other consultants such as Stantec.

5.2.2 Our Technology Approval Process has allowed us to progress technologies into approval without the need to trial, for example the Mobile Organic Biofilm technology approved and now in detailed design and construction for our Macclesfield WwTW AMP7 scheme. This approach highlights the UUW credentials as a fast adopter of new technology but with deeper awareness of the inevitable innovation risks that need to be managed.

5.2.3 To develop our PR24 submission we have incorporated the technologies that have now secured "Approved" status into our Process Decision Support Tool which was used to identify innovation opportunities by driver and site details. Where these innovation opportunities present the best value solutions they have been selected to be taken forward as the preferred solution. If the value of these novel and less well understood solutions cannot be determined with sufficient certainty they have been identified as an opportunity for United Utilities to pursue in the period between submission and delivery. Alongside this we will continue to review those innovations / solutions not yet approved but relevant to AMP8 drivers and progress these through our Technology Approval Process and, where deemed truly necessary, deliver specific Innovation trials. We believe this sets United Utilities in good standing in terms of understanding the key opportunities that innovation can deliver within our PR24 submission but will also allowing for further efficiency driven by our Innovation programme.

5.3 Options selection

5.3.1 The water sector is moving towards a 'best value' approach, promoted by the regulators, with a best value option being one which drives the best outcomes for the environment, society and UUW over the long term.

5.3.2 The value associated with the various options was assessed using the value assessment tool developed by United Utilities specifically for this purpose. This tool lists intervention type and pulls through the associated benefits and value. It assesses value against a number of benefits including all the wider environmental outcomes as requested in the EA WINEP Options Development Guidance. The benefits were drawn from the MyRisk Risk Breakdown Structure (RBS), currently widely used in United Utilities. The wider value element, was also taken from the EA's WINEP guidance on Wider Environmental Outcomes.

5.3.3 The inputs to the value tool included costs (CAPEX, OPEX and whole life), carbon (embedded, operation and whole life), data on biodiversity plus risks and benefits as described above. The outputs from the tool included a cost benefit analysis and allowed the selection of the preferred solution based on the comparison of value between the various options (RV2). The option selected was therefore that which provides the best value to our customers.

5.3.4 To ensure consistency and oversight, the WINEP Programme Scenario Development Group has reviewed the overall programme summary in terms of cost, value, benefits and carbon to ensure decisions on preferred options are well evidenced and in customers' interests. The group has focused on reviewing where the outcome of the best value assessment has led to marginal differences between options. A summary of the decisions made and programme metrics including value were then provided to the UUW Executive WINEP Steering Group.

6. Cost efficiency

6.1.1 This section sets out how we have calculated the value of this enhancement case, how we have challenged our assumptions to develop efficient costs and how these have been benchmarked and assured.

6.2 Approach to cost build

6.2.1 Costs for projects which have a final effluent improvement requirement have been assesses using site specific information. In some cases such as those projects associated with the Manchester Ship Canal detailed optioneering has taken place to ensure we are addressing requirements in line with the adaptive plan in a least cost, low/no regrets order in AMP8, ensuring our plan is as efficient as possible and in line with future environmental drivers we know are imposed in AMP9 and beyond.

6.2.2 In other cases such as the septic tank programme, we have undertaken a review of all sites to look for opportunities for green solutions and then undertaken a deep dive costs assessment on various options. Using this information we have been able to develop a septic tank specific cost curve to assess sites against.

6.2.3 Our UUW engineering team have developed solutions for each individual site based on the sites specific requirements and the future permit requirements of the WINEP. This assessment resulted in a scope items list and sizing which was passed to the estimating team to build the individual direct capital costs. An example of these scope items is detailed in Table 5 and Table 7.

6.2.4 Case Study 1 and Case Study 2 give detailed cases studies for the estimating breakdown of the costs submitted in our plan. These examples are for a large WwTW with proposed biological phosphorus removal plus new ammonia permit (Ashton under Lyne WwTW) and a small WwTW where phosphorus at the technically achievable limit of 0.25mg/l at a small filter works is driving extensive works rebuild.

Case Study 1: Ashton Under Lyne WwTW Biological Phosphorus removal

Ashton Under Lyne WwTW is located in Greater Manchester and serves a current population equivalent of 53,408 and discharges to the River Tame. In AMP8 there is a WINEP requirement under the Environment Act and The Water Environment (Water Framework Directive) to tighten the phosphorus discharged from the WwTW from 2mg/l to 0.25mg/l on annual average, the BOD from 20mg/l to 16mg/l and the ammonia from 3mg/l to 1mg/l. The preferred solution to achieve this is to retrofit Mobile Organic Biofilm (MOB) in the existing activated sludge plant to provide additional aeration capacity for biological phosphorus removal, plus tertiary solids removal. Further detail on MOB is available in Section 3.2.14.

The solution options are determined by UUW Engineering team, numerous other site specific factors are identified and used to build the individual direct capital cost for Ashton under Lyne WwTW. The largest direct cost elements are included in Table 5. Our PR24 capital cost estimating approach is then based on data collected over a number of AMPs (AMP3 to AMP7) updated to reflect the present market conditions under which UUW and the UK Water Industry are operating. Mott Macdonald (MM) have provided an estimating service to UUW over AMP6 and AMP7. MM also provide an estimating service to a number of other UK Water Companies, which allows them to provide a benchmarked approach to UUW's PR24 capital cost estimates. Table 5, Table 6 and Table 7 show how the final cost included in our plan for Ashton under Lyne WwTW have been put together. These costs reflect those included in Table CWW3.

Table 5: Ashton under Lyne WwTW Direct costs

Area Name	Element Name	Quantity	Cost (£)	Comments
Tertiary and Advanced Treatment	Deep Bed Sand Filters	192 m2	3,873,031	Tertiary Solids Removal system- Rapid Gravity Filter (RGF) backwash instantaneous flow rate is 44 l/s with total surface area 192 m2 and backwash storage tank of 1200 m3
Pumping	Civils PS - Well Structures	1200 m3	1,262,881	RGF dirty backwash wet well chamber.
Refirb - Secondary Settlement	Final Settlement Tanks (Conventional Activated Sludge)	2123.7 Item	899,779	New Autodesludging required on Final Settlement Tanks (FST) 1No. New de-sludge pump from centre sump of each tank to new Surplus Activated Sludge (SAS) pump station, civil modifications to each FST for 4" sump channel in each tank for sludge collection.
Odour Control	Comb-Bio-Filter and Dry Media Scrub	677.04 m3/h	738,394	Combined-BioFilter and Dry Media Scrub
Pumping	Submersible Pumping Stations	220 KW	650,596	RGF feed PS (operating Duty/Assist/Assist/Standby).
Sludge storage/pump thick & de-watering	Drum Thickeners	14.7 m3/h	612,598	SAS Thickening Duty and standby- Drum Thickeners 7.35 l/h each. (ref: EBPR Unit Sizing).
Chemical Dosing	Polyelectrolyte Dosing	840.26 l/hr	570,635	Polyelectrolyte Dosing
Chemical Package Dosing & Storage	Ferric Sulphate	7.64 m3	522,225	Trim ferric alum dose, 22.75l/h. Assumed dosing into Tertiary Solids Removal rising main.
Tertiary and Advanced Treatment	Flocculation <6m3 vol	179.74 m3	518,219	Total volume for floc tank. Baffled tank with 2 mixers. Sized for residence time of 5 minutes.
Chemical Storage	Polyelectrolyte Prep & Storage	10.08 m3	476,734	Polyelectrolyte day tank.
Other direct costs			281,303	
Total direct contractor costs			**10,406,395**	

Contractor Indirect Costs (CICs) cover design costs, construction staff costs, risk, fee and profit margin. These indirect costs have been increasing over the last four AMPs and this has been due to more risk being transferred to contractors, more refurbishment work on existing plant and equipment, more optioneering and value engineering to minimise CDCs and a more risk averse approach post the collapse of Carillion. MM have benchmarked CICs across UUW's supply chain, the UK Water Industry and UK Transport Industry and have seen the increase accelerate in AMP7, which has been due to the reasons mentioned above and also the large increase in post-COVID infrastructure spend, which has driven significant growth into resource wages. Contractors are also actively picking sectors and work type to maximise profit returns and this means that some have reduced their work in the water sector or exited completely. MM and UUW have, therefore, reflected this benchmarking data into the WINEP estimating approach. The CICs applied to the cost estimates have been based on current market performance with adjustments for project size, complexity and Operating Delivery Model (ODR). The ODR and associated CICs' percentage is based on AMP7 market data and also the proposed AMP8 delivery model, which will select the chosen runway based on risk management and level of design between UUW and its extended supply chain.

Table 6 shows the breakdown of opex costs for the Ashton under Lyne WwTW ammonia and phosphorus project once it has been completed. We will not see the full year effect of the increase in opex on this site until year 1 of AMP9 as the regulatory date for this project is 31st March 2030. A large proportion of these costs are for power and chemicals. An increase in power is required in the activated sludge plant to provide the additional aeration required to achieve the lower ammonia limit, and to control the process to provide the right conditions for the biological phosphorus removal process. Additional chemicals (polyelectrolyte) are required to thicken the additional sludge created from this process, additionally tanker movements from this site are anticipated to increase to transport the sludge away from site.

Table 6: Annual Opex costs for Ashton under Lyne WwTW WINEP schemes.

Cost element	Cost (£) FY21 price base	Cost (£) FY23 price base
Power	374,877	
Chemicals	125,879	
Staff	62,506	
Maintenance	212,292	
Business rates	214,173	
Sludge tankering	382,660	
Landscaping	10,550	
Other	4,494	
Biodiversity net gain	4,4040	
Total	**1,391,471**	**1,569,164**

Case Study 2: Embleton WwTW Conventional Chemical dosing for Phosphorus Removal

Embleton WwTW is located in Cumbria it serves a current population equivalent of 241 and discharges to Dubwath Beck a tributary of River Derwent. It is currently a small biological filter works with a 30mg/l BOD and 45mg/l suspended solids permit requirement. In AMP8 there is a requirement to add a first time phosphorus removal to this site to meet the habitats regulations requirement of technical achievable limit of 0.25mg/l phosphorus. We are proposing a chemical dosing solution and tertiary solids removal at this WwTW to meet this requirement.

Aligned to our approach to WINEP solution option development UUW engineering department have assessed options to be estimated to comply with the WINEP requirements. Due to the very low phosphorus requirement at this WwTW one option was put forward as the solution comprising; new primary ferric dosing, septic tank, tertiary submerged aerated filter (TSAF), tertiary solids removal and ancillaries. Table 7 this estimate for the contractor direct costs, what these comprise of and the estimated cost associated which has gone into our totex build for this solution.

Table 7: Embleton WwTW Direct Costs

Area Name	Element Name	Quantity	Cost (£)	Comments
Tertiary and Advanced Treatment	Filter	58m3/h	503,255	Tertiary Solids Removal system
Submerged Aerated Filter (SAF)	SAF	39m3	253,425	
Power	Electricity supply	-	250,000	New power supply
Dosing	Ferric Chloride	2m3	444,928	Dosing and storage
Pumping	TSR feed and backwash transfer	6 KW and 4.4KW	229,946	Tertiary solids removal feed and backwash transfer
Tanker offloading and blind tank		2m3	90,445	Volume of blind tank
Foundations		80m2	80,860	Piled foundations on area to encompass all structures
Septic tank		56.4m3	52,518	
Other direct costs			430,416	Including pipework, mixers, analysers, Kiosks
Total of Construction Add-on			158,367	
Total direct contractor costs			2,494,160	

The total direct contractor costs were then updated with price base assumptions bringing the total for direct costs to £2,566,712. Following a detailed review of the project efficiencies were found and the cost for cable trough and dosing were reduced by £155,623. Bringing the final total for direct costs to £2,411,291.

Table 8 shows the breakdown of opex costs for the Embleton WwTW phosphorus project once it has been completed. We will not see the full year effect of the increase in opex on this site until year 1 of AMP9 as the regulatory date is 31st March 2030. A large proportion of these costs are for chemicals and maintenance of the new assets on the site. The addition of ferric to remove phosphorus will create additional sludge which has increased tankering costs from the site.

Table 8: Annual Opex costs for Embleton WwTW WINEP schemes.

Cost element	Cost (£) FY21	Cost (£) FY23
Power	[✂]	
Chemicals	[✂]	
Staff	[✂]	
Maintenance	[✂]	
Business rates	[✂]	
Sludge tankering	[✂]	
Landscaping	[✂]	
Other	[✂]	
Biodiversity net gain	[✂]	
Total	**[✂]**	**[✂]**

6.3 Approach to challenging our assumptions

6.3.1 There are several aspects of project costs, which are impacted by the scale of the programme and thus as the AMP8 programme matures, they may be subject to change. At the moment the following assumptions are included in our costs Corporate Overhead: we have currently estimated 7% allowance for Corporate Overhead. This is estimated on anticipated high level organisational structures to support the programme. This has been calculated based on current delivery assumptions, which is a largely outsourced design and build basis.

6.3.2 UUW's AMP8 WINEP is substantially larger in cost than that seen previously, and larger than the whole WINEP for England in AMP7. Additionally, we also expect the AMP9 WINEP to be substantial in scale given the longer-term environmental requirements that are already visible today. As a result of this, it is more important than ever that we can give regulators, customers and stakeholders' confidence around the development of the WINEP and so we commissioned Arup to run an independent scrutiny and challenge process on the development of the PR24 WINEP. Arup spent time working with specialists across UUW to understand how we had arrived at the scope, the approach to developing costs and whether the programme had been appropriately optimised.

6.3.3 Feedback from Arup 'Overall, we note the very significant amount of work that was done by UUW in the short time between our reviews… We found that UUW responded positively to the challenge and scrutiny applied to it from Arup and the Panel members, with a very significant amount of work undertaken after our initial review. We observed that progress had been made by UWW in many areas that we highlighted in our original review. As part of this, we also noted a strong push across the leadership and the operational teams on trying to ensure that the programme achieves a balance of solutions across traditional engineered approaches and alternative solutions where these are feasible and appropriate.'

6.3.4 The WINEP scrutiny and challenge panel consisted of: Trevor Bishop (Independent, Panel Chair), Bernice Law (Independent (and Chair of UUW's YourVoice ICG panel), Alastair Chisholm (Director of Policy, CIWEM), Simon wright OBE (Independent and Ryan Harris (Senior Commercial Director, Arcadis) The panel concluded:

6.3.5 "It is reassuring to see the company embracing and positively responding to the key challenges set by the panel of independent experts on its WINEP programme. Whilst the company's WINEP programme is, by necessity of the environmental issues to be resolved in the North West, both substantial and complex the panel is encouraged to see a carefully balanced programme being developed. The use of adaptive planning was noted by the panel who strongly supported the approach to ensure further optimisation of value for money and reductions in carbon as solutions are refined through experience."[5]

6.3.6 Following the initial review by Arup we incorporated their feedback into our plan. Particularly relevant to this case is the cost estimating methodology which following the second review they concluded that UUW costing methodologies largely comply with the requirements of WINEP guidance as well as standard industry practice. However, they did raise concern that "across a broad programme the level of risk allowance is at the lower end of the range we would expect' we have further developed our plan to ensure concerns raised are addressed within the final estimates.

6.4 Third party assurance of our cost estimates

6.4.1 We commissioned two specific pieces of third party work to assure the cost efficiency of our enhancement cases:

- A bottom-up benchmarking exercise (Faithful and Gould); and,
- Assurance on top-down benchmarking carried out by UUW (Deloitte).

