

# SRN-DDR-033: Raw Water Deterioration Enhancement Cost Evidence Case

28<sup>th</sup> August 2024

Version 1.0



from  
**Southern  
Water** 

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# 1. Introduction

## 1.1 What is this document about?

This document follows on from our Raw Water Deterioration Enhancement Business Case (**SRN30**) and is in response to Ofwat's Draft Determination challenges received in July 2024 for our Nitrate and UV disinfection schemes, and our climate change adaptation and emerging contaminants studies. This document addresses Ofwat's allowance of (**£85.3m**) vs the amount we are requesting (**£95.2m**).

This discrepancy stems primarily from concerns regarding the cost efficiency of our proposed Nitrate, UV disinfection, and Emerging Contaminant schemes. Furthermore, Ofwat has expressed concerns that we have not provided sufficient evidence that our proposed Nitrate and Emerging Contaminant schemes are the best options for our customers, citing a need for stronger evidence that we have fully considered the full impact of each option. This document provides a detailed response to each of these challenges, outlining the robust analysis underpinning our proposed solutions.

## 1.2 What's changed since October?

We have not made any changes to the scope of work since our October 2023 submission.

We requested **£100.4m** in our original submission. In recognition of the challenges received to our Water Programme, we have applied a further efficiency challenge to all of the schemes within this enhancement area of 5%, thus our updated funding request is for raw water deterioration is **£95.2m**.

## 1.3 Ofwat's Draft Determination

Below is a summary of the challenges raised by Ofwat on Raw Water Deterioration at Draft Determination for each of the 3 areas of scope included in this enhancement case, i.e., Nitrate, UV Disinfection, and our proposed Studies.

### 1.3.1 Nitrate

Our Nitrate Martin Gorse and Martin Hill schemes have been subjected to an Ofwat deep dive which we have summarised below.

#### Need for enhancement investment

- Ofwat deems the investment meets the criteria for enhancement investment and additional customer funding.

#### Best option for customers

- Ofwat believes that we have not provided sufficient evidence that we have fully considered the full impact that each option would provide for these schemes.

#### Cost efficiency

- Ofwat has minor concerns as to whether the investment for these schemes is efficient due to a lack of cost comparison evidence and third-party assurance

#### Customer protection

- Ofwat deems the proposal sufficient in protecting customers from under or non-delivery. See Section 4 Customer Protection for updated PCD.

The remaining schemes in our Nitrate programme were subject to Ofwat modelling.

### 1.3.2 Disinfection Future Resilience Programme

Unlike the Nitrates programme above, our DFRP has not been subjected to an Ofwat deep dive, therefore we have not received specific commentary related to the sub-headings in the above section.

Our UV Disinfection programme has been subject to Ofwat modelling.

Our Contact Tanks have been subjected to an Ofwat Shallow Dive.

### 1.3.3 Studies (PFAS) – Emerging Contaminants Study

Our Emerging Contaminants study has been subjected to an Ofwat deep dive which we have summarised below.

#### Need for enhancement investment

- Ofwat deems the investment meets the criteria for enhancement investment and additional customer funding.

#### Best option for customers

- Ofwat believes that we have not evidenced the decision-making process to justify the optioneering process and proposed solution fully.

#### Cost efficiency

- Ofwat believes that we need to show further evidence that the investment is efficient, such as output from subject matter experts or benchmarking to demonstrate that the sample analysis costs are efficient.

#### Customer protection

- Ofwat deems the proposal sufficient in protecting customers from under or non-delivery. See Section 4 Customer Protection for updated PCD.

### 1.3.4 Studies (PFAS) - Climate Change Adaption Study

It is not clear how this has been challenged as Ofwat have noted in their studies deep dive that they incorrectly included this study within the Raw Water Deep Dive, but Ofwat have noted that this study is to be assessed within the freeform models. We have not been able to locate any reference to this in Ofwat's freeform model however we are confident in the need and costing of this proposed study and thus are requesting the full amount originally included within our Business Plan October submission.