6.4.2 We consider that the complementary and independent output of these pieces of work demonstrates that our cost estimates are efficient and represent excellent value for money for customers.

6.4.3 We provide a description of each below.

Bottom-up benchmarking (Faithful and Gould)

6.4.4 Faithful and Gould undertook a bottom-up deep dive into the cost efficiency of our enhancement cases. This involved a close examination of our cost base relating to a sample of our plan, with comparisons made to similar activity carried out by third party companies across a variety of sectors.

6.4.5 F&G looked at our direct costs across each of the following categories:

(a) Staff including site supervision

(b) Mobilisation and site set up, running and removal of site offices and welfare

(c) Temporary services for general site use, such as water to wash out concrete skips

(d) Attendant plant and equipment, such as cranes, forklift for unloading deliveries etc.

(e) Attendant labour, defined as hourly paid operatives not involved in productive works

(f) Site consumables, such as waste skips

(g) Set-up site compounds, erecting hoardings etc.

(h) O&M manuals

(i) Health and safety

6.4.6 It looked at the contractor's indirect costs (e.g. overhead and design costs) and UUW's indirect costs (e.g. land acquisition costs). Due to the size of the programme, F&G examined a sample of our

[5] 2023, Arup, WINEP Scrutiny and challenge Independent review report – Final

enhancement cases. However, this sample included projects from each of our enhancement categories and covered £1.246bn of expenditure.

6.4.7 F&G noted the effectiveness of UUW's cost estimation process:

"In addition to the benchmarking data held by Faithful+Gould we understand that UUW has applied multiple internal and external challenges to progressively refine the cost estimation undertaken to date. In particular we note UUW's use of its Investment Programme Estimating System (IPES) which is a bespoke parametric estimating tool containing data from AMP3 to AMP7, to provide historical cost curves alongside estimated data from third party organisations."

6.4.8 F&G found that our proposed costs are in line with rates typically seen across the industry:

"Overall, UUW's approach of utilising historic cost curves, market testing and obtaining specialist third party quotations demonstrates a sound proactive approach to cost planning. In total £1.2bn of schemes underwent targeted cost assessment with £573m making up the construction works element.

After presenting our initial findings, it was encouraging to see UUW's commitment to addressing our findings and applying these to the wider enhancement estimates, charting a strategic route towards greater efficiency and scope clarification.

In light of this Cost Assurance work and evidence of UUW's responsive actions we have concluded that the data we have benchmarked is within a reasonable alignment with anticipated market rates."

Assurance on top-down benchmarking (Deloitte)

6.4.9 As part of our business plan submission, UUW carried out top-down benchmarking, which took two distinct forms:

- Unit cost analysis using recent data from the industry's APR data share and other publications (e.g. Drainage and Wastewater Management Plans); and,
- Where possible and feasible, econometric analysis based upon Ofwat's PR19 model suite.

6.4.10 As we discuss in *Chapter 8 – Delivering at efficient cost* and supplementary document *UUW46 – Cost Assessment Proposal,* recent supply-side shocks mean that the relationship between cost and cost driver reflected within the econometric models used to assess enhancement expenditure at PR19 is no longer appropriate. As such, we consider benchmarking carried out using more recent data to be more effective at assessing AMP8 enhancement costs.

6.4.11 As we discuss in our enhancement cases, where recent and comparable data was available, our benchmarking analysis found our business plan costs align to similar comparator companies. This is reflected in Deloitte's findings:

"Overall, UUW has performed econometric benchmarking on programmes totalling £3,908m in enhancement case costs. We did not find any material errors in this econometric benchmarking…UUW's other top-down benchmarking based on more recent data submitted by peer companies indicates that UUW PR24 costs are generally in line with expected costs."

6.4.12 This demonstrates that top-down benchmarking information presented within the cost efficiency has been assured by Deloitte and as such, the findings can be considered robust.

6.5 Industry comparison

6.5.1 We have undertaken a review of our costs using available cost share data on similar schemes across the industry. The most data is available for phosphorus removal schemes using data from the APR23 data share of table 7F. This table details the cost and population equivalent of schemes delivered or planned to be delivered within AMP7. Figure 10 shows the unit costs assessment of £ per population equivalent

for phosphorus removal projects. In our assessment of PR24 plan against this our PR24 phosphorus removal plan is less than the industry average, however the UUW costs do sit above other companies. Reasons for this could include:shows the unit costs assessment of £ per population equivalent for phosphorus removal projects. In our assessment of PR24 plan against this our PR24 phosphorus removal plan is less than the industry average, however the UUW costs do sit above other companies. Reasons for this could include:

- This is AMP7 data collected before the increase in input prices;
- The AMP8 programme includes more schemes where phosphorus permit limits are down to the technically achievable limit of 0.25mg/l increasing the amount of totex required to achieve the permit level;
- This analysis does not look at the current level of the permits at sites ahead of the new lower permit coming into force, an existing Urban wastewater limit may allow more optimisation of the process ahead of new lower limit therefore reducing cost; and
- Population equivalent of schemes is also a factor for the efficiency of £ per PE. It is more costly to remove a Kg of phosphorus from a small WwTW than one which serves a larger PE.
- This benchmark analysis is a simple analysis of unit rates and does not account for differences in treatment works size, phosphorus limits. Cost assessment should appropriately account for these factors when identifying efficient cost targets for phosphorus removal.

6.5.2 As part of our submission, table CWW19 includes the granular level data for the costs, design and current PE as well as Capex and Opex costs for the AMP8 programme. We are confident that our plan represents an efficient cost for the delivery of the phosphorus removal schemes.

Figure 10: Unit cost assessment using Table 7F data APR22

7. Customer protection

7.1 Introduction

7.1.1 It is important that customers have confidence that we will deliver the enhancement schemes that get reflected in our PR24 final determinations and they are suitably protected in the event of non-delivery, or if there are material changes to deliverables (including changes to dates), which leads to a change in cost (including changes in the timing of required expenditure). Ofwat proposes that, if companies fail to deliver or are late delivering improvements to customers, then price control deliverables (PCDs) should, where appropriate, be used to compensate customers. In our PR24 *Chapter 8 – Delivering at Efficient Cost, section 8.8.9* we have proposed an approach to PCDs that aims to provide customer protection, such that customers are fairly compensated for non-delivery (such as due to a change in regulatory requirements) or late delivery (including as a result of a change to a regulatory date), between PCDs, any related ODI underperformance payments, and cost sharing arrangements.

7.1.2 We have considered this in three areas (total claim value £944.518m AMP8 totex):

(a) Sanitary determinands (£334,448m AMP8 totex)

(b) Phosphorus removal (£569,395 AMP8 totex)

(c) Other final effluent drivers (£68,009m AMP8 totex)

7.2 Price Control Deliverable

(a) Sanitary determinands

Table 9: PCD summary

Scheme delivery expectations	
Description of deliverable	Improvement in treatment efficacy at WwTW for sanitary parameters: Ammonia, BOD and Suspended solids delivering a reduction in contaminant load to aquatic environments.
Output measurement and reporting	Company should deliver the improvement in treatment efficacy benefits for the sanitary parameters specified at the WwTWs listed or equivalent schemes with comparable benefit, in line with the profile in the Company Business plan to deliver WINEP requirements. The lag between investment and delivery is explained by the fact that these schemes are major construction projects which are completed over multiple years.
Assurance	Successful completion of WINEP Enhancement schemes for sanitary parameters is assured internally through review of evidence compiled by delivery partner / Engineering and External assurance is by the Environment Agency confirming completion and updating the WINEP Tracker to reflect the date the output was claimed. Generation of an associated output in use (OIU) certificate and evidence pack. This will also be reported through APR
Conditions on scheme	Excludes Davyhulme BOD and Wigan ammonia schemes. These are subject to a separate PCD due to the nature of the schemes, for more detail see the WINEP Final Effluent limits - WINEP Optimisation document.
Impact on PCs	Failure to deliver will impact on the discharge permit compliance PC number of WwTW 385, 1 WwTW is 0.260%, ODI rate for 1% is £2,880,000 19 WwTW, average PE per scheme is 40,243 1 PE = £18.588

7.2.1 In our PCD template *UUW32-PCD Excel Sheet* we have assumed a wholesale WACC of 3.23%, in line with Ofwat's guidance. We have assumed a 50% totex cost sharing rate, which is applied before calculating PCDs. We have applied a further 50% for Bioresources (where applicable), to ensure that only 25% of Bioresources totex is at risk from PCDs, given the lack of RCV guarantee, and general uncertainty in cost recovery from future Bioresources price controls. For late delivery we have applied a proportionate value of annual opex, and assumed 3.5% of capex, which provides a fair reflection of the time value of money of any related deferred capital spend.

Table 10: PCD delivery profile

	Unit	AMP8	2024	2025	2026	2027	2028	2029	2030	Ultimate delivery
Cumulative delivery target for PCD	**PE**		**-**	**-**	**236**	**70,701**	**79,970**	**377,854**	**764,624**	**764,624**
AMP8 Capex (22/23 pb)	£	303,343,440	5,048,442	9,602,803	24,897,613	97,808,605	117,384,200	42,714,758	5,887,019	
AMP8 Opex (22/23 pb)	£	3,720,817	-	-	-	-	11,566	1,001,166	2,708,085	
ODI impact per unit of PCD volume	£/PE	18.59								

Table 11: Price Control Allocation

Price Control	Unit	Price Control Allocation
Water resources	%	0.00%
Water network+	%	0.00%
Wastewater Network+	%	100.00%
Bioresources	%	0.00%

Table 12: PCD Incentive rates

	Unit	WR	WN+	WwN+	BR
Overall delivery	£/PE	0	0	182	0
Time value rate	£/PE	0	0	6	0
Late delivery	£/PE	0	0	6	0

(b) Phosphorus PCD

7.2.1 We consider that customers are fully protected from non-delivery via cost sharing and Outcome Delivery Incentives (ODIs). As such, no Price Control Deliverable (PCD) is required.

7.2.2 We calculate that potential penalties under the Outcome Delivery Incentive framework could total £96.50 per PE impacted (3,228,553 of PE) by our WINEP P removal programme, or £311.5m in total. These calculations are set out in Table 13: Customer protection afforded by Outcome Delivery Incentives.

Table 13: Customer protection afforded by Outcome Delivery Incentives

Analysis		Notes
River Water Quality PC		
ODI rate (£)	661	£/kg removed
Outcome - Design PE served	3,228,553	
Kg P removed as per PCL - 2029/30	473,270	per OUT5.66
Kg P removed as per PCL - 2024/25	81,248	per OUT5.66
Kg P removed as per PCL - AMP8	392,099	= 473,270 - 81,248
Kg removed per 1 PE	0.121	= 392,099 / 3,228,553
ODI impact per PE in P programme (£)	**80.28**	**= 0.121 * 661**
Discharge Permit Compliance PC		**Notes**
ODI rate (£)	2,880,000	£ per % failing works
Outcome - Design PE served	3,228,553	
Number of AMP8 schemes	70	
Average PE per scheme	46,122	= 3,228,553 / 70
Impact on 1 failing works on % failing works	0.260%	= 1 / 385 (based on 385 permits)
ODI impact of 1 failing works	748,052	= 2,880,000 * 0.260
ODI impact per PE in P programme (£)	**16.22**	**= 748,052 / 46,122**
Total ODI impact per PE in P programme (£)	**96.50**	**= 80.28 + 16.22**
Total ODI impact of P programme (£)	**311,541,061**	**= 96.5 * 3,228,553**

Source: UUW analysis

7.2.3 We calculate the protection provided by cost sharing to be £284.7m. This is calculated by multiplying the implicit allowance for this enhancement case totex of £569.4m by an assumed 50 percent customer cost sharing rate:

7.2.4 $Implicit\ allowance \times cost\ sharing\ rate = customer\ protection$

7.2.5 $\rightarrow £569.4m \times 0.5 = £284.7m$

7.2.6 This means that in the event UUW fails to invest in this area, we will hand back £284.7m to customers.

7.2.7 Overall, this provides customer protection in excess of the £569.4m associated with this enhancement case. This is shown in Table 14: Overall customer protection.

7.2.8 In addition to this customer protection through the price control mechanisms, we would also be subject to further regulatory sanction for failing to meet our obligations.

Table 14: Overall customer protection

	Unit	
Customer protection provided by cost sharing	£m	284.7
Customer protection provided by ODIs	£m	311.5
Total customer protection	£m	596.2

7.2.9 Therefore, we do not consider a Price Control Deliverable to be necessary or proportionate.

(c) Other final effluent drivers

7.2.10 We have not included a PCD for this area as each individual driver is small in size, and below Ofwat's indicated threshold.

Appendix A New designations of inland bathing waters

A.1.1 Confirmation that Coniston Local Council and Ribble Rivers Trust intend to reapply for Bathing Water Status for Coniston Water and Edisford Bridge on the River Ribble respectively.

From: Jack Spees [mailto:jack@ribbletrust.com]
Sent: 27 June 2023 18:46
To: Pilling, Iain <Iain.Pilling@uuplc.co.uk>
Cc: Platts-Kilburn, Sion <Sion.Platts-Kilburn@uuplc.co.uk>
Subject: Re: Inland bathing waters stakeholder support

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Report Suspicious

Hi Iain

Yes I can confirm that it is our intention to re-submit our application in the autumn/winter with further evidence gathered this year (surveys and monitoring have commenced, and will run through the bathing water season) we will share our findings with yourselves at the earliest opportunity.

Kind regards

Jack

Jack Spees
CEO
Ribble Rivers Trust

2 KirkBeck
Coniston
LA218EL

1st August 2023

Dear United Utilities

I am Chair of Coniston Parish Council and on the sub-group that submitted last years Bathing Water Status application to DEFRA, the surveys being conducted in 2022.

We were disappointed last year not to be taken to public consultation with the application as we believe that Coniston Water is regularly used by a large number of people for bathing during the season. I am happy to share any of the data with yourself to evidence the number of people using Coniston Water for swimming and recreational use.

We intend to submit a new application this year, the resolution was put before Coniston Parish Council on Monday 17th July 2023 and it was accepted. The areas to be surveyed this year will be around the Coniston Boating Centre and Monk Coniston. In our previous application we evidenced that a large amount of bathers also use the area around Brown Howe, and we will also surveying this area again for resubmission. We are surveying the areas with the facilities required for Bathing Water Status, but the whole lake is widely used for swimming.

It is most helpful to be able to update you on the progress of this application, and keep you informed of our public consultations. I'm sure that it is in all our priorities to ensure that the water quality in Coniston is as good as possible.

Should you require any further information please do not hesitate to contact me,

Regards

Tracy Coward
Chair - Coniston Parish Council
07852982815

Appendix B Copy of letter sent 31/08/23 Jo Harrison to Claire Bunter WINEP scope and delivery dates

United Utilities
Water for the North West

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

Telephone: 01925 237000

unitedutilities.com

Claire Bunter

Environment Agency

Via email: 31.08.23

Dear Claire

WINEP scope and delivery dates

Thank you for your recent clarification regarding the WINEP scope and your efforts to address phasing issues collaboratively with us.

We are concerned regarding the outcome of this clarification, which potentially adds a further £1 billion of expenditure into the AMP8 WINEP programme. This is investment that had previously been subject to an extensive adaptive planning process and scheduled to be delivered in AMP9. Accelerating this investment limits the opportunity for the delivery of more efficient and sustainable solutions and will inevitably lead to the delivery of grey, engineered solutions with a high carbon footprint. We are also concerned that the potential to discuss appropriate delivery dates for other schemes is also now on hold until after the Final Determination.

Delivery of complex schemes (see appendices 1 and 2)

As part of our WINEP options submission in January 2023 we highlighted a number of large, complex projects where there was a need to phase regulatory dates (see appendix 1). We subsequently engaged extensively and in good faith with regulators throughout 2023 to develop proposals and submit them through the various channels identified to us. A full timeline of the interactions is set out in appendix 2 to this letter.

As you will see from appendix 2 we have made significant efforts to engage with regulators on WINEP phasing needs and this culminated with the inclusion of phasing proposals for Davyhulme, Wigan & Skelmersdale and Pennington Flash, within our wider phasing submission of 19th July 2023.

In the meeting with all regulators ahead of the July submissions it was set out that companies should carefully consider phasing and if companies had concerns about deliverability, affordability and financeability they should be taking advantage of this opportunity. In addition to responding on the areas we were steered to look at, we again specifically raised the need for phasing for the three areas above and provided adaptive plans to support those proposals.

We are therefore concerned that the conclusion of this last process, which was communicated by the Environment Agency (EA) on the 17th August 2023, did not accept the phasing for Davyhulme, Wigan & Skelmersdale and Pennington Flash. It was stated that phasing decisions had been concluded and that the WINEP alteration process was not now available until after the Final Determination of PR24 plans.

As a consequence, the statutory WINEP now has dates for major schemes at Davyhulme, Wigan and Skelmersdale schemes in AMP8 and so costs must now be included in our AMP8 totex plan. We are concerned that this will both drive an additional £1bn (2021 prices) into our AMP8 WINEP programme and result in sub-optimal environmental improvements. Whilst our associated enhancement cases for these schemes will detail the need to enter into alteration processes to agree deliverable dates in AMP9 post Final Determination, our view is that these major scheme delivery dates should be agreed ahead of the business plan submission.

For Pennington Flash we have no deliverable solution developed and costed and so will not include costs in the PR24 plan at this time. We are working on a grey infrastructure solution and the cost, in the event that this is required, is potentially more than £150m (2021 prices). We will flag this need as part of our PR24 business plan with the expectation that, if such a scheme is required to be delivered within AMP8, a cost allowance will be added during the determination process.

Wider concerns on AMP8 delivery dates (see appendix 3)

More broadly we have continued to work hard on developing our delivery plans throughout 2023 so that wherever possible we plan to meet regulatory dates. With significant and welcome regulator support, through accelerated and transitional investment, we have started early on projects across £1.5bn of our AMP8 programme, bringing forward £200m of investment into AMP7. This has resolved a number of deliverability issues, but in addition to the issues raised above, there remain a further 16 WINEP schemes needing in-AMP8 date moves, which are set out in appendix 3.

Direct Procurement for Customers (DPC) – Salford, Sale and Stockport

As per our presentation to you on 4th July 2023, the Salford, Sale and Stockport bundle of schemes trigger thresholds as viable Direct Procurement for Customers (DPC) and we wish to explore that mode of delivery. The regulatory date for Salford already needs pushing back to Autumn 2031 to enable traditional delivery, but a further extension to that, and a likely less material delay to Sale and Stockport regulatory dates, would unlock DPC for this bundle. As strong DPC candidates only the running costs of the DPC process are included in our PR24 submission at this time for all 3 schemes, and not the full capital costs – which would be financed separately. In the event that the regulatory dates are not successfully moved, then we would need to include the in-house delivery cost requirement ahead of Final Determination, and we would still need to move the regulatory date for Salford. Equally, in the event that the DPC process does not result in a successful DPC contract award this bundle of schemes would require in-house delivery and associated cost allowances. This matter requires discussion with Ofwat and EA on the regulatory dates to resolve the approach to the regulatory processes and secure best value delivery of these schemes.

In summary, we understand that a mechanism for in-AMP scheme and date changes is proposed to be available through the WINEP alteration process after Final Determination, and we can use this for the in-AMP8 date changes identified in appendix 3, if the dates can't be changed ahead of that. Within that group we believe the Salford regulatory date requires more urgent discussion given the impact on the DPC bundle.

However, for the group of complex schemes in appendix 1, whilst we have appreciated the efforts made by regulators to explore the more significant phasing needs and opportunities, we remain of the view that any material and consequential scheme dates relating to deliverability must be agreed ahead of the Final Determination so the most representative costs and benefits flow through our delivery plan. We stand ready to discuss this further, and believe that it is important that we work together between the

PR24 submission and the Final Determination, to try and get the best outcomes from these drivers and greater certainty on what is a very large programme of investment for AMP8 and AMP9.

Please note that there is a separate matter on aligning WINEP drivers for Eccles WwTW and our overflow programme. I will write to you separately on Eccles with our proposals, given the legal considerations regarding compulsory purchase needs at the location.

Many thanks for your ongoing support on this matter.

Kind regards,

Jo Harrison
Asset Management Director

Cc:
Richard Hatch, Andy Judd and EA PR24 Mailbox, Environment Agency
Tim Griffiths, Ofwat

Appendix 1

Complex schemes requiring adaptive plans and AMP9 completion

Davyhulme WwTW - Throughout 2023 we have flagged the imperative for, and benefit from, phasing Davyhulme WINEP drivers differently. This culminated in us, as directed by the EA, formally submitting phasing proposals to the national WINEP panel (in March 2023) and then, after positive feedback, we were instructed to submit alteration requests to formalise those proposals, which we did (along with adaptive plans). Both EA North West and UUW understand that the 6 mg/l currently in the WINEP does not meet strict WFD needs in any event due to the physical nature of the ship canal waterbody. Our proposal for Davyhulme is for a low/no regrets interim solution at Davyhume – this would involve a BOD permit limit of 8mg/l in AMP8. This would also be deliverable within the AMP8 time period whilst it would take significantly longer to deliver the current WINEP requirement of 6mg/l BOD, if we are to keep the route to biological phosphorus removal open for the site (0.25mg/l phosphorus required in AMP9). If we are required to achieve 6mg/l BOD in AMP8 this could only be achieved with high levels of chemical dosing and a new tertiary solids removal plant that would compromise the available space for future biological phosphorus removal plant.

Pennington Flash overflows - In June 2023, the EA concluded that additional overflows in the Pennington Flash drainage area required improvement to 10 spills per annum to address phosphorus loading in Pennington Flash and would include these in the AMP8 WINEP as there was no time to discuss an alternative at that stage. This was added to our WINEP by the EA within the 3rd July 2023 WINEP version. We have previously flagged that resolution of these to a 10 spills per annum standard is technically challenging and not deliverable within AMP8. Our proposal is to instead pursue a rainwater management approach in AMP8 before committing to significant grey infrastructure. We would, however also propose to retain in the plan the solutions to meet the local WFD issues in Hey Brook (Hindley PS and Templeton Road) as we believe these deliver significant benefit (25% reduction in phosphorus loading to Pennington Flash).

Wigan & Skelmersdale WwTWs - On 3rd July 2023 the EA issued a version of the WINEP to reflect the latest position and, whist this reflected many of the changes we were expecting, it also included in AMP8 a large drivers for Wigan and Skelmersdale WwTWs that had previously been in AMP9. Our proposal for this location is to deliver the AMP8 and AMP9 environmental requirements as a combined solution. The proposal joins flows from both treatment facilities through a transfer of Skelmersdale flows to Wigan WwTW and utilising a new biological phosphorous removal activated sludge plant. The approach has been assessed against alternative chemical dosing options and treatment at the respective works individually. Since the overflows at Pennington Flash are upstream of Wigan WwTW we have produced one adaptive plan (as per our phasing submission of 19th July 2023). Our proposed delivery date for the combined solution for Wigan & Skelmersdale and Pennington Flash overflows is 31st March 2035, but with the WFD improvements for Hey Brook and 25% reduction in load to Pennington Flash by 31st March 2030.

The drivers and our alternative proposal/dates are summarised below.

WINEP action ID	Scheme name	Primary driver	Scheme grouping	Proposed change to WINEP
08UU102339a	Davyhulme WwTW	WFD_IMPg	Davyhulme 6 BOD	Change requirement from 6 to 8mg/l BOD by 31st March 2030 (with 6mg/l in AMP9)
09UU100060a	WIGAN (HOSCAR) WwTW	EnvAct_IMP1	Wigan/ Skelmersdale	Change delivery date to 31st March 2035
09UU100060b	SKELMERSDALE WwTW	EnvAct_IMP1	Wigan/ Skelmersdale	Change delivery date to 31st March 2035
08UU101002a	Hindley PS SO WIG0255SO	EnvAct_IMP2	Pennington Flash	WFD improvements for Hey Brook and 25% reduction in load to Pennington Flash by 31st March 2030. Completion of all SODRP requirements (including improvements to Pennington Flash) by 31st March 2035
08UU101372a	Templeton Road PS WIG0095SO	EnvAct_IMP2	Pennington Flash	WFD improvements for Hey Brook and 25% reduction in load to Pennington Flash by 31st March 2030. Completion of all SODRP requirements (including improvements to Pennington Flash) by 31st March 2035
08UU102447a	Bickershaw Lane PS WIG0128	EnvAct_IMP4	Pennington Flash	Change delivery date to 31st March 2035
08UU102448a	Crankwood Road PS WIG0129	EnvAct_IMP4	Pennington Flash	Change delivery date to 31st March 2035
08UU102449a	Abram Hall PS WIG0130	EnvAct_IMP4	Pennington Flash	Change delivery date to 31st March 2035
08UU102451a	Abram Hall CSO WIG0216	EnvAct_IMP4	Pennington Flash	Change delivery date to 31st March 2035
08UU102450a	Strangeways CSO WIG0153	EnvAct_IMP4	Pennington Flash	Change delivery date to 31st March 2035

Appendix 2

EA / UUW interactions of phasing and deliverabilty

24th Jan 2023 – The UUW WINEP submission two covering letter flags concerns about deliverability and an option for an alternative at Davyhulme to reduce the scale of expenditure (this is the 8mg/l BOD proposal), improve the sustainability and future site flexibility.

9th Feb 2023 – UUW presented the proposed 8mg/l BOD AMP8 option for Davyhulme to the EA in the North West.

17th March 2023 – UUW wrote to the EA highlighting that we had 39 WINEP actions where at that time we believed it may be necessary to request regulatory date changes. This letter requested guidance on the process for agreeing such changes.

24th Mar 2023 – The EA confirmed they had identified the established route for our proposals for Davyhulme WwTW to be reviewed which was through a national WINEP assessment panel. Responses to EA queries were provided on 30th Mar 2023 to inform the panel.

29th Mar 2023 – EA advise that date changes should be managed through the "Data Handling and Changes Tracking after Options Development".

14th April 2023 – Following feedback from the national assessment panel UUW was advised to submit an alteration form for Davyhulme to request the 8mg/l BOD proposal is included in the WINEP.

5th May 2023 – EA write to companies asking them to set out which parts of the WINEP and WRMP they have concerns about and *'If so, which parts of the programmes would you choose to phase beyond AMP8 if you could and why'*. The letter also offered a chance of a meeting with the regulators that we took and where we presented our proposals.

16th May 2023 – UUW respond to the letter of 5th May. One of our proposals here is to deliver a solution at Davyhulme to meet 8mg/l BOD rather than 6mg/l BOD as this would be significantly lower cost, be more sustainable, deliver the majority of the intended benefit and keep open the option of us being able to use more sustainable treatment processes in the future for phosphorus removal. This is a proposal we first floated in our WINEP options submission in Jan 2023.

25th May 2023 – meeting with EA, Ofwat and Defra to discuss our proposals. There was positive feedback from the session about an informative and constructive dialogue was. There was subsequently no further decisions or actions from the regulators specific to our proposals.

3rd July 2023 – EA issue a revised WINEP to reflect the outcome of their review of water company's WINEP submissions made in January 2023. This reflected many changes we were expecting, but also included a major scheme for Wigan and Skelmersdale WwTWs which had not been previously specified by the EA. Following queries from UUW it transpired the EA in the North West were not aware of this change and it had been made by their national team. This version of the WINEP also included 5 additional overflows which impact Pennington Flash and changes to requirements for two existing ones.

5th July 2023 – EA write to water companies asking them to set out if their WINEP is deliverable, affordable and financeable and if not we were to propose options to phase investment. In the pre-meet with regulators it was made clear that if companies have concerns about deliverability, affordability and financeability they should be taking advantage of this opportunity.

19th July 2023 – UUW submit completed EA phasing spreadsheet with proposals for their review. This included Davyhulme, Wigan/Skelmersdale and Pennington Flash schemes as well as the boreholes, septic tanks and emergency overflow monitoring.

21st July 2023 – EA email to inform UUW that the WINEP change process is not live for AMP8 schemes until after the Final Determination. UUW had been verbally informed of this on 19th July so we included Davyhulme, Wigan/Skelmersdale and Pennington Flash in the phasing submission.

27th July 2023 – Further data provided by UUW to support the phasing submission (costs for phasing options for Davyhulme, Wigan/Skem and Pennington Flash were uploaded).

18th Aug 2023 – EA provide a short email setting out their position on emergency overflow monitoring and septic tanks (common to all companies) as well as pointing companies to their decisions on phasing which were on the EA SharePoint. The feedback was very high level, but rejected phasing for Davyhulme, Wigan/Skem and Pennington Flash within the spreadsheet.

Pennington Flash specific timeline

8th June 2023 - EA agree that a 250kg/yr phosphorus load reduction target is needed for Pennington Flash in AMP8. This equates to 10 spills per annum for 7 overflows in the Hindley area.

14th June 2023 – UUW email EA with proposal to phase solutions for the 7 overflows with a focus on rainwater management in AMP8 and completion of solutions in AMP9. This would allow us to maximise the opportunity for partnership with the Wigan Greenheart project.

3rd July 2023 – EA issue a revised WINEP to reflect the outcome of their review of water company's WINEP submissions made in Jan 2023. This version of the WINEP also included 5 additional overflows which impact Pennington Flash and changes to requirements for two existing ones.

5th July 2023 – EA write to water companies asking them to set out if their WINEP was deliverable, affordable and financeable and if not we were to propose options to phase investment. In the pre-meet with regulators it was made clear that if companies have concerns about deliverability, affordability and financeability they should be taking advantage of this opportunity.

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Appendix 3

AMP8 in-period regulatory dates changes

In March 2023 we wrote to you to highlight the 39 instances where, at that time, regulatory dates were in misalignment with forecast achievable programme dates and we were sign-posted to raise these through the WINEP change process. However, subsequently in July 2023 we were advised that this process was not live for AMP8 schemes until after the Final Determination.

Following receipt of the WINEP dated 3rd July 2023 and the subsequent finalisation of our totex programme for AMP8 we now have a final view of where we still have residual issues with achieving regulatory dates. The benefit of transitional spend and some further programme optimisation has reduced the instances where in-AMP programme dates extend beyond regulatory dates to 15.

The drivers and our alternative proposal/dates are summarised below. We will bring details of what drives the deliverable dates for these schemes to the discussion with EA North West.