## 2. Our proposed response

### 2.1 Nitrate

#### Best options for customers

Our proposed nitrate interventions are the result of a rigorous and transparent process designed to prioritise the best interests of our customers. Our analysis, driven by robust nitrate modelling, clearly demonstrates the urgent need for action to address rising nitrate levels and protect public health. We carefully evaluated a range of options for each impacted site, including doing nothing, delaying action, source management, various blending solutions, and ion exchange nitrate removal. The comprehensive assessment, informed by detailed engineering designs and validated cost curves, led us to select the most cost-effective solutions that meet both regulatory requirements and our commitment to delivering safe, high-quality drinking water for our customers.

Further to averting public health risks and breaching regulatory standards, deteriorating raw water quality, particularly from protozoa and viruses, increases the risk of treatment failures at water treatment works. This could force us to shut down affected sites, leading to water supply interruptions for customers.

Our selection of the best options for customers regarding nitrate interventions (and our DFRP) involved a collaborative and transparent decision-making process with the Drinking Water Inspectorate (DWI). As noted above, our engineering and water quality teams developed a range of potential solutions for each impacted site. These options were then presented to the DWI through detailed Appendix B submissions, followed by constructive discussions to ensure alignment on the most effective and appropriate interventions. The DWI subsequently issued formal decision letters confirming their support for the chosen solutions. Finally, these agreed-upon solutions were developed into legally binding notices, ensuring a clear regulatory framework for implementation. This collaborative approach with the DWI ensured that the selected nitrate interventions are robust, technically sound, and aligned with the highest standards of public health protection.

#### Cost efficiency

We are confident in our costing approach and the robustness of our costing. To check our costs in comparison to similar Water companies we commissioned Mott MacDonald to undertake a benchmarking exercise of our PR24 Nitrate schemes.

The individual costed items of the 6 nitrates projects included in our October Business Plan submission were identified and benchmarked against data from 8 UK Water and Wastewater companies (WaSCs), of comparable scale and operating model to us. Companies have been selected as the closest peers to SWS and data normalised for location and date to ensure comparisons are appropriate.

Please see Table [1] below for a summary of the benchmarking.

**Table 1 - PR24 Nitrate Removal Benchmarking Results**

Project Name	Overall Project Cost (£m)	Overall Project Benchmark (£m)	Variance
Madehurst 4.16 MLD	7.90	8.04	-1.7%
Patching 4.57 MLD	8.00	8.24	-3.0%
Mossy Bottom 3.38 MLD	7.80	7.60	2.6%
Patcham 17.5 MLD	8.80	11.84	-25.7%
Martin Gorse 4.7 MLD	10.50	8.1	26.42%
Ringwould 4.36 MLD	7.70	8.4	-5.4%
<b>Total</b>	<b>50.70</b>	<b>52.16</b>	<b>-2.8%</b>

As demonstrated via the benchmarking exercise, our cost estimates have been assessed as cheaper than elsewhere in the industry, providing additional confidence that we have challenged ourselves from an efficiency perspective. Removing the two outliers in the dataset, Patcham and Martin Gorse, results in us being 2.7% cheaper than the benchmark.

Please refer to Appendix [1] for the Nitrate Benchmarking report.

## 2.2 Disinfection Future Resilience Programme - UV

We are challenging the modelled costs for the UV schemes. We are confident in our costing approach and the robustness of our costing as our costs have been built up using industry benchmarked costs, we therefore believe them to be efficient.

We have commissioned Mott MacDonald to provide us with updated benchmarking of our PR24 UV disinfection process and associated pumping station costs following the PR24 submission. They have benchmarked our estimated UV costs for the 8 sites included within our October 2024 submission against five comparable water and wastewater companies from England and Wales, please see Figure 1 below. The cost comparisons have been calculated using each company’s latest cost curve database. This should provide a suitable comparison as these cost curve databases have been used to build up each company’s PR24 submission.

**Table 2 – PR24 UV Benchmarking Results**

Site	Southern Water Net Direct Works Cost	Benchmark Mean Average	Variance	Variance %
Barton Stacey	£535,491	£612,219	-£76,728	-12.5%
Burpham	£683,867	£808,606	-£122,939	-15.2%
Calbourne	£535,153	£608,393	-£73,240	-12.0%
Luton	£673,465	£802,961	-£129,496	-16.1%
Northfleet	£548,674	£707,797	-£160,123	-22.6%
Patcham	£914,737	£924,495	-£9,758	-1.1%
Twyford	£1,007,884	£952,868	£55,016	5.8%
Wingham	£1,029,554	£971,562	£57,992	6.0%
<b>Total</b>	<b>£5,929,825</b>	<b>£6,388,102</b>	<b>-£459,277</b>	<b>-7.2%</b>

This benchmark indicates that our costs are less expensive than the benchmark overall, and our cumulative cost of £5.93m sat between the upper 75<sup>th</sup> percentile and lower 25<sup>th</sup> percentile intervals and yielded a variance of -7.2% against a benchmark of £6.39m.

This benchmarking shows that our direct UV costs are cheaper than the average of the benchmarked water companies, however Ofwat's model suggests we are more expensive when modelling total costs. This is due to our total UV costs being made up of UV direct costs + UV site complexity costs. Our total costs are higher due to the additional complexities at our sites, such as complex planning mitigation, ecology/habitat factors, land purchase requirements etc., meaning that overall, our schemes are more expensive. These individual site complexities are not accounted for in Ofwat's cost modelling. Please see Table 3 below for additional detail of the complexities faced at our sites.

**Table 3 - PR24 UV Site Complexities**

Site	Site capacity [PWPC] (Ml/d)	Capex Cost (£m)	Site Complexities
Barton Stacey	1.82	2.170	Adjacent to MoD land requiring a complex planning application.  Rural site meaning ecological complexities.
Burpham	11.75	2.972	Within South Downs National Park resulting in additional architectural requirements and a complex planning application.  Rural site meaning ecological complexities.
Calbourne	1.5	2.170	Rural site meaning ecological complexities.
Luton	11.5	2.607	No complexities identified
Northfleet	7.6	2.617	Rural site meaning ecological complexities.
Patcham	17.5	3.149	Within South Downs National Park resulting in additional architectural requirements and a complex planning application.

			Rural site meaning ecological complexities.
Twyford	20.15	3.519	The Scheduled Ancient Monument site has additional architectural requirements and a complex planning application.  Rural site meaning ecological complexities.  Steam Engine visitor centre is a listed building and has complexities around shared site with public visitors.
Wingham	20.6	3.510	There is a listed building on site which means additional architectural requirements and a complex planning application.  Rural site meaning ecological complexities.
	92.42	22.714	

The scopes for the UV schemes have been developed by our engineering teams, who have had extensive experience of designing these types of schemes. These scopes, which incorporate allowances for the specific complexities identified at each site (as per Table 3 above), have then been costed by our Cost Intelligence Team (CIT) using cost curves which were validated using recent market data, ensuring accuracy and efficiency. Further detail on our costing approach can be found in our costing technical annex submitted as part of our October 2023 submission.

We recognise the importance of balancing risk and reward for our customers when making investment decisions. The proposed UV installations are a direct response to the documented deterioration of raw water quality, as detailed in our Needs Case for Enhancement in our SRN30 Raw Water Deterioration Enhancement Business Case (Section 2). These proactive investments offer significant rewards for customers by enhancing public health protection and increasing the resilience of critical water treatment works, ensuring a more reliable water supply.

## 2.3 Disinfection Future Resilience Programme – Contact Tanks

We do not agree with Ofwat’s approach for assessing this area of our programme. We are confident that the costs we have proposed are justified and robust as outlined in our enhancement business case submission and do not believe a shallow dive assessment is appropriate. For further details please refer to our [Cost and Efficiency Enhancement Overarching Narrative Evidence Document].

Similar to our UV sites, our contact tanks costs include an estimate of the impact of the additional site-specific complexities (complex planning mitigation, ecology/habitat factors, land purchase requirements etc.), which we have detailed in Table 4 below.



**Table 4 - PR24 Contact Tanks Site Complexities**

Site	Site capacity [PWPC] (Ml/d)	Capex Cost (£m)	Site Complexities
Balsdean	16.0	4.388	Involves contact vessels.  Within South Downs National Park which could impact planning application if required.  Rural site meaning ecological complexities.
Sutton	6.0	3.312	Involves contact vessels.  Rural site meaning ecological complexities.  Land purchase likely required (issues with this landowner).
Brede	22.0	3.440	Aerator needs to be relocated to make room  Contact tank significant extension – civil structure required.
Beauport	11.0	4.457	Tight space where extension required  Contact tank significant extension – civil structure required.
Andover	18.4	5.111	Congested site  Contact tank extension – civil structure required.
	73.4	20.708	

## 2.4 Emerging Contaminants Study

Emerging contaminants encompasses substances which are not yet regulated but may be of environmental or human health concern. Limited information is currently available on concentrations of these substances in source/treated water. As our customers expect and deserve, safeguarding public health is at the core of our mission and this industry leading study represents a proactive and essential step in fulfilling that commitment.