WINEP Action ID	Scheme Name	Primary driver	Regulatory Date	UUW Proposed Delivery date
08UU102423	Lytham PS FYL0003SO - BW IMP	BW_IMP1	31/03/2026	19/03/2029
08UU102422	Lamaleach CSO FYL0002SO - BW IMP	BW_IMP1	31/03/2026	19/03/2029
08UU102420	Lancaster (Stodday) WwTW - BW IMP	BW_IMP1	31/03/2026	19/03/2029
08UU102421	Askam-in-Furness WwTW ST 017470136ST - BW IMP	BW_IMP1	31/03/2026	19/03/2029
08UU102419	Southport (Bank End) WwTW - EnvAct IMP3	BW_IMP1	31/03/2026	05/08/2029
08UU100878	Davyhulme WwTW - phosphorus	WFD_ND	31/03/2026	31/03/2030
08UU100971	No Det - Warrington South WwTW	WFD_ND	31/03/2026	05/03/2029
08UU100961	No Det - Crewe WwTW	WFD_ND	31/03/2026	13/11/2028
08UU100113	Dufton WwTW - Habitats	WFD_ND	31/03/2026	30/09/2026
08UU100935	Milburn WwTW WINEP Habitats	WFD_ND	31/03/2026	31/01/2027
08UU100936	Morland WwTW - WINEP Habitats	WFD_ND	31/03/2026	31/01/2027
08UU100932	Long Marton East WwTW	WFD_ND	31/03/2026	30/11/2026
08UU100926	Great Asby WwTW	WFD_ND	31/03/2026	30/11/2026
08UU100953	Partington -016940148ST	WFD_ND	31/03/2026	01/12/2028
08UU100882	Salford WwTW - BOD	WFD_IMPg	31/03/2030	15/09/2033[1]

Appendix C Schemes included within this enhancement case

Project	EA Unique ref	Completion date	Project driver	Determinandl	Capex (£m)	Opex (£m)	Totex (£m)
Ackers Crossing Green Gables WwTW Septic tank	08UU100029	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.917	0.055	0.971
Ackers Crossing Macclesfield Canal WwTW Septic tank	08UU100030	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.868	0.037	0.905
Aikton WwTW	08UU1009571	31/03/2026	WFD_ND	Biochemical Oxygen Demand, Suspended Solids	0.000	0.000	0.000
Ainsdale WwTW	08UU100293	31/03/2027	WFD_NDLS_CHEM1	PFOS	0.002	0.000	0.002
Ainsdale WwTW	08UU102436	31/03/2030	EnvAct_IMP1	Phosphorus	5.454	0.000	5.454
Alpraham WwTW	08UU100192	13/05/2030	U_IMP1	Biochemical Oxygen Demand, Suspended Solids, Ammonia, Phosphorous	4.952	0.000	4.952
Alsager WwTW (Chemicals monitoring)	08UU100172	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.036	0.000	0.036
Altrincham WwTW	08UU102354	31/03/2030	EnvAct_IMP1	Phosphorus	28.015	0.000	28.015
Altrincham WwTW	08UU102356,08UU102355	31/03/2027	WFD_NDLS_CHEM2	Nonyl-Phenol, Cypermethrin	0.044	0.000	0.044
Appleby WwTW	08UU100908	31/01/2027	HD_IMP_NN	Phosphorus	6.612	2.164	8.775

Project	EA Unique ref	Completion date	Project driver	Determinandl	Capex (£m)	Opex (£m)	Totex (£m)
Ashton Under Lyne WwTW	08UU102357	31/03/2030	WFD_ND	Phosphorus, Ammonia, Biochemical Oxygen Demand	23.841	0.000	23.841
Ashton Under Lyne WwTW	08UU102359,08UU102358	31/03/2027	WFD_NDLS_CHEM2	Nonyl-Phenol, Cypermethrin	0.044	0.000	0.044
Aspatria WwTW	08UU100891	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.036	0.000	0.036
Bampton WwTW Septic tank	08UU100034	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.885	0.040	0.925
Barnoldswick WwTW	N/A	31/03/2030	Conditional on designation	N/A	9.131	0.000	9.131
Barnoldswick WwTW (Chemicals monitoring)	08UU100174	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.036	0.000	0.036
Barton WwTW	08UU102347	31/03/2027	WFD_NDLS_CHEM1	Cypermethrin	0.036	0.000	0.036
Barton WwTW		31/03/2030	WFD_IMPg	Phosphorus	8.182	0.000	8.182
Bassenthwaite WwTW	08UU100909	10/04/2028	HD_IMP	Phosphorus	7.448	0.361	7.809
Bilsborrow WwTW Septic Tank	08UU100035	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.453	0.018	0.472
Binn Green 1 WwTW Septic Tank	08UU100083	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.293	0.019	0.312
Binn Green 2 WwTW Septic Tank	08UU100084	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.456	0.019	0.475

Project	EA Unique ref	Completion date	Project driver	Determinandl	Capex (£m)	Opex (£m)	Totex (£m)
Bolton (Penrith) WwTW	08UU100910	31/03/2030	HD_IMP	Phosphorus	1.795	0.000	1.795
Bolton WwTW	08UU100294	31/03/2027	WFD_NDLS_CHEM1	PFOS	0.002	0.000	0.002
Brampton (Carlisle) WwTW	08UU100911	31/01/2027	HD_IMP_NN	Phosphorus	13.640	1.997	15.637
Brampton EDEN WwTW	08UU100912	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	3.026	0.035	3.060
Branthwaite WwTW	08UU100913	31/03/2030	HD_IMP	Phosphorus	6.976	0.000	6.976
Bridekirk WwTW	08UU100865	20/08/2027	WFD_ND	Phosphorus	1.900	0.156	2.055
Burnley WwTW	08UU101390	13/05/2030	U_IMP2	Phosphorus	0.000	0.000	0.000
Burnley WwTW (Chemicals monitoring)	08UU102368	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.044	0.000	0.044
Bury WwTW	08UU100295	31/03/2027	WFD_NDLS_CHEM1	PFOS	0.002	0.000	0.002
Caldbeck WwTW	08UU100915	31/03/2030	HD_IMP	Phosphorus	6.460	0.000	6.460
Carlisle WwTW	08UU100266	30/04/2027	WFD_INV_CHEM	PFOS	0.051	0.000	0.051
Carlisle WwTW	08UU100916	31/01/2029	HD_IMP_NN	Phosphorus, Biochemical Oxygen Demand	17.738	1.459	19.196
Carlisle WwTW	08UU100305	31/03/2027	WFD_NDLS_CHEM1	PFOS	0.002	0.000	0.002
Cedar Lane WwTW Septic Tank	08UU100085	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.344	0.011	0.355

Project	EA Unique ref	Completion date	Project driver	Determinandl	Capex (£m)	Opex (£m)	Totex (£m)
Chapel en Le Frith WwTW (Chemicals monitoring)	08UU102401	31/03/2030	WFD_ND_CHEM4	Cypermethrin	0.036	0.000	0.036
Chapel Terrace WwTW Septic Tank	08UU100086	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.363	0.025	0.389
Chorley WwTW (Chemicals monitoring)	08UU100178	31/03/2027	WFD_NDLS_CHEM2	Nonyl-Phenol	0.034	0.000	0.034
Cleator WwTW	08UU100892	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.036	0.000	0.036
Clitheroe WwTW	08UU100885	19/09/2027	WFD_ND	Phosphorus	1.283	0.112	1.396
Clitheroe WwTW	08UU100893	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.036	0.000	0.036
Cockermouth WwTW	08UU100917	31/03/2030	HD_IMP	Phosphorus	7.847	0.000	7.847
Congleton WwTW (Chemicals monitoring)	08UU102370	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.044	0.000	0.044
Coniston WwTW	08UU101291	01/04/2028	EnvAct_IMP4	N/A	20.627	0.725	21.353
Crank Road WwTW Septic Tank	08UU100087	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.408	0.046	0.455
Crewe WwTW	08UU100961	13/11/2028	WFD_ND	Biochemical Oxygen Demand	27.241	2.885	30.126
Crewe WwTW (Chemicals monitoring)	08UU102372	31/03/2027	WFD_NDLS_CHEM1	Cypermethrin	0.044	0.000	0.044
Croston WwTW	08UU101389	13/05/2030	U_IMP2	Phosphorus	3.879	0.000	3.879

Project	EA Unique ref	Completion date	Project driver	Determinandl	Capex (£m)	Opex (£m)	Totex (£m)
Crowton WwTW	08UU100193	13/05/2030	U_IMP1	Biochemical Oxygen Demand, Suspended Solids	1.424	0.000	1.424
Cumwhinton WTW Septic Tank	08UU100088	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.501	0.035	0.535
Dacre WwTW	08UU100918	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	1.293	0.010	1.302
Dalston WwTW	08UU100919	10/10/2028	HD_IMP	Phosphorus	8.132	0.581	8.714
Davyhulme WwTW	08UU100878	31/03/2030	WFD_ND	Phosphorus	78.404	0.000	78.404
Davyhulme WwTW	08UU102388,08UU102387,08UU100302	31/03/2027	WFD_NDLS_CHEM2	Nonyl-Phenol, Cypermethrin, PFOS	0.044	0.000	0.044
Davyhulme WwTW	08UU100302	31/03/2027	WFD_NDLS_CHEM1	PFOS	0.002	0.000	0.002
Dub Wath WwTW	08UU100921	31/03/2030	HD_IMP	Phosphorus	2.453	0.000	2.453
Dufton WwTW	08UU100113	07/05/2028	HD_IMP	Phosphorus	3.592	0.248	3.840
Dukinfield WwTW	08UU102360	31/03/2030	WFD_ND	Phosphorus, Ammonia	13.419	0.000	13.419
Dukinfield WwTW	08UU102362,08UU102361	31/03/2027	WFD_NDLS_CHEM2	Nonyl-Phenol, Cypermethrin	0.044	0.000	0.044
Dukinfield WwTW	08UU102360	31/03/2030	WFD_ND	Phosphorus, Ammonia	37.702	0.000	37.702
Eaglesfield WwTW	08UU100923	31/03/2030	HD_IMP	Phosphorus	6.375	0.000	6.375
Eccles WwTW	08UU100880	09/10/2033	WFD_IMP	Ammonia, Biochemical Oxygen Demand	173.133	0.000	173.133

Project	EA Unique ref	Completion date	Project driver	Determinandl	Capex (£m)	Opex (£m)	Totex (£m)
Eccles WwTW	08UU102390,08UU102389	31/03/2027	WFD_NDLS_CHEM2	Nonyl-Phenol, Cypermethrin	0.044	0.000	0.044
Embleton WwTW	08UU100114	31/03/2030	HD_IMP	Phosphorus	5.173	0.000	5.173
Ennerdale Bridge WwTW Septic tank	08UU100045	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	1.352	0.036	1.388
Failsworth WwTW	08UU100303	31/03/2027	WFD_NDLS_CHEM1	PFOS	0.002	0.000	0.002
Failsworth WwTW (Chemicals monitoring)	08UU102374	31/03/2027	WFD_NDLS_CHEM1	Cypermethrin	0.036	0.000	0.036
Fazakerley WwTW	09UU100041	31/03/2030	EnvAct_IMP1	Phosphorus	3.405	0.000	3.405
Formby WwTW	09UU100042	31/03/2030	WFD_IMPm	Phosphorus	9.535	0.000	9.535
Foxhill WTW Septic Tank	08UU100089	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.538	0.034	0.572
Garstang WwTW	08UU102363	31/12/2038	EnvAct_IMP1	Phosphorus	20.133	0.000	20.133
Garstang WwTW	08UU102364	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.036	0.000	0.036
Glenridding WwTW	08UU100115	31/03/2030	HD_IMP	Phosphorus, Suspended Solids	4.462	0.000	4.462
Glossop WwTW (Chemicals monitoring)	08UU102376	31/03/2027	WFD_NDLS_CHEM1	Nonyl-Phenol	0.044	0.000	0.044
Grange-in-Borrowdale WwTW	08UU100924	31/03/2030	HD_IMP	Phosphorus	2.679	0.000	2.679
Grayrigg WwTW	08UU100925	31/03/2030	HD_IMP	Phosphorus	2.608	0.000	2.608

Project	EA Unique ref	Completion date	Project driver	Determinandl	Capex (£m)	Opex (£m)	Totex (£m)
Great Asby WwTW	08UU100926	10/01/2028	HD_IMP	Phosphorus	4.599	0.163	4.762
Great Broughton WwTW	08UU100927	31/03/2030	HD_IMP	Phosphorus	2.590	0.000	2.590
Hawkshead WwTW	08UU102346	21/03/2029	HD_IMP	Phosphorus	2.072	0.035	2.107
Hazel Grove WwTW	08UU102349	31/03/2030	EnvAct_IMP1	Phosphorus	24.224	0.000	24.224
Hazel Grove WwTW	08UU102351,08UU102350	31/03/2027	WFD_NDLS_CHEM2	Nonyl-Phenol, Cypermethrin	0.044	0.000	0.044
Hodder WTW Septic Tank	08UU100090	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.606	0.059	0.666
Holcroft Lane WwTW Septic Tank	08UU100091	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.382	0.038	0.419
Horwich WwTW (Chemicals monitoring)	08UU100181	31/03/2027	WFD_NDLS_CHEM2	Nonyl-Phenol	0.034	0.000	0.034
Houghton Green WwTW Septic Tank	08UU100092	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.518	0.029	0.547
Hurleston WTW Septic Tank	08UU100103	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.622	0.066	0.688
Hutton In The Forest WwTW Septic tank	08UU100054	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.485	0.029	0.514
Huyton WwTW	08UU100896	31/03/2027	WFD_NDLS_CHEM2	Nonyl-Phenol	0.034	0.009	0.043
Huyton WwTW	08UU100304	31/03/2027	WFD_NDLS_CHEM1	PFOS	0.002	0.000	0.002

Project	EA Unique ref	Completion date	Project driver	Determinandl	Capex (£m)	Opex (£m)	Totex (£m)
Hyde WwTW	08UU102391	31/03/2030	WFD_ND	Cypermethrin	31.731	0.000	31.731
Hyde WwTW	08UU102392,08UU102391	31/03/2027	WFD_NDLS_CHEM2	Nonyl-Phenol, Cypermethrin	0.044	0.000	0.044
Hyndburn WwTW	08UU100876	10/04/2028	WFD_ND	Ammonia	0.044	0.000	0.044
Irlam WwTW	08UU100296	31/03/2027	WFD_NDLS_CHEM1	PFOS	0.002	0.000	0.002
Kendal WwTW	08UU100297	31/03/2027	WFD_NDLS_CHEM1	PFOS	0.002	0.000	0.002
Keswick WwTW	08UU100928	31/03/2030	HD_IMP_NN	Phosphorus	7.158	0.000	7.158
Kings Meaburn WwTW	08UU100929	31/03/2028	HD_IMP	Phosphorus, Biochemical Oxygen Demand, Suspended Solids	2.837	0.099	2.936
Kirkby Stephen WwTW	08UU100930	31/03/2030	HD_IMP_NN	Phosphorus	8.919	0.000	8.919
Kirkby Thore WwTW	08UU100931	31/03/2030	HD_IMP	Phosphorus	3.316	0.000	3.316
Knock WwTW	08UU100057	31/03/2028	HD_IMP	Phosphorus, Biochemical Oxygen Demand, Suspended Solids	2.411	0.025	2.435
Knutsford WwTW (Chemicals monitoring)	08UU100899	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.036	0.000	0.036
Lane Bottom WwTW	08UU100965	31/03/2030	WFD_ND	Phosphorus	2.889	0.000	2.889

Project	EA Unique ref	Completion date	Project driver	Determinandl	Capex (£m)	Opex (£m)	Totex (£m)
Long Marton East WwTW	08UU100932	10/07/2028	HD_IMP	Ammonia, Phosphorus, Biochemical Oxygen Demand, Suspended Solids	5.520	0.120	5.641
Long Marton West WwTW	08UU100933	10/04/2028	HD_IMP	Ammonia, Phosphorus	4.503	0.300	4.803
Longton WwTW	08UU101388	13/05/2030	EnvAct_IMP1	Phosphorus	5.404	0.000	5.404
Lorton WwTW	08UU100934	31/03/2030	HD_IMP	Phosphorus	4.507	0.000	4.507
Low Marple WwTW	08UU100966	31/03/2030	WFD_ND	Phosphorus	12.008	0.000	12.008
Macclesfield WwTW	08UU100967	31/03/2030	WFD_ND	Ammonia	4.602	0.000	4.602
Middlewich WwTW (Chemicals monitoring)	08UU102379	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.044	0.000	0.044
Milburn WwTW	08UU100935	10/04/2028	HD_IMP	Phosphorus	7.445	0.120	7.565
Mill Brow WwTW Septic Tank	08UU100093	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.536	0.036	0.571
Morland WwTW	08UU100936	10/01/2028	HD_IMP	Phosphorus	6.551	0.373	6.924
Mossley WwTW (Chemicals monitoring)	08UU100184	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.036	0.000	0.036
Murton East WwTW	08UU100937	31/03/2030	HD_IMP	Phosphorus	4.133	0.000	4.133
Nantwich WwTW (Chemicals monitoring)	08UU100900	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.036	0.000	0.036

Project	EA Unique ref	Completion date	Project driver	Determinandl	Capex (£m)	Opex (£m)	Totex (£m)
Nether Kellet WwTW	08UU100863	20/08/2027	WFD_ND	Phosphorus	1.270	0.086	1.356
Nether Peover WwTW	08UU100873	10/01/2028	WFD_ND	Phosphorus	5.423	0.208	5.631
Newbiggin (Eden) WwTW Septic tank	08UU100063	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.896	0.041	0.937
Northwich WwTW	08UU100877	31/03/2027	WFD_NDLS_CHEM2	Nonyl-Phenol, Cypermethrin	0.044	0.000	0.044
Oldham WwTW	08UU100952	31/03/2030	EnvAct_IMP1	Phosphorus	14.497	0.000	14.497
Oldham WwTW	08UU100298	31/03/2027	WFD_NDLS_CHEM1	PFOS	0.002	0.000	0.002
Orton WwTW	08UU100874	10/01/2028	WFD_ND	Phosphorus	4.426	0.291	4.717
Outhgill WwTW	08UU100938	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.498	0.010	0.508
Over Kellet WwTW	08UU100864	20/08/2027	WFD_ND	Phosphorus	1.765	0.117	1.882
Paddy End WTW Septic Tank	08UU100094	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.485	0.020	0.506
Partington WwTW	08UU100953	01/12/2028	WFD_ND	Phosphorus, Biochemical Oxygen Demand, Ammonia	13.565	0.624	14.189
Pasture Lane WwTW Septic Tank	08UU100095	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.622	0.044	0.666

Project	EA Unique ref	Completion date	Project driver	Determinandl	Capex (£m)	Opex (£m)	Totex (£m)
Patterdale WwTW Septic tank	08UU100954	31/03/2028	U_IMP7	Phosphorus, Biochemical Oxygen Demand, Suspended Solids	0.630	0.021	0.651
Penrith WwTW	08UU100939	31/03/2030	HD_IMP_NN	Phosphorus	3.510	0.000	3.510
Pexhill WwTW Septic Tank	08UU100096	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.627	0.053	0.680
Pica WwTW	08UU102435	31/03/2030	WFD_IMPg	Ammonia	0.870	0.000	0.870
Poaka Beck WTW Septic Tank	08UU100097	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.324	0.025	0.349
Pooley Bridge East WwTW	08UU100940	10/04/2028	HD_IMP	Phosphorus	6.574	0.466	7.041
Portfield Bar WwTW Septic tank	08UU100070	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.747	0.036	0.783
Ravenstonedale WwTW	08UU100941	13/10/2028	HD_IMP	Phosphorus	11.664	0.494	12.158
Rossendale WwTW	08UU102365	31/03/2030	EnvAct_IMP1	Phosphorus	13.860	0.000	13.860
Rossendale WwTW	08UU102366	31/03/2027	WFD_NDLS_CHEM1	Cypermethrin	0.036	0.000	0.036
Rosthwaite WwTW	08UU100942	31/03/2030	HD_IMP	Phosphorus	4.849	0.000	4.849
Saddleworth Ww TW (Chemicals monitoring)	08UU102381	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.044	0.000	0.044

Project	EA Unique ref	Completion date	Project driver	Determinandl	Capex (£m)	Opex (£m)	Totex (£m)
Salford WwTW	08UU102398,08UU102398,08UU102397,08UU100299	31/03/2027	WFD_NDLS_CHEM2	Cadmium (Total),Nonyl-Phenol, Cypermethrin, PFOS	0.044	0.000	0.044
Salford WwTW	08UU100299	31/03/2027	WFD_NDLS_CHEM1	PFOS	0.002	0.000	0.002
Sandbach WwTW (Chemicals monitoring)	08UU100902	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.036	0.000	0.036
Settle WwTW	N/A	31/03/2030	Conditional on designation	N/A	4.502	0.000	4.502
Shap WwTW	08UU100126	31/03/2030	HD_IMP	Phosphorus	1.369	0.000	1.369
Skem WwTW	08UU102404	13/05/2030	U_IMP2	Phosphorus	5.025	0.000	5.025
Southview WwTW Septic Tank	08UU100098	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.496	0.021	0.517
Spouthouse Lane WwTW Septic Tank	08UU100099	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.496	0.018	0.514
St Helens WwTW	08UU100956	31/03/2030	EnvAct_IMP1	Phosphorus	8.961	0.000	8.961
Temple Sowerby WwTW	08UU100943	31/03/2030	HD_IMP	Phosphorus	3.277	0.000	3.277
Thornthwaite WwTW	08UU100944	31/03/2030	HD_IMP	Phosphorus	2.263	0.000	2.263
Threlked WwTW	08UU100945	31/03/2030	HD_IMP	Phosphorus	6.722	0.000	6.722
Threlkeld WwTW	08UU100945	31/03/2030	HD_IMP	Phosphorus	0.747	0.000	0.747
Torpenhow WwTW	08UU100870	20/08/2027	WFD_ND	Phosphorus	2.611	0.217	2.828

Project	EA Unique ref	Completion date	Project driver	Determinandl	Capex (£m)	Opex (£m)	Totex (£m)
Tyldesley WwTW	08UU100300	31/03/2027	WFD_NDLS_CHEM1	PFOS	0.002	0.000	0.002
Ulpha WwTW Septic Tank	08UU100100	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.485	0.022	0.507
Walton Bore Hole WwTW Septic Tank	08UU100101	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.485	0.029	0.514
Warburton Lane WwTW Septic Tank	08UU100102	31/03/2028	U_IMP7	Biochemical Oxygen Demand, Suspended Solids	0.664	0.052	0.716
Warcop WwTW	08UU100946	31/03/2030	HD_IMP	Phosphorus	6.216	0.000	6.216
Warrington South WwTW	08UU100971	05/03/2029	WFD_ND	Ammonia	13.230	0.281	13.512
Warwick Bridge WwTW	08UU100975	31/03/2030	HD_IMP_NN	Phosphorus	7.528	0.000	7.528
Westhoughton WwTW	08UU102425	09/11/2029	WFD_IMPg	Ammonia	6.630	0.000	6.630
Whaley Bridge WwTW (Chemicals monitoring)	08UU102383	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.044	0.000	0.044
Wigan WwTW	08UU100886	31/03/2027	WFD_NDLS_CHEM1	Cypermethrin	0.036	0.000	0.036
Wigan WwTW		31/03/2030	WFD_NDLS_CHEM1	Cypermethrin	0.077	0.000	0.077
Wigan WwTW	08UU101386	18/06/2030	U_IMP2	Phosphorus	21.742	0.000	21.742
Wigton WwTW	08UU102352	10/01/2028	WFD_ND	Ammonia	2.950	0.116	3.066
Wigton WwTW	08UU102353	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.036	0.013	0.048

Project	EA Unique ref	Completion date	Project driver	Determinandl	Capex (£m)	Opex (£m)	Totex (£m)
Winsford WwTW	08UU102426	09/11/2029	WFD_IMPg	Ammonia	5.538	0.000	5.538
Winsford WwTW (Chemicals monitoring)	08UU102385	31/03/2027	WFD_NDLS_CHEM2	Cypermethrin	0.044	0.000	0.044
Worsley WwTW	08UU100301	31/03/2027	WFD_NDLS_CHEM1	PFOS	0.002	0.000	0.002
Worsley WwTW (Chemicals monitoring)	08UU100171	31/03/2027	WFD_NDLS_CHEM2	Nonyl-Phenol	0.034	0.000	0.034

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Water for the North West

UUW63

WINEP Investigations and fish weir removal

October 2023

Enhancement Case 12

United Utilities

Water for the North West

Contents

Appendices

1. Enhancement submission

<table>
<tr><th colspan="2">Enhancement submission</th></tr>
<tr><td>Title:</td><td>Ww3 WINEP Investigations and fish weir removal</td></tr>
<tr><td>Price Control:</td><td>Ww Network +</td></tr>
<tr><td>Enhancement headline:</td><td>The investigations included in this programme area are all required under the Water Industry National Environment Programme (WINEP) in order to support the robust identification of future needs for investment in enhancement drivers and to inform PR29. As they are included as WINEP requirements they are over and above our base costs.

This programme of investigations is required in order to determine whether future investment is justified to meet the requirements of the following legislation:
• Water Framework (Water Framework Directive) Regulations 2017
• Habitats Regulations 2017
• Bathing Water Regulations 2013
• Marine and Coastal Access Act 2009
• Environment Act 2021
We have reviewed and influenced the requirements to ensure the investigations programme only includes investigations which are relevant to our duties as a water company and have a realistic possibility of leading to environmental improvements in future Asset Management Plans. Additionally we have checked they are appropriate in light of the Environment Agency’s PR24 guidance.

Fish weir removal is enhancement investment is driven by the Water Framework (Water Framework Directive) Regulations 2017 which is a statutory driver</td></tr>
<tr><td>Enhancement expenditure

(FY23 prices)</td><td>
<table>
<tr><th></th><th>AMP8 Capex inc TI (£m)</th><th>AMP8 Opex (£m)</th><th>AMP8 Totex (£m)</th></tr>
<tr><td>Pre RPE and Frontier Shift</td><td>67.03</td><td>0.00</td><td>67.03</td></tr>
<tr><td>Post RPE and Frontier Shift</td><td>65.89</td><td>0.00</td><td>65.89</td></tr>
</table>

The table above shows the total expenditure, inclusive of accelerated programme and transitional investment, on both a pre-efficiency (i.e. pre frontier shift and real price effects basis, consistent with the cost data tables), and a post efficiency and RPE basis (i.e. consistent with the value we propose to be recovered from price controls). All numbers referenced hereafter in this enhancement case are on a post efficiency and RPE basis.</td></tr>
<tr><td>This case aligns to :</td><td>Ww WINEP submissions Data tables CWW3, 9, 20.

For full reconciliation between enhancement costs and data table lines, see enhancement mapping tabs in UUW117 – Project allocations CW3 and CWW3.</td></tr>
<tr><td>PCD</td><td>No</td></tr>
</table>

2. Enhancement case summary

Gate	Summary	Location reference
Need for enhancement investment	The investigations included in this programme area are all required under the Water Industry National Environment Programme (WINEP) in order to support the robust identification of future needs for investment in enhancement drivers. As they are included as WINEP requirements they are over and above our base costs. This programme of investigations is required in order to determine whether future investment is justified to meet the requirements of the following legislation. • Water Framework (Water Framework Directive) Regulations 2017 • Habitats Regulations 2017 • Bathing Water Regulations 2013 • Marine and Coastal Access Act 2009 • Environment Act 2021 The removal of fish weirs is driven by the Water Framework (Water Framework Directive) Regulations 2017 which is a statutory driver.	*Section 3*
Best option for customers	Investigations ensure that investment in future AMPs is required, based on robust data and has the appropriate environmental benefit. In most cases the requirements of the investigations are quite prescriptive and therefore there is not a range of options that can be considered. The outcome of the investigations will however be the generation of a significant information which will inform options for wastewater environmental enhancement programmes in PR29 and beyond. The fish weir programme is the implementation of recommendations following the fish weir investigations in AMP7.	Section 4
Cost efficiency	The use of a risk and value (R&V) assessment across all our major projects supports challenge of our expenditure requirements, including enhancements by better challenging both needs and solutions. This ensures that when we decide projects are necessary, we only do what we need to do, that our decisions are based on strong evidence, and the value of both business and customers is clear. The process ensures that we keep challenging and validating both the need for our projects and the way we deliver them.	Section 5
Customer protection	Consequences of non-delivery include: • Reputational impact of a reducing Environmental Performance rating • Loss of trust with customers and stakeholders • Loss of trust with the Environment Agency leading to less support for innovative approaches to delivering environmental improvement • Lack of detailed information to feed into PR29 development	Section 6
Price Control Deliverable	As the value of the Ww WINEP investigations programme is less than 1% of the Ww Totex a PCD for these investigations is not required. This is in line with Ofwat guidance. As these schemes form part of the WINEP there will be Environment Agency oversight on the delivery of these schemes.	Section 6

3. Introduction

3.1.1 This document set out the enhancement case of £65.89m to allow UUW to meet the requirements of the WINEP wastewater investigations programme and the implementation of recommendations following the fish weir investigations in AMP7 as a result of drivers in the AMP8 WINEP.

3.1.2 It also covers why these requirements are outside of management control, our approach to the definition of these investigations and how ensure that the costs are robust. A total of 449 investigations and three fish weir projects are required in the AMP8 period. The investigations will inform development of the PR29 programme. This cost is not included in our base expenditure as it relates to new requirements that are not included in our existing Environmental Permits.

3.1.3 The development of the WINEP has been informed by the key regulatory guidance including; the WINEP methodology, WINEP options development guidance, WINEP options assessment guidance, WINEP driver and supporting guidance. Our approach reflects the specific context within which we operate in the North West of England.

3.1.4 The Environment Act, Water Framework and Bathing Waters Directives mainly drive the need for these investigations. The programme is vital in terms of ensuring a robust evidence base is developed to inform any future environmental improvement schemes so that they offer good value to customers.