While our current treatment processes effectively address known and regulated substances, the evolving landscape of emerging contaminants requires a similarly dynamic approach. This study will provide critical insights into the presence and concentration of these substances within our water sources, enabling us to make informed, science-based decisions regarding any necessary treatment or monitoring interventions.

The data obtained, and results of this study will be made available to researchers and other interested parties (e.g., other UK water companies)

## Best option for customers

The proposed solution was designed by a subject matter expert, the Southern Water and University of Portsmouth sponsored PhD of Adam Taylor, who has produced a number of review and research papers covering this topic<sup>1</sup>. The study has been designed to capture data throughout the year at every site. This will enable us to understand seasonal variations and understand intermittent discharges. The nature of the passive sampling techniques that we are using will ensure that we are monitoring continuously for an entire year.

## Cost efficiency

### Commercially Sensitive

The sampling costs used are efficient. For the study we used analysis costs of £[REDACTED] per sample. These were based on actual recent costs for similar samples from our current laboratory supplier [REDACTED].

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<sup>1</sup> i) A.C. Taylor, G.R. Fones, B. Vrana, G.A. Mills, Applications for Passive Sampling of Hydrophobic Organic Contaminants in Water—A Review, Crit. Rev. Anal. Chem. (2019) 1–35. doi:10.1080/10408347.2019.1675043.

ii) A.C. Taylor, G.R. Fones, G.A. Mills, Trends in the use of passive sampling for monitoring polar pesticides in water, Trends Environ. Anal. Chem. 27 (2020) e00096. doi:10.1016/j.teac.2020.e00096.

iii) A.C. Taylor, G.R. Fones, A. Gravell, G.A. Mills, Use of Chemcatcher® passive sampler with high-resolution mass spectrometry and multi-variate analysis for targeted screening of emerging pesticides in water, Anal. Methods. 12 (2020) 4015–4027.

iv) Adam C. Taylor, Graham A. Mills, Anthony Gravell, Mark Kerwick, Gary R. Fones, Passive sampling with suspect screening of polar pesticides and multivariate analysis in river catchments: Informing environmental risk assessments and designing future monitoring programmes, Science of The Total Environment, 787, (2021), doi:10.1016/j.scitotenv.2021.147519.

v) Adam C. Taylor, Graham A. Mills, Anthony Gravell, Mark Kerwick, Gary R. Fones, Pesticide fate during drinking water treatment determined through passive sampling combined with suspect screening and multivariate statistical analysis, Water Research, 222, (2022), doi:10.1016/j.watres.2022.118865.

### 3. Customer Protection

At business plan submission we had proposed the PCD to cover:

- 5 schemes to reduce nitrate concentrations; and
- 13 schemes to enhance disinfection at sites across our region.

At Draft Determination, Ofwat expanded the scope of this PCD by including also:

- Our lead strategy; and
- Study on emerging contaminants.

We agree to include lead strategy and emerging contaminants study in the scope of this PCD. Our updated PCD below reflects this wider scope.

Our proposed PCD below aligns with the Conditions we set for PCD design which are explained in detail in SRN-DDR-052 Price Control Deliverables.

**Table 5 - Raw Water Deterioration PCD**

Component	Output based on delivery of DWI notices
Description	Delivery of schemes to reduce nitrate concentrations, enhance disinfection at sites across our region and delivery our lead strategy.
Output	Delivery of 5 schemes to reduce nitrate concentrations. Delivery of 13 schemes to enhance disinfection at sites across our region Replace 2000 lead pipes Delivery of Emerging contaminants study
Total Cost	Total £114.0m, split as follows: Nitrate: £46.81m Disinfection: £44.76m Lead strategy: £19.93m Emerging contaminants study: £2.49m
Unit cost	Nitrate: average scheme value £9.36m per scheme Disinfection: average scheme value £3.44m per scheme Lead: average value per pipe £9,965 per lead pipe replaced Emerging contaminants study: £2.49m
Penalty rate	Same as unit costs
Materiality of future scope alterations	£1.14m (1% of total cost)
Output delivery date with current scope	31 March 2030
Gated dates (if required)	Assurance of the scheme will be delivered on time 31st of March 2030.
Conditions on allowance	Should we receive confirmation from a regulator of a necessary change to the timing or scope of a scheme, or in fact the change of scheme design to address the core issue being it, either change in the benefit delivered or the solution being more expensive, the implication of this change would be reflected in the PCD. Where this change leads to a material variance greater than 1% of the original enhancement investment, then the PCD would symmetrically account for this change in a reconciliation at the end of the AMP.