Table 1: Overview of requirements, number of schemes and associated totex included in this enhancement case

Project	Number	Capex (£m)	Opex (£m)	Totex (£m)
Environment Act Storm overflows Investigations environmental impact	392	43.02	0	43.02
Chemicals investigations	35	5.91	0	5.91
Nitrogen Technically achievable limit	3	3.77	0	3.77
Bathing Waters Investigations	5	1.58	0	1.58
Shellfish Water Investigations	1	0.7	0	0.7
Marine Conservation Zone Investigations	6	0.31	0	0.31
Microplastics Investigations	2	0.66	0	0.66
WFD investigation	1	0.92	0	0.92
Habitats investigations	1	0.1	0	0.1
Fish weir removal	3	8.92	0	8.92
Total	**449**			**65.89**

4. Need for enhancement investment

4.1.1 **This section details the environmental driver and legislation which supports the need for investment and our approach to addressing these requirements.**

4.1.2 The WINEP investigations programme supports the robust identification of the need for future environmental improvement schemes such that we are playing our fair share in delivering environmental improvements and they are based on sound evidence. As a result this programme is required due to a diverse range of drivers including:

- Water Framework (Water Framework Directive) Regulations 2017
- Habitats Regulations 2017
- Bathing Water Regulations 2013
- Marine and Coastal Access Act 2009
- Environment Act 2021

4.1.3 Our base expenditure does not include for the need to investigate the potential impact of our activities on meeting future environmental drivers. As a result the Environment Agency have included a range of investigation requirements under the WINEP. We have reviewed and influenced the requirements to ensure the investigations programme only includes investigations which are relevant to our duties as a water company and have a realistic possibility of leading to environmental improvements in future Asset Management Plans. We have also put forward investigations were investment in AMP8 would be uncertain to ensure when we do invest it is in the best interests of the environment and the long term plan. Further detail on the activity undertaken can be found in Table 2 below.

4.1.4 This enhancement case also includes the implementation of fish pass improvements at wastewater network plus price control operated weirs at Ringley (Bolton WwTW), Stockport and Rochdale to implement the recommendations following the fish weir investigations in AMP7. These costs sit outside our base expenditure as they are new requirements which have been included in the WINEP.

Table 2: Action taken to ensure appropriate scope included in investigations WINEP build

Investigation	Actions taken to ensure scope is appropriate
Environment Act storm overflows investigations	In agreement with the EA we have scoped investigations to define the long term integrated adaptive plan for storm overflows within the Davyhulme, Mersey Estuary, River Irwell and Pennington Flash catchments. Further detail on the scoping of these investigations is available in section 4.2.
Chemical investigations programme 4 (CIP4)	We have actively participated in the Chemical Investigation Programme 3 which has influenced the scope of CIP4. The scope of the investigations in our plan is aligned with the outputs from these discussions.
Nitrogen technically achievable limit	We actively participated in the cross water industry and EA group to agree the scope and appropriate sites for the investigations to ensure a good cross section of sites and technologies are considered for this national trial
Bathing waters investigations	We took a risk based approach identifying the highest likelihood designation of inland bathing waters to include in our programme.
Shellfish water investigations	We have been in liaison with the EA over the scope of this investigation and have included additional detail at their request

Investigation	Actions taken to ensure scope is appropriate
Marine Conservation Zone Investigations	We worked with Natural England marine conservation specialist to scope the investigations required by this driver
Microplastics Investigations	We actively participated in the SSG microplastic sub-group who agreed the specific studies which form these investigations.

4.1.5 The Nitrogen technical feasibility trials at WwTW is part of a England and Wales study to understand how low we can go for total nitrogen with current and new innovative technology. Each water company has identified three sites to contribute to this investigation. In collaboration with the industry this will total 30 WwTW being trialled and give a robust view of what may be needed to achieve future water quality targets for total nitrogen. For UUW the sites put forward are Worsley WwTW, Formby WwTW and Morecambe WwTW.

4.1.6 The Chemicals Investigation programme (CIP4) is a continuation of the investigations which took place in AMP5, 6 and 7, building on various areas previously included in CIP such as antimicrobial resistance which is a global issue. It also includes further investigation of locally identified issues from CIP3 where more data gathering is required to ensure robust data is used to inform future requirements. Liverpool WwTW investigation for Bisphenol-A has been identified for this.

Table 3: Overview of the purpose of investigations included in this enhancement:

Investigation category	WINEP driver code	Purpose of investigation
Environment Act Storm overflows Investigations	EnvAct_INV4	Investigations to define the long term integrated adaptive plan for storm overflows within Davyhulme, the Mersey Estuary and the River Irwell catchments. Also an investigation into the catchments upstream of Hindley Pumping Station which impact on Pennington Flash. Investigations of specific named overflows as part of a continuation of the storm overflows assessment framework
Chemical Investigations Programme 4	WFD_INV_CHEM	Analysis of samples from various WwTW and catchments in the following areas: PFOS catchment investigations Chemicals in sludge Antimicrobial resistance Emerging substances Trend monitoring Local investigation for Bisphenol-A at Liverpool WwTW Integrated constructed wetlands TraC model for chemicals of the Mersey Estuary Groundwater Endocrine disrupters Biosolids applied to land field trials
Nitrogen Technically achievable limit	WFD_INV_N-TAL	To investigate how low total N can go using a various treatment methods at Morecambe, Formby and Worsley WwTW
Bathing Waters Investigations	BW_INV3 and BW_INV5	To investigate action to achieve statutory bathing water standards at 5 potential inland bathing waters Edisford Bridge, Coniston, Pennington Flash, Carrs Park and Daisy Nook Country Park

Investigation category	WINEP driver code	Purpose of investigation
Shellfish Water Investigations	SW_INV	Investigation into the UUW impact of discharges on shellfish beds in Morecambe Bay (Morecambe Bay East, Walney, Roosebeck and Morecambe Bay (Leven).
Marine Conservation Zone Investigations	MCZ_INV	Investigation into the UUW contribution to identified MCZ Ribble Estuary, Solway Firth, Wyre Lune and to monitor WwTW and overflows for aqueous contaminants in Cumbria coast MCZ, Ribble Estuary MCZ and Solway Firth MCZ
Microplastics Investigations	WFD_INV_MP	Further quantification of microplastics generated within the Ww Treatment process and to investigate Advanced thermal (ATC) technologies and their impact on microplastics
WFDR investigation	WFD_INV	Investigation into UUW contribution to water quality in terms of total nitrogen objectives at Worthington Lake.
Habitats investigations	HD_INV	Investigation into discharges from UUW WwTWs to Morecambe Bay and Lune Habitats

4.2 Environment Act storm overflow investigations

4.2.1 The requirement of the Environment Act is that all storm overflows discharge 10 times per year by 2050. The North West is a diverse region with some of the highest areas of combined sewers in England. Further detail of our plans for AMP8 investment on storm overflows is available in enhancement case Ww2. To optimise expenditure on storm overflow reduction to achieve the targets of the Environment Act we need to understand the most effective way making these spill reductions looking at the whole catchment including the receiving wastewater treatment works.

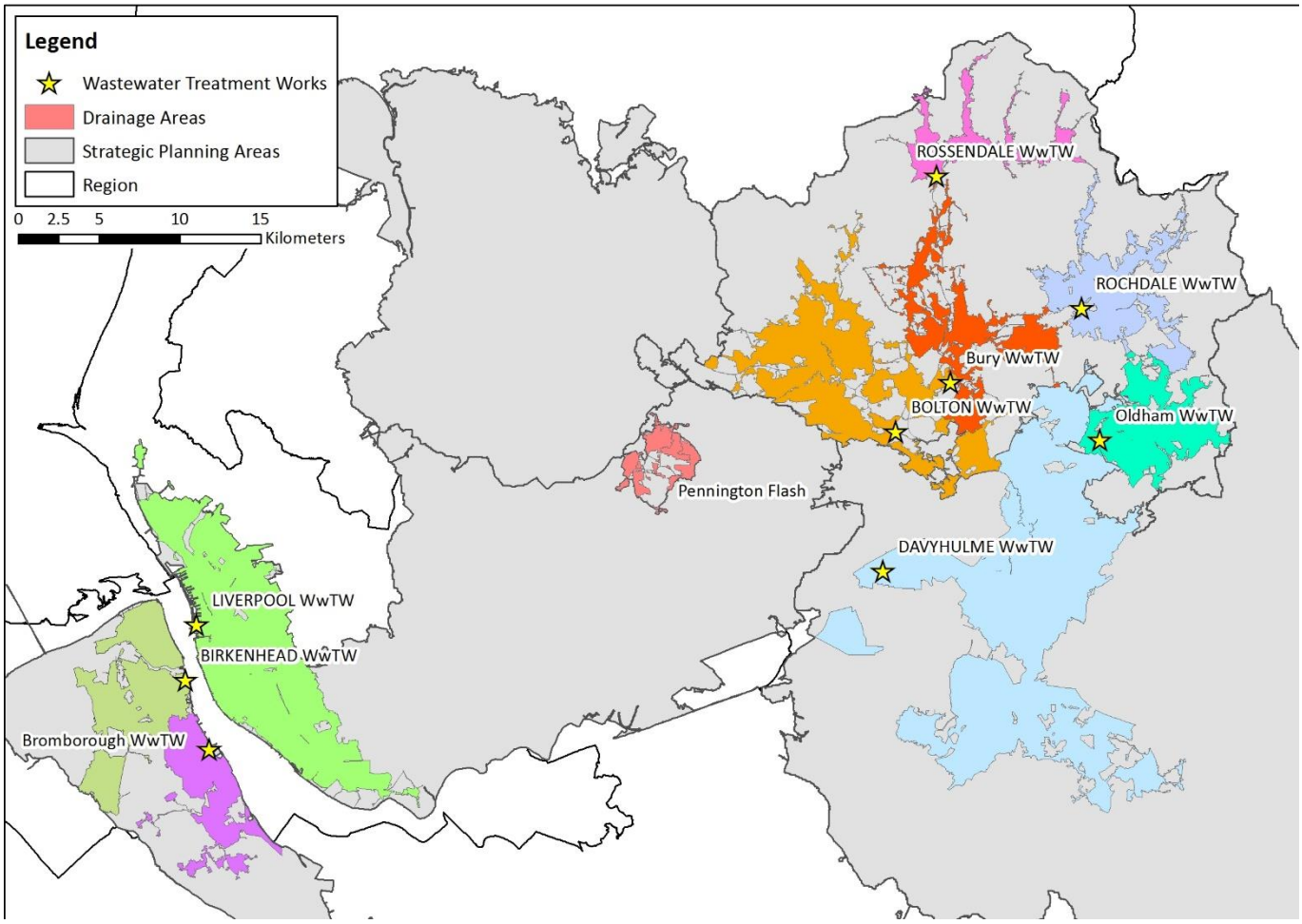
4.2.2 In agreement with the Environment Agency we have scoped investigations to define the long term integrated adaptive plan for storm overflows at for the Davyhulme, Mersey Estuary and the River Irwell catchments. We have also included an investigation for the Pennington Flash catchment to incorporate surface water removal with the spill reduction requirements in this catchment. The Pennington Flash investigation is an alternative to the current WINEP requirement to achieve 10 spills per annum in AMP8 for this catchment, further detail is included in section 0.

4.2.3 These investigations come under the EnvAct_INV4 driver and cover wide catchment investigation, which all follow some common philosophy plus unique challenges and investigation bespoke to each area. As these cover such wide catchments the expected investment to achieve robust outputs that the future price reviews can build on are likely to be beyond the average cost of this type of investigations. Our enhancement case for these investigations and detail of the areas they cover and third party support for them is detailed below.

Table 4 Detailed costs for the Environment Act storm overflow investigations

Investigation catchment	Number of investigations	Capex (£m)	Opex (£m)	Totex (£m)
Davyhulme	1	13.97	0.00	13.97
Mersey Estuary	3	11.30	0.00	11.30
River Irwell	6	7.60	0.00	7.60
Pennington Flash	1	0.41	0.00	0.41
Total	11	33.28	0.00	33.28

Figure 1: locations of the Environment Act storm overflow catchment investigations



4.2.4 The Environment Act target to achieve 10 spills per annum on average to all overflows by 2050 is a significant ask and presents a significant challenge, particularly in the North West with the scale of historic urban combined sewer systems, large number of storm overflows and being one of the wettest regions in England. This also presents a massive opportunity for us think and plan differently on how we are going to deliver the spill reductions in an adaptive, collaborative and affordable way by 2050.

4.2.5 The purpose of these investigations is to develop the catchment approach in AMP8 to move away from single output delivery/option to a catchment delivery strategy for AMP9 to AMP12. Areas that we will focus on will include:

- Integration – following the principle in the CIWEM Integrated Urban Drainage Modelling Guidance, we plan to develop integrated models (where required) to consider pluvial and fluvial stormwater impacts. This is going to particularly important as we try and manage the stormwater runoff differently.
- Maximise benefit – following the Integrated Water Management Planning philosophy, identify joint opportunities with multiple stakeholders around rainwater management.
- Infiltration reduction
- Surface Water Management – to look at the full range of storm water management opportunities; blue/green, SuDS, storm water separation, stormwater treatment, infiltration reduction, groundwater inundation.
- Historic nature of the wider network development may mean watercourses have been incorporated into the sewer system over time but there may be daylighting opportunities added significant amenity value benefits.
- An adaptive plan will be proposed for each catchment working with the local CaBA group and stakeholders.
- Viable land for improvements (sustainable drainage and natural flood management opportunities)

- Assess Biodiversity net gain, carbon and societal impacts

4.2.6 It will also include data collection; flow surveys (network, surface water and river), surveys for building integrated models and surface water connectivity surveys

4.2.7 These investigations also have 25YEP_INV as a secondary driver. We know from our DMWP that very substantial expenditure will be required by 2050 to meet the standards in the storm overflow discharge reduction plan (SODRP) and want to ensure that this is done in a way that not only meets these requirements but also delivers wider benefits against the 25 year plan goals which include the following;

- Clean and plentiful water
- Thriving plants and wildlife
- Reduced risk of harm from environmental hazards such as flooding and drought
- Mitigating and adapting to climate change

4.2.8 For UU the SODRP targets represent a very substantial change which is evidenced by Stantec's work on the Storm overflow evidence project showing that UU would account for 35% of the costs of meeting the SODRP targets. With the scale of expenditure required we have a once in a lifetime opportunity to better integrate water management to identify transformative projects. The investigations will support detailed integration with potential partner organisations to determine how we can combine meeting the SODRP targets with delivering on the 25 year plan goals. Identifying opportunities to better manage rainwater at source and prevent it reaching the combined sewer system will be a key focus on this work. Key to the success of this is ensuring that water has a home and there is join up between the relevant organisations with water management responsibilities.

4.2.9 We have a trilateral partnership between the Greater Manchester Combined Authority, the Environment Agency and UU which was established in September 2021 and aims to improve collaborative working relating to the water environment. At an event hosted by the Mayor of Greater Manchester on the 30th September 2022 it was agreed that an Integrated Water Management Plan (IWMP) for Greater Manchester would be developed. The IWMP will focus on all aspects of Greater Manchester water cycle and bring together various strategic plans into an overall framework and ambition for Greater Manchester. The plan will be a first step to ensuring sustainable water management is applied holistically across Greater Manchester to enhance water quality, manage flood risk and increase biodiversity which benefits people, place and prosperity. The proposed investigations will complement the work of the IWMP and identify opportunities to unlock its objectives. Andy Burnham in his letter of 31st May 2023 (Appendix 1) has confirmed his support for the long term planning 'One thing that we can agree on is that short-term solutions, tinkering at the edges or crossing our fingers and hoping for someone else to solve the problem won't solve the fundamental challenge of managing water differently'

4.2.10 Steve Rotherham, Major of Liverpool City Region is keen to have a similar partnership in place for the Liverpool City Region and thus the proposed investigations for the Mersey estuary will complement this. Support of this approach from Liverpool City Region is available in Section Appendix A Appendix 1. In his letter of support for this investigation he said: " We are therefore supportive of United Utilities' planned investigation which will help to reimagine how water can be managed in a city which has an extensive combined sewerage system as well as wider water management issues."