Assessment of PCD	In the event of not delivering the output by the end of AMP8 (i.e., by 31 March 2030), but the need is still required, this PCD remains in place until the end of AMP9 (i.e., 31 March 2035). Ofwat will assess the completion of this PCD by 31 March 2035 as part of the PR34 process.
Late penalty (if required)	No late penalty will be applied
Late penalty unit	N/A - Penalties will be applied by DWI for late delivery
DWI penalties to be netted off in the event of non-delivery	If delivery dates or requirements are changed in conjunction with the DWI, the penalties will not be applied to the relevant schemes. Delivery relates to on-site work and excludes completion of notice approval paperwork
Assurance	Third party assurer will assure conditions have been met

## 4. Appendix 1 – Nitrate Benchmarking Report

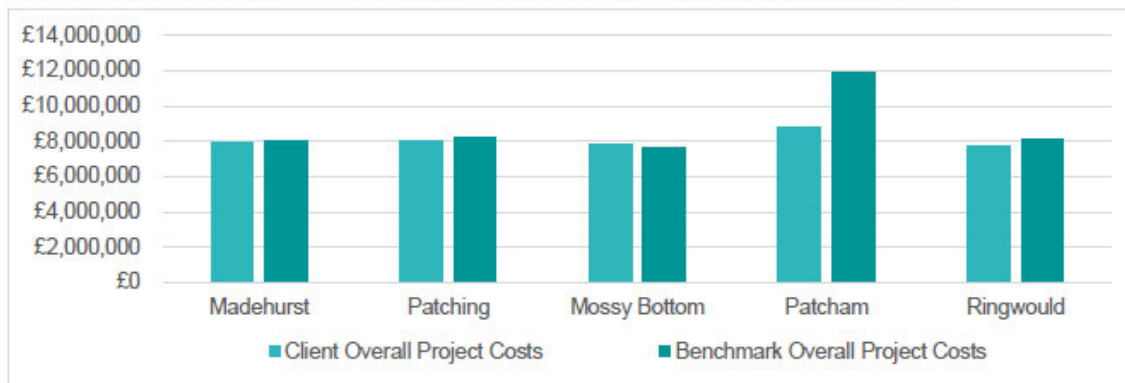
### 1.4 Conclusion

The primary purpose of this study is to bolster confidence in the PR24 Nitrates Removal Project estimates by increasing benchmarked coverage and by using the latest available comparable data.

For the 6 schemes, the total variance is **-2.8%** (a cost difference of £1.45m), whereas the total variance of the 5 schemes excluding Martin Gorse is **-8.33%**. This means the SWS total benchmarked scope is **8.33%** lower than the total benchmark cost (a cost difference of £3.65m).

The project with the highest variance is Patcham. The other projects have their scope costs more closely aligned with the benchmark costs.

**Chart 1 Project Coverage & Benchmark Results per Project (Excluding Martin Gorse)**



Source: Mott MacDonald

Appendix A





# Southern Water PR24 Review

## Nitrates Removal Benchmark

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<b>Project:</b>	PR24 Review		
<b>Prepared by:</b>	[REDACTED]	<b>Date:</b>	09/07/2024
<b>Approved by:</b>	[REDACTED]	<b>Checked by:</b>	[REDACTED]
<b>Subject:</b>	Nitrates Removal Benchmark		

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### Executive Summary

Southern Water commissioned this report to increase confidence in the anticipated cost of its PR24 Nitrates Removal Programme. The analysis shows a programme variance of less than **5.39%**, excluding Patcham as an outlier, with a variance of **25.65%**. Further analysis into Patcham is recommended however, initial observations indicate the works to be circa 4 times the size of the others yet only estimated at only 10% more in cost.

Martin Gorse has also been excluded from the analysis in **Table 2** as the scope (**Appendix A**) provided includes costs associated with Martin Mill's treated flows, and there was no visibility to split the net direct costs to enable a comparable benchmark.

### 1.1 Introduction

Mott MacDonald have been engaged by Southern Water (SWS) to increase cost confidence in the PR24 Nitrates Removal solutions. To gain a more comprehensive understanding of the overall costs associated with the Nitrates removal programmes, a full benchmark has been undertaken on 6 solutions.

### 1.2 Methodology

The individual costed items of the 6 nitrates projects were identified and benchmarked against Mott Macdonald's industry database where comparable data was available. The MM database includes data from 8 UK Water and Wastewater companies (WaSCs), of comparable scale and operating model to Southern Water (SWS). Companies have been selected as the closest peers to SWS and data normalised for location and date to ensure comparisons are appropriate.

To make like-for-like comparisons, the comparator data has been adjusted for inflation (and deflation) to **1Q2023** using the published CPIH figures.

To account for regional variations in the base cost of the resources needed for water projects, the location factors published by the BCIS were used to adjust comparator data to a SWS base. This adjustment seeks to remove any 'skewing' of the comparison due to data being sourced from companies across the UK, which experience local differences in resource cost due to factors including availability; the general local economy and average rates of pay; logistical or access constraints caused by the preponderance of urban or rural communities within their catchment areas; and variances in productivity.

Occasionally, costed items were factored to adjust costs to reflect market changes, replacement costs and additional assumptions. Where applicable, these factors have been used in the benchmark costs as well to ensure a like-for-like benchmark comparison.

As the scope costs presented detail an all-in cost, an indirects benchmark has been undertaken to scale up the direct works into a comparable benchmark output. Additionally, a risk percentage has been generated based on the AACE classification of Level 5 and levels of design definition for key areas.

### 1.3 Analysis and Results

This section of the report provides the results and analysis of the benchmarking process. **Table 1** below presents the variance which represents in percentage terms the cost difference between SWS cost for the scope benchmarked and the industry benchmark. For example, 8% variance implies that scope benchmarked is 8% more expensive than the benchmark. All of the schemes include:-

- Benchmarked Net Direct Costs
- Industry Average Contractor & Client Indirect costs (**70.80%**)
- Corporate Overheads (**18.34%**)
- Risk (**45.00%** based on AACE Class 5 Definition)

**Table 1 Project Coverage & Benchmark Results per Project (Including Martin Gorse)**

Project Name	Overall Project Cost	Overall Project Benchmark	Variance
Madehurst 4.16 MLD	£7,900,000.00	£8,036,733.72	-1.70%
Patching 4.57 MLD	£8,000,000.00	£8,242,917.14	-2.95%
Mossy Bottom 3.38 MLD	£7,800,000.00	£7,599,375.05	2.64%
Patcham 17.5 MLD	£8,800,000.00	£11,836,585.54	-25.65%
Martin Gorse 4.7 MLD	£10,500,000.00	£8,305,461.49	26.42%
Ringwold 4.36 MLD	£7,700,000.00	£8,139,080.26	-5.39%
<b>Total</b>	<b>£50,700,000.00</b>	<b>£52,160,153.20</b>	<b>-2.80%</b>

Source: Mott MacDonald

Of the **£50.70 million** scope included in the estimates the benchmark was **£52.16 million**, indicating that the scope costs are 2.80% lower than the benchmark. However, this is skewed as Martin Gorse includes costs associated with Martin Mill's treated flows, and there is no visibility to split the component costs. Table 2 below shows the variance excluding Martin Gorse and is a better representation of the cost data. Analysing the **£40.20 million** which is **79.29%** of the full scope, the benchmark came in at **£43.85 million**. This indicates that the scope costs are in fact **8.33%** lower than the benchmark.

Excluding Martin Gorse, the project with the highest variance is Patcham where the scope was **25.7%** lower than the benchmark cost (a cost difference of £3.03m). This is significantly larger than the other project variances which are around 5% or less. Mossy Bottom is the project with the highest positive variance where the scope was **2.6%** higher than the benchmark cost (a cost difference of £200,625).