4.2.11 We are also forging links with the Wigan Greenheart Landscape Recovery Scheme which is an ambitious project to create, expand and improve habitats, this area includes Pennington Flash. Their aims are to:

- restore and manage a post-industrial landscape, supporting species recovery through increased connectivity and resilience, building on more than 25 years of landscape scale conservation;
- To reconnect people with their landscape through improved access, learning and volunteering opportunities;

- To deliver wider socio-economic benefits from the landscape.

4.2.12 This investigation of how to sustainably remove surface water from the Pennington Flash catchment to achieve the spill reduction, aligns with the aims of this group and our intention is to ensure the output of this investigation contribute and enhance investment made.

Mersey Estuary (Liverpool, Birkenhead and Bromborough)

4.2.13 The Mersey Estuary Pollution Alleviation Scheme (MEPAS) is a connected system completed in 1997 including work on the banks of the Mersey Estuary taking wastewater to the wastewater treatment works at Liverpool. Similar challenges occur and Bromborough and Birkenhead. As this is an integrated system it cannot be assessed in isolation.

4.2.14 The system passes through the centre of Liverpool and along the waterfront so any changes are going to be very disruptive. The MEPAS made improvements to the Mersey as planned in the 1990s but the ambition has now moved on, particularly with the Environment Act requirement that all overflow must meet 10 spills per annum by 2050.

4.2.15 The investigation will include the sewer systems and combined sewer overflows discharging from the networks connected to Bromborough, Birkenhead and Liverpool (Sandon Dock) WwTW and impact of the increased flows to the treatment works and capacity at site. We will undertake a detailed population growth review to identify growth at a more granular level and assist in understanding likely flow and load changes and how this could impact on potential plans. We will also upgrade our environmental models and integrate them with 3rd party models and plans e.g. flood risk management plan. This will enable us to identify any impact of storm overflows on wider environmental performance and categorise improvements.

4.2.16 We will also assess the flow and load received at the three treatment works and the potential for increasing their treatment capacity within the current constrained footprint and what alternative approaches there may be. The output of this investigation will be a detailed integrated masterplan for the Mersey which can be fed into the into the next (PR29) and future price reviews.

4.2.17 As part of the development of these studies we have liaised with the Liverpool City Combined Authority to seek support for this approach. They have responded positively and support our proposal for this investigation on informing the future.

Davyhulme catchment

4.2.18 The recognition of the large storage volume required for the Davyhulme catchment and associated lack of available suitable land on the WwTW requires careful consideration and may require solutions that are currently unprecedented such as storm treatment to a defined quality standard which is likely to be different to final effluent. Model upgrades for environmental models and integration with 3rd party models and plans e.g. water quality model. Identify impact of CSOs on wider environmental performance and categorise improvements.

4.2.19 Updates for the Manchester Ship Canal Water quality model including new water quality data. Assess hydraulic and process operational envelopes at Davyhulme WwTW and potential for increasing FtFT and how this would impact planned future WwTW upgrades such as "Bio P" type options as per the adaptive plan.

4.2.20 Undertake a review of storm treatment processes, assess suitability and trial potential technology to prove performance and suitability (if required) this could include options in network or at WwTW. Outputs to be passed through water quality models to understand impact – likely Iterative process. All of these output will then be integrated into the Manchester Ship Canal adaptive plan.

Irwell (Rossendale, Bury, Bolton, Rochdale, Oldham & Failsworth)

4.2.21 This investigation is to develop an adaptive plan on the Irwell River Basin developing a long term strategy for all 300+ overflows and recommendations on how we achieve our regulatory obligations by

2045. This will need to take into account co-creating of solutions. This investigation is significant in size and will need to take into account any triggers that could drive the approach, surface water opportunities, flooding, spills, maintenance and access issues, condition monitoring, what treatment do we need and where (including identification of viable land). The output will generate a 10-15 year programme for delivery starting in AMP9 and completing by 2045 and an integrated model of the region.

Pennington Flash

4.2.22 We have identified that the Hindley area of the Wigan WwTW drainage area has a particular hydraulic constraint which means that we cannot achieve the storm overflow discharge reduction plan targets through storing sewage or treating it locally. We must therefore either target significant surface water separation from the combined system or upsize the downstream infrastructure to manage higher flows. There is significant opportunity to work in partnership to manage rainwater differently in this area as greater water is needed in the local landscape to support landscape recovery as discussed in section 4.2.11. As a result of this our first step on our plan is a proposal to investigate how management of rainwater can be reimagined in this area. This will inform future decisions on infrastructure investment to address the multiple drivers of change in this area.

4.3 Fish weir removal

4.3.1 Three sites have been identified following the AMP7 fish weir investigations for implementation of weir removal in AMP8, actions to address barriers to passage of fish or impacted physical habitat in WFD failing waterbodies not designated artificial or heavily modified for water resources use. This is the implementation of recommendations following the fish weir investigations in AMP7 for schemes within the Ww Network + price control. These schemes all have site specific solutions based on these detailed investigations. Detail of solution and totex costs are included in Table 5. There are further fish weir removal schemes within the water price control (Water WINEP Enhancement case)

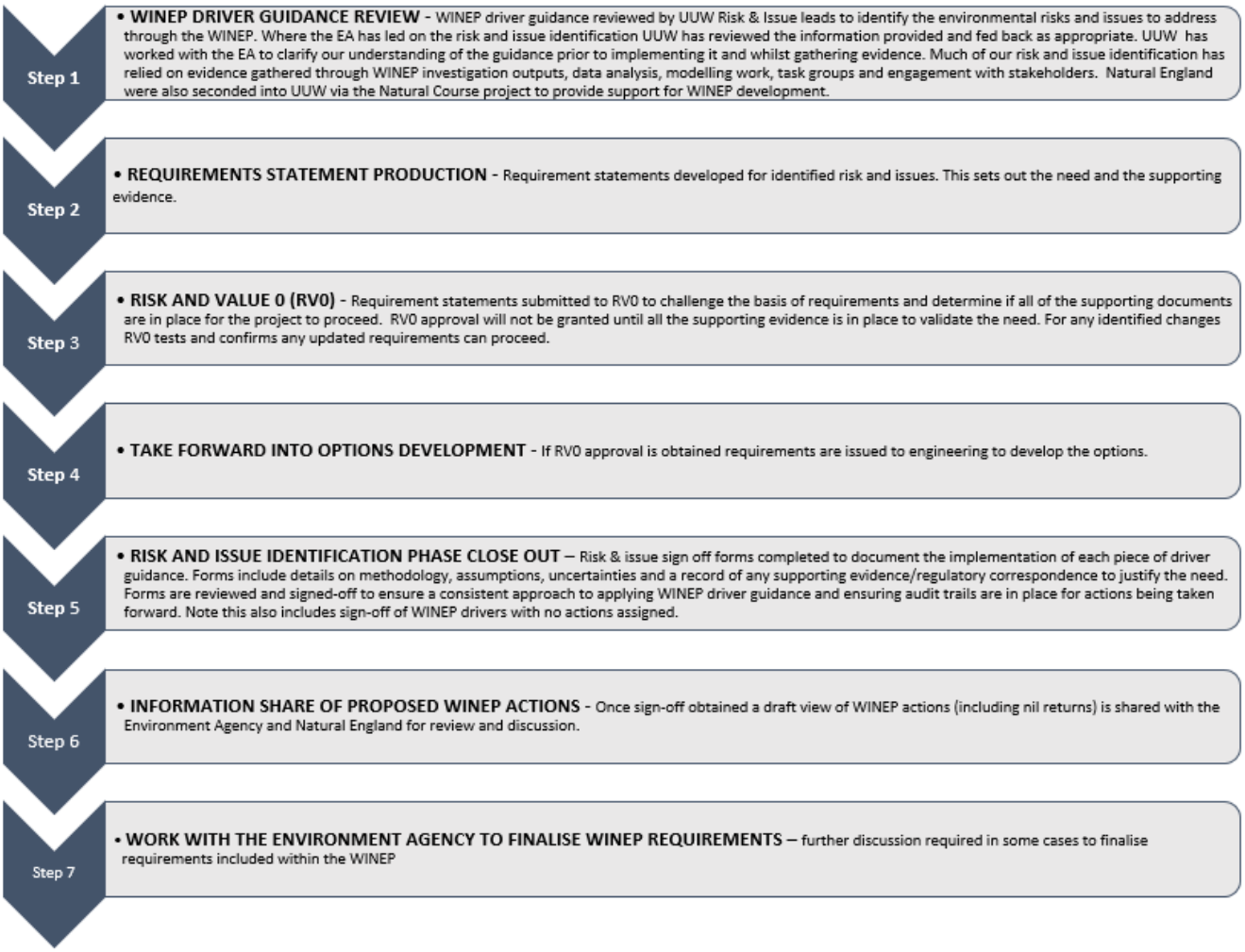
Table 5: Fish weir removal schemes

Location	Solution	Totex (£m)
Ringley Weir, River Irwell (near Bolton WwTW	Weir removal	3.65
Downstream of Stockport WwTW	Weir notching	0.58
Rochdale WwTW weir	Larinier bypass fish pass with a pumped eel bypass	4.68

4.4 Approach to risk and issues identification

4.4.1 The approach we have taken to identify WINEP actions is in line with Stage 2 of the Environment Agency's WINEP methodology. This involves collaboratively identifying environmental issues that need addressing and risks that require further monitoring/investigation through the WINEP. Our Risk and issue identification process follows a stage approached, shown in Figure 2, which has enabled us to identify where action is required to deliver compliance with our environmental obligations.

Figure 2: Risk and issue identification process stages



4.4.2 This collaborative process has ensured that we are prioritising and investing in areas which have a well evidenced need, and that we are meeting those needs in the most efficient way. Investigations ensure that any interventions are based on good evidence and these have been proposed where evidence for investment in AMP8 is not clear. Investigations will give the clarity required to make robust decisions at PR29.

4.5 Customer support

4.5.1 Customer research indicates protecting the environment is a key priority. Research for the Drainage and Wastewater Management Plan and Water Resources Management Plan carried out in April 2021 showed that 21% of those customers surveyed ranked removal of wastewater in the top 3 greatest long term challenges. It was also noted that aspects such as maintaining the network and wastewater treatment are often fairly easy for people to envisage, but happen in the background. When asked what people themselves feel is important; 'the impact on the environment is a constant concern' and customers 'love living in an area with lots of countryside and green space (perhaps heightened by Covid) and want this to be preserved'. We consider this to be evidence that customers support UUW's continued compliance with its environmental obligations.

4.5.2 United Utilities Water (UUW) hold a library of customer insights for projects we have delivered within AMP 7 (currently in progress from 2020 – 25). Each insight and research project has used an appropriate method to capture a variety of customer and stakeholder opinions, ensuring a representative view of the diverse customer base across the North West. This insight has been incorporated in to the options

development and selection process undertaken. Further information can be found in the UUW's WINEP approach to WINEP development and our insight and research library[1].

4.1 Management Control

4.1.1 Investigations will inform development of PR29 and are included in the WINEP, this is therefore outside of management control. Base expenditure maintains compliance with current permits, the output of investigations will build our understanding of any environmental impact of new or emerging issues from UUW assets and inform future enhancement expenditure requirements.

[1] 2023 (UUW) Customer insight and research library. Available here: https://www.unitedutilities.com/insight-and-research-library

5. Best option for customers

5.1 Option development

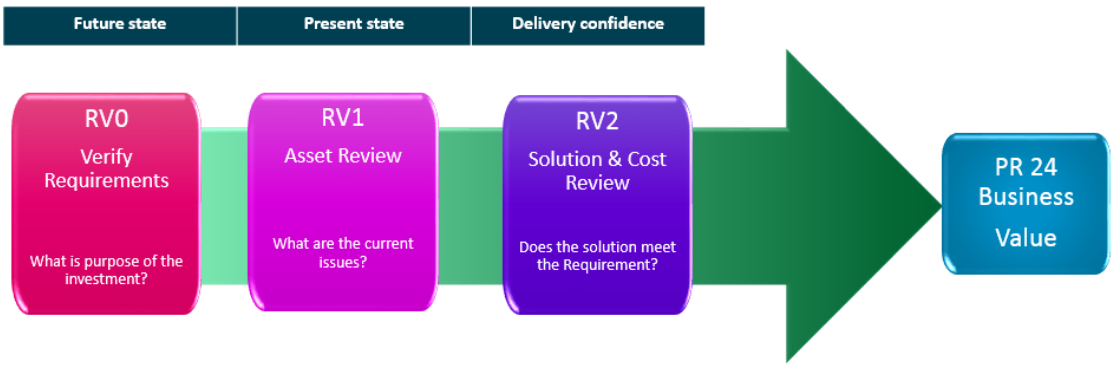
5.1.1 In most cases the requirements of the investigations are quite prescriptive and therefore there are not a range of options that can be considered. The outcome of the investigations will however be the generation of significant information which will inform our wastewater environmental enhancement programmes in PR29 and beyond. A robust understanding of the role our discharges play in the wider ecosystem is important in terms of confirming the need for intervention and also to allow an integrated catchment approach to find the most cost beneficial solution to enhance natural capital. For example, the investigation into the Liverpool, Bromborough and Birkenhead WwTW drainage areas which discharge into the Mersey Estuary and the subsequent options appraisal will allow us to determine the most sustainable management approach to achieve the longer term 10 spills requirements as well as to protect and enhance the long term water quality (0).

5.1 Approach to risk and issue identification

5.1.1 The approach we have taken to identify WINEP actions is in line with Stage 2 of the Environment Agency's WINEP methodology. This involves collaboratively identifying environmental issues that need addressing and risks that require further monitoring/investigation through the WINEP. Our Risk and issue identification process follows a stage approached, shown in Figure 2, which has enabled us to identify where action is required to deliver compliance with our environmental obligations.

5.1.2 PR24 options development followed the fundamental principles of UUW defined value management process. Risk and Value for PR24 (RV) was a three stage process (shown in Figure 3), aimed at positively challenging our projects to ensure we have sufficient evidence behind decisions. It provides us with confidence that we are proposing the right projects for the AMP8 Programme and therefore managing and maximising the value for their customers from their investments. It also ensures that the organisation adopts the correct approach to option identification, development and selection maximise realisation of benefits associated with their investments.

Figure 3: Risk and Value for PR24



5.1.3 The use of a risk and value (R&V) assessment across all our major projects has supports challenge of our expenditure requirements, including enhancements by better challenging both needs and solutions. This ensures that when we decide projects are necessary, we only do what we need to do, that our decisions are based on strong evidence, and the value of both business and customers is clear. The process ensures that we keep challenging and validating both the need for our projects and the way we deliver them. As the investigations programme has single option for scoping the required solution the RV process was shortened however the programme has been reviewed through this process to ensure that the costs identified satisfy the requirements of the drivers.

6. Cost efficiency

6.1.1 This section details how our capabilities for modelling and our approach to costing investigations is cost efficient, how we have challenged our assumptions to develop efficient costs and how these have been assured.