**Table 2 Project Coverage & Benchmark Results per Project (Excluding Martin Gorse)**

Project Name	Overall Project Cost	Overall Project Benchmark	Variance
Madehurst 4.16 MLD	£7,900,000.00	£8,036,733.72	-1.70%
Patching 4.57 MLD	£8,000,000.00	£8,242,917.14	-2.95%
Mossy Bottom 3.38 MLD	£7,800,000.00	£7,599,375.05	2.64%
Patcham 17.5 MLD	£8,800,000.00	£11,836,585.54	-25.65%
Ringwold 4.36 MLD	£7,700,000.00	£8,139,080.26	-5.39%
<b>Total</b>	<b>£40,200,000.00</b>	<b>£43,854,691.71</b>	<b>-8.33%</b>

Source: Mott MacDonald



**Table 10: Options considered to meet nitrate needs**

Group	Site	PWPC (M/d)	Preferred option		
Group	Site	PWPC (M/d)	Scope	Capex Costs (£m)	
B	Madehurst	4.16	Install Nitrate Removal Plant	7.9	18.2
	Stanhope Lodge	6.2	Blend with flows to Highdown Hill WSR	2.4	
	Patching	4.57	Install Nitrate Removal Plant	8.0	
C	Mossy Bottom	3.38	Install Nitrate Removal Plant	7.8	16.6
	Patcham	17.5	Install Nitrate Removal Plant	8.8	
D1	Hazells	7.62	Blend with Northfleet, with enhanced monitoring	1.4	1.4
	Fawkham	5.2	Enhanced monitoring		
D2	Keycol	1.8	Blend in Sheppey main	1.6	1.6
E	Martin Mill	1.8	Install Nitrate Removal Plant at Martin Gorse and blend with Martin Mill's treated flows		16.3
	Martin Gorse	4.7		10.5	
	Ringwould	4.36	Install Nitrate Removal Plant	7.7	
		<b>64.29</b>		<b>58.4</b>	<b>58.4</b>

## 5. Appendix 2 – UV Benchmarking Report



## Southern Water PR24 UV Function Benchmark Review

**Project:** Southern Water PR24 Enhancement Review

**Prepared by:** [REDACTED] **Date:** 03/07/2024

**Approved by:** [REDACTED] **Checked by:** [REDACTED]

**Subject:** UV Function Benchmark Review

# 1 Executive Summary

Ahead of their PR24 submission, Southern Water requested the benchmarking of their function level UV disinfection costs across 8 schemes. Following the PR24 submission, a request has been made to check and update this benchmark, to ensure the output and conclusions remain valid.

At PR24 the UV costs were benchmarked at function level. This included the UV disinfection process and the associated Pumping Station for the 8 sites detailed in Figure 1. All costs within Figure 1 are presented at a price base of Q4 2022 using the CPIH index to account for inflation.

At PR24, the benchmark indicated that the Southern Water costs were less expensive than the benchmark overall. The Southern Water cumulative cost of £5.93m sat between the upper and lower confidence intervals of £7.58m and £4.53m and yielded a -7.2% variance against a benchmark of £6.39m. This is illustrated in Figure 1.

Ref	Name	Southern Water	Benchmark Mean Average	25th Percentile	75th Percentile	Delta	Delta %	Benchmarked Items
PR24-CIT-0167	Barton Stacey	£535,491	£512,219	£480,274	£748,873	-£76,728	-12.5%	UV Disinfection - 1019s Pumping Station - 5.5MW
PR24-CIT-0168	Burpham	£983,867	£806,806	£566,385	£965,200	-£122,939	-15.2%	UV Disinfection - 1369s Pumping Station - 40MW
PR24-CIT-0169	Calbourne	£535,153	£508,393	£478,348	£743,946	-£73,240	-12.0%	UV Disinfection - 1019s Pumping Station - 5kW
PR24-CIT-0170	Luton	£673,465	£802,961	£563,757	£962,948	-£129,496	-16.1%	UV Disinfection - 1339s Pumping Station - 40MW
PR24-CIT-0171	Northfleet	£548,674	£708,797	£517,819	£872,134	-£180,123	-22.6%	UV Disinfection - 1019s Pumping Station - 25MW
PR24-CIT-0172	Patcham	£914,737	£924,495	£827,456	£1,072,863	-£9,758	-1.1%	UV Disinfection - 2039s Pumping Station - 55kW
PR24-CIT-0173	Twyford	£1,007,884	£952,868	£945,978	£1,095,478	£55,016	5.8%	UV Disinfection - 2339s Pumping Station - 55kW
PR24-CIT-0174	Wingham	£1,029,554	£971,562	£852,044	£1,117,830	£57,992	6.0%	UV Disinfection - 2399s Pumping Station - 60kW
<b>Total</b>	<b>Total</b>	<b>£5,928,825</b>	<b>£6,389,192</b>	<b>£4,532,639</b>	<b>£7,578,879</b>	<b>-£489,277</b>	<b>-7.2%</b>	

Figure 1: PR24 Benchmarking Output

Each of the 8 schemes exhibited a variance within tolerance for a high-level function comparison, and each of their costs fell within the upper and lower percentile benchmark costs. As such, the costs were considered in line with the benchmark.

Following the PR24 submission, Southern Water have requested a further check on the models to understand whether the benchmark analysis remains valid when new datasets and up to date models are considered. The benchmark was analysed to determine whether there were applicable models that could be used to update the benchmark. The same PR24 scope was costed, with the outputs at the same price base



using the same inflation index to ensure comparability between results. The results of the update are presented in Figure 2.

Ref	Name	Southern Water	Benchmark Mean Average	25th Percentile	75th Percentile	Delta	Delta %	Benchmarked Items
PR24-QT-0167	Barton Stacey	£535,491	£617,695	£492,247	£748,673	-£82,184	-13.3%	UV Disinfection - 101Ws Pumping Station - 5.5kW
PR24-QT-0168	Burpham	£683,867	£839,318	£696,406	£965,209	-£155,451	-18.5%	UV Disinfection - 136Ws Pumping Station - 40kW
PR24-QT-0169	Calbourne	£535,153	£613,762	£490,320	£743,946	-£78,609	-12.8%	UV Disinfection - 101Ws Pumping Station - 5kW
PR24-QT-0170	Luton	£673,465	£834,650	£689,667	£962,948	-£181,185	-19.3%	UV Disinfection - 133Ws Pumping Station - 40kW
PR24-QT-0171	Northfleet	£548,674	£722,829	£555,579	£872,134	-£174,155	-24.1%	UV Disinfection - 101Ws Pumping Station - 25kW
PR24-QT-0172	Patcham	£914,737	£985,108	£896,258	£1,072,863	-£70,371	-7.1%	UV Disinfection - 203Ws Pumping Station - 55kW
PR24-QT-0173	Twyford	£1,007,884	£1,021,712	£940,780	£1,097,806	-£13,828	-1.4%	UV Disinfection - 233Ws Pumping Station - 55kW
PR24-QT-0174	Wingham	£1,029,554	£1,045,357	£968,868	£1,126,933	-£15,803	-1.5%	UV Disinfection - 239Ws Pumping Station - 60kW
<b>Total</b>	<b>Total</b>	<b>£5,928,625</b>	<b>£6,680,389</b>	<b>£5,730,124</b>	<b>£7,580,312</b>	<b>-£751,684</b>	<b>-11.3%</b>	

**Figure 2: Enhancement Review Benchmarking Output**

The cumulative benchmark has increased from £6.39m at PR24 to £6.68m in the review. This increases the variance from the scope to -11.3%. The Southern Water scope still falls within the cumulative upper and lower intervals of £7.59m and £5.73m. However, the scope costs for Burpham, Luton and Northfleet now fall just shy of the lower interval.

Overall, there is a increased cost of £0.29m from the PR24 benchmark to the review, with a variance increase of -4.1%. The reviewed position indicates that the Southern Water costs are slightly low with respect to the benchmark, but well within the tolerance for this stage of design definition.

To improve the benchmark accuracy for the UV schemes, further benchmarking could be undertaken that considers the whole scope. This would include more granular assets in the benchmark, increasing the coverage and therefore the confidence in the final cost position.

## 6. Business Plan Dependencies

This document is supported by our **Enhancement Business Case of Raw Water Deterioration (SRN30)** which sets out the enhancements required to address raw water quality deterioration in AMP8.

Data Tables impacted by the representation:

Table/s Impacted	Data Lines Impacted
CW3	Lines 97-99

All documents and tables referenced above can be found on our website here: [Business Plan 2025-30 - Southern Water](#)