6.2 Modelling capability

6.2.1 We have developed bottom up costs for our investigations programme based on the scope of work available to us. One area where we are able to enhance the efficiency of delivery and the value of the benefits is through the use of our significant modelling capability which we will update and use to support several of the investigations rather than start from nothing. The investigations that will benefit from this include:

- **Bathing water investigations** – we have river water quality and sewer models for the areas of potential future designation so we will focus on exploring uncertainties within models and updating baseline performance where we have carried out significant improvements. This will enable us to develop a strong evidence base to determine the impact of our assets on the potential newly designated bathing waters.
- **Shellfish waters investigations** - we have full coastal models for the whole North West coast so we will focus on exploring uncertainties within models and updating baseline performance where we have carried out significant improvements. This will enable us to develop a strong evidence base to determine if there are cost beneficial interventions we could carry out in future AMPs
- **CIP4 TraC model** – we have the coastal model of the Mersey Estuary which can be updated and calibrated for the requirements of the CIP4 modelling supporting our understanding of the impact of coastal discharges.
- **Environment Act Investigations** – Davyhulme, Mersey Estuary and River Irwell integrated catchment investigations – We have integrated catchment models for the areas so we will focus on exploring uncertainties within the models and updating baseline performance. Using this strong evidence base we will be able to identify and carry out options appraisal on potential options to feed into future price reviews.

6.3 Options costs

6.3.1 Our cost estimates for the investigation programme are based on the investigations we completed in AMP7. These costs have subsequently been uplifted to the appropriate price base for PR24. Our approach to the costing of the investigations programme is therefore based on costs assumed at PR19 and allowed sufficient cost to deliver the programme. Assumptions for each investigation have been logged including:

- Hours for project management
- Functional engineering support
- Costs to be paid to consultants (e.g. coastal modelling)
- Contractors for sampling if required
- Costs to UKWIR etc which were agreed through industry steering groups (eg CIP4).

6.3.2 For investigations which are new drivers in PR24, assumptions have been made (e.g. total N technically achievable limit) based on assessments of sites put forward for trials. Agreements on a ceiling price for elements of the Chemical Investigations Programme have also been agreed across the industry and with the EA and NRW where a collaborative investigation for an England and Wales view on emerging issues is required.

6.1 Third party assurance

6.1.1 Faithful and Gould undertook a bottom-up deep dive into the cost efficiency of our enhancement cases. This involved a close examination of our cost base relating to a sample of our plan, with comparisons made to similar activity carried out by third party companies across a variety of sectors.

6.1.2 F&G looked at our direct costs across each of the following categories:

(a) Staff including site supervision

(b) Mobilisation and site set up, running and removal of site offices and welfare

(c) Temporary services for general site use, such as water to wash out concrete skips

(d) Attendant plant and equipment, such as cranes, forklift for unloading deliveries etc

(e) Attendant labour, defined as hourly paid operatives not involved in productive works

(f) Site consumables, such as waste skips

(g) Set-up site compounds, erecting hoardings etc

(h) O&M manuals

(i) Health and safety

6.1.3 It also looked at the contractor's indirect costs (e.g. overhead and design costs) and UUW's indirect costs (e.g. land acquisition costs). Due to the size of the programme, F&G examined a sample of our enhancement cases. However, this sample included projects from each of our enhancement categories and covered £1.246bn of expenditure.

6.1.4 F&G noted the effectiveness of UUW's cost estimation process:

"In addition to the benchmarking data held by Faithful+Gould we understand that UUW has applied multiple internal and external challenges to progressively refine the cost estimation undertaken to date. In particular we note UUW's use of its Investment Programme Estimating System (IPES) which is a bespoke parametric estimating tool containing data from AMP3 to AMP7, to provide historical cost curves alongside estimated data from third party organisations."

6.1.5 F&G found that our proposed costs are in line with rates typically seen across the industry:

"Overall, UUW's approach of utilising historic cost curves, market testing and obtaining specialist third party quotations demonstrates a sound proactive approach to cost planning. In total £1.2bn of schemes underwent targeted cost assessment with £573m making up the construction works element.

After presenting our initial findings it was encouraging to see UUW's commitment to addressing our findings and applying these to the wider enhancement estimates, charting a strategic route towards greater efficiency and scope clarification.

In light of this Cost Assurance work and evidence of UUW's responsive actions we have concluded that the data we have benchmarked is within a reasonable alignment with anticipated market rates."

7. Customer protection

7.1 Introduction

7.1.1 It is important that customers have confidence that we will deliver the enhancement schemes that get reflected in our PR24 final determinations and they are suitably protected in the event of non-delivery, or if there are material changes to deliverables (including changes to dates), which leads to a change in cost (including changes in the timing of required expenditure). Ofwat proposes that, if companies fail to deliver or are late delivering improvements to customers, then price control deliverables (PCDs) should, where appropriate, be used to compensate customers. In our PR24 *Chapter 8 – Delivering at Efficient Cost, section 8.8.9* we have proposed an approach to PCDs that aims to provide customer protection, such that customers are fairly compensated for non-delivery (such as due to a change in regulatory requirements) or late delivery (including as a result of a change to a regulatory date), between PCDs, any related ODI underperformance payments, and cost sharing arrangements.

7.2 Price Control Deliverable

7.2.1 We have not included a PCD for this area as each individual driver is small in size, and below Ofwat's indicated threshold.

Appendix A Support for our plan

ANDY BURNHAM
MAYOR OF GREATER MANCHESTER

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

31 May 2023 Ref: DH/GD

Dear Louise,

United Utilities Advanced Water Industry National Environment Programme (WINEP) proposal: Rainwater Management Programme

I am writing to offer my support for the United Utilities Advanced WINEP proposal for a Rainwater Management Programme in Greater Manchester that will deliver £250m of investment.

The Combined Authority has worked in partnership with United Utilities over many years including pilot projects such as IGNITION and Natural Course.

I chaired two round tables involving stakeholders (30 September 2022 and 31 March 2023) where the scale of the challenge of managing too much water (floods), too little water (droughts) and too dirty water (pollution) was presented and discussed.

Whatever the merits or demerits of past decisions by different parts of the system, one thing that we can agree on is that short-term solutions, tinkering at the edges or crossing our fingers and hoping for someone else to solve the problem (or for the problem to go away) won't solve the fundamental challenge of managing water differently.

At the latest roundtable we agreed that the GMCA, UU and EA should jointly produce an Integrated Water Management Plan (IWMP) to draw together a collective vision, objectives, and actions, and identify accountability and resources for delivery.

GMCA, Broadhurst House, 56 Oxford Street, Manchester, M1 6EU

BOLTON	MANCHESTER	ROCHDALE	STOCKPORT	TRAFFORD
BURY	OLDHAM	SALFORD	TAMESIDE	WIGAN

Our strategy for Greater Manchester sets out a route, over the next decade, to deliver this vision for the benefit of our people, our places and our planet.

Working collectively across our city region, with our communities, we will be focusing on improved wellbeing for the 2.8m people here, with better homes, jobs, skills and transport.

These ambitions align with the Integrated Water Management Plan which includes a range of activities to support the enhancement of the natural environment, reduce flood risk, improve the water quality of Greater Manchester, and develop the skills and jobs to deliver change.

I believe that the Advanced WINEP proposal developed by United Utilities will contribute to these ambitions and we are happy to work in partnership with you to support the following outcomes:

- Accelerate the implementation of sustainable drainage interventions in locations identified through the Integrated Water Management Plan and in doing so reducing carbon emission, increasing climate resilience whilst providing benefits to nature, society and pride in pour places
- Reduce the operation of storm overflows by attenuating or disconnecting rainwater in urban areas and preventing it from entering the combined system, reducing pollution, benefitting local waterways in Greater Manchester.
- Creating new jobs, developing skills and apprenticeship roles that benefit residents in Greater Manchester
- Integration and embedding the programme within the identified strategic growth locations to leverage multiple benefits.

We recognise the value of United Utilities' proposal to translate issues and opportunities into projects that deliver tangible benefits for the environment, people and place.

We look forward to being able to work with United Utilities to deliver this exciting multi-beneficial programme.

Andy Burnham
Mayor of Greater Manchester

Appendix B Schemes included within this enhancement case

Action ID	Description	Driver	WINEP Date	Capex	Opex	Totex
08UU100288a	Habitats investigations Morcambe Bay and Lune	HD_INV	30/04/2027	0.1	0	0.1
08UU100292a	Morcambe Bay -Shellfish waters improvement investigation	SW_INV	30/04/2027	0.7	0	0.7
08UU100266a	CIP4 PFOS Ainsdale WwTW	WFD_INV_CHEM	30/04/2027	0.05	0	0.05
08UU100266b	CIP4 PFOS Bolton WwTW	WFD_INV_CHEM	30/04/2027	0.05	0	0.05
08UU100266c	CIP4 PFOS Bury STW	WFD_INV_CHEM	30/04/2027	0.05	0	0.05
08UU100266d	CIP4 PFOS Davyhulme WwTW	WFD_INV_CHEM	30/04/2027	0.05	0	0.05
08UU100266e	CIP4 PFOS Failsworth WwTW	WFD_INV_CHEM	30/04/2027	0.05	0	0.05
08UU100266f	CIP4 PFOS Huyton WwTW	WFD_INV_CHEM	30/04/2027	0.05	0	0.05
08UU100266g	CIP4 PFOS Irlam WwTW	WFD_INV_CHEM	30/04/2027	0.05	0	0.05
08UU100266h	CIP4 PFOS Kendal WwTW	WFD_INV_CHEM	30/04/2027	0.05	0	0.05
08UU100266i	CIP4 PFOS Oldham WwTW	WFD_INV_CHEM	30/04/2027	0.05	0	0.05
08UU100266j	CIP4 PFOS Salford WwTW	WFD_INV_CHEM	30/04/2027	0.05	0	0.05
08UU100266k	CIP4 PFOS Tyldesley WwTW	WFD_INV_CHEM	30/04/2027	0.05	0	0.05
08UU100266l	CIP4 PFOS Worsley STW (CIP2 T2)	WFD_INV_CHEM	30/04/2027	0.05	0	0.05
08UU100267a	CIP4 Sludge Stockport WwTW	WFD_INV_CHEM	30/04/2027	0.14	0	0.14
08UU100268a	CIP4 Antimicrobial Resistance Stockport WwTW	WFD_INV_CHEM	30/04/2027	0.33	0	0.33
08UU102342a	CIP4 Emerging Substances PEWS	WFD_INV_CHEM	30/04/2027	0.27	0	0.27
08UU100270a	CIP4 Emerging Substances Trend Monitoring Crewe	WFD_INV_CHEM	31/03/2030	0.06	0	0.06
08UU100270b	CIP4 Emerging Substances Trend Monitoring Eccles	WFD_INV_CHEM	31/03/2030	0.06	0	0.06
08UU100270c	CIP4 Emerging Substances Trend Monitoring Morecambe	WFD_INV_CHEM	31/03/2030	0.06	0	0.06
08UU100270d	CIP4 Emerging Substances Trend Monitoring Rochdale	WFD_INV_CHEM	31/03/2030	0.06	0	0.06
08UU100270e	CIP4 Emerging Substances Trend Monitoring Widnes	WFD_INV_CHEM	31/03/2030	0.06	0	0.06
08UU100271a	CIP4 Local Investigations bisphenol- Liverpool WwTW	WFD_INV_CHEM	30/04/2027	0.02	0	0.02
08UU100272a	CIP4 TraC model of the Mersey Estuary	WFD_INV_CHEM	30/04/2027	1.86	0	1.86
08UU100273a	CIP4 Integrated Constructed Wetlands	WFD_INV_CHEM	30/04/2027	0.36	0	0.36

Action ID	Description	Driver	WINEP Date	Capex	Opex	Totex
08UU100278a	Biosolids application and groundwater impacts	WFD_INV_CHEM	30/04/2027	0.36	0	0.36
08UU100311a,08UU100312a,08UU100313a,08UU100314a	Investigations to assess treatment options for nitrogen.	WFD_INV_N-TAL	30/04/2027	0.04	0	0.04
08UU100312a	Formby WwTW Phytoplankton	WFD_INV_N-TAL	30/04/2027	2.18	0	2.18
08UU100313a	Morecambe WwTW NTAL optimisation	WFD_INV_N-TAL	30/04/2027	0.86	0	0.86
08UU100274a	CIP4 Groundwater	WFD_INV_CHEM	30/04/2027	0.19	0	0.19
08UU100269a	CIP4 Emerging Substances PFAS	WFD_INV_CHEM	30/04/2027	0.29	0	0.29
08UU100275a	CIP4 Emerging Substances Endocrine Disruptors	WFD_INV_CHEM	30/04/2027	0.1	0	0.1
08UU100270d	CIP4 Emerging Substances Concern Rochdale	WFD_INV_CHEM	30/04/2027	0.06	0	0.06
08UU100269b	CIP4 Emerging Substances Non Targeted Screening Rochdale	WFD_INV_CHEM	30/04/2027	0.04	0	0.04
08UU100276a	CIP4 Local investigations PFOS Sludge	WFD_INV_CHEM	30/04/2027	0.07	0	0.07
08UU100277a	CIP4 Investigations Ancillary Costs	WFD_INV_CHEM	30/04/2027	0.75	0	0.75
08UU100143a	Ww Fish Pass - Rochdale Weir	WFD_IMP_PHYSHAB	31/03/2030	4.68	0	4.68
08UU100144a	Ww Fish Pass - Stockport Weir	WFD_IMP_PHYSHAB	31/03/2030	0.58	0	0.58
08UU100142a	Ww Fish Pass - Ringley Weir	WFD_IMP_PHYSHAB	31/03/2030	3.65	0	3.65
08UU100884a	Davyhulme - Storm Overflow Inv	EnvAct_INV4	30/04/2027	13.97	0	13.97
08UU100974a	MCZ Aqueous Contaminants Solway Firth Estuary	MCZ_INV	30/04/2027	0.03	0	0.03
08UU100972a	MCZ Aqueous Contaminants Cumbria Coast	MCZ_INV	30/04/2027	0.07	0	0.07
08UU100904a	Mersey Estuary Integrated Water Management Investigation	EnvAct_INV4	30/04/2027	11.3	0	11.3
08UU100266m	CIP4 PFOS Carlisle	WFD_INV_CHEM	30/04/2027	0.05	0	0.05
08UU100903a	Irwell River Basin Integrated Water Management Investigation	EnvAct_INV4	30/04/2027	7.59	0	7.59
08UU100973a	MCZ Aqueous Contaminants Ribble Estuary	MCZ_INV	30/04/2027	0.19	0	0.19
08UU102345a	Worthington Reservoir Investigations	WFD_INV	30/04/2027	0.92	0	0.92
08UU102414e	EnvACT_INV4 Investigations to inform EnvAct_IMP2 actions	EnvAct_INV4	30/04/2027	9.74	0	9.74

Action ID	Description	Driver	WINEP Date	Capex	Opex	Totex
08UU100285a	Pennington Flash Investigation	EnvAct_INV4	30/04/2027	0.41	0	0.41
08UU100283a	Bathing Water Edisford Bridge Investigations	BW_INV5	30/04/2027	1.32	0	1.32
08UU100284a	Bathing Water Coniston Investigations	BW_INV5	30/04/2027	0.26	0	0.26
08UU100278a	Field sampling trials (joint with CIP4) - biosolids application and groundwater impacts	WFD_INV_CHEM	30/04/2027	0.11	0	0.11
08UU100309b	Further quantification of microplastics generated within the treatment process	WFD_INV_MP	30/04/2027	0.11	0	0.11
08UU100309c	Investigation into Advanced Thermal Conversion (ATC) technologies	WFD_INV_MP	30/04/2027	0.55	0	0.55
08UU100289a	Marine Conservation Zones Investigation (3 sites)	MCZ_INV	30/04/2027	0.02	0	0.02
08UU100314a	N-TAL investigation - MOB Trial Worsley (WwTW)	WFD_INV_N-TAL	30/04/2027	0.7	0	0.7
					Total	**65.89**

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