TMS-DD-056
PR24 Enhancement Case
Sewage Treatment
Waste Asset Assurance Programme (WAAP)

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1. Summary Table

Table 1 - Summary table

Reference	TMS-DD-056 - PR24 Enhancement Case - Sewage Treatment Waste Asset Assurance Programme (WAAP)
Description	Improvements to 101 Sewage Treatment Works in AMP8 to continue to ensure compliance with numeric and descriptive permits. The work will require the provision of increased treatment capacity as well as delivering enhancement to comply with other aspects of discharge permits that have been subject to recent regulatory changes and updates.
Outputs	101 Sewage Treatment Works will be upgraded in AMP8 to maintain compliance with their current permits.
Cost	This enhancement case forecasts a total of £1,044m capex in AMP8 at 101 Sewage Treatment Works. • Of this total, £413m capex has been proportionally allocated to address future growth requirements at 60 Sewage Treatment Works to assess cost efficiency. • Of this total, £631m capex has been proportionally allocated to address other flow related and regulatory aspects of discharge permit to understand cost efficiency
Spend apportionment	This investment sits 100% within Wastewater Network Plus price control.
Delivery year	2025-2030
DPC	This case was not deemed suitable for DPC because schemes do not meet the technical guidance for discreteness and individual sites are all below the value threshold.

Source: Thames Water

2. Introduction

In November 2021, Thames Water undertook a review of Sewage Treatment Works, taking a conservative approach to identifying higher risk sites that were potentially failing to achieve compliance with flow parameters. This workstream has now become part of a broader "Wastewater Asset Assurance Programme" (WAAP), whose aim is to identify solutions to specific concerns identified as part of a root cause analysis exercise. Through our work on WAAP, other recent changes to discharge permit guidance and new statutory requirements have been highlighted that will require investment for Thames Water to maintain compliance in AMP8.

Our October 2023 business plan submission forecast £677m of totex in AMP8 to invest in addressing discharge permit compliance risks at 157 sites, where there is a risk that FFT conditions may not be met before storm discharges occur. This investment case was set out in our Asset Health Deficit submission[1].

Ofwat's Draft Determination did not include any enhancement totex to address any flow or new aspects of discharge permit compliance.

Consequently, and as part of our response to the Draft Determination, we have chosen to submit this stand-alone Enhancement Case for WAAP. We provide an update to the need, programme outputs and £677m totex forecast that was included in our October 2023 business plan:

Section 3	Need for investment	We explain how flow compliance investment is driven by growth/demand[2] in addition to statutory permit requirements including: inlet screening; macerators upstream of storm separation, flow to full treatment; biological treatment capacity; storm storage capacity; and process return flows. We show that guidance and statutory requirements have changed recently, requiring new investment to ensure that compliance is maintained going forward.
Section 4	Best Option for Customers	We explain our original approach to identifying 157 sites. Through ongoing engineering work and programme optimisation, we have rationalised the numbers of sites that require investment from 157 to 101. We explain why costs have increased from £677m in October 2023 to £1,044m in this submission, as confidence in scope and outputs has improved.
Section 5	Cost Efficiency	We demonstrate that our latest cost estimates are efficient by proportionally allocating costs across growth and new compliance drivers. To do this, we use insight from the Draft Determination cost assessment

[1] TMS15 Asset Health Deficit. See Section 13 - AMP8 Priority - Sewage Treatment Works (Wastewater Asset Assurance Programme)

[2] Covers additional changes to growth such as impact of Climate Change.

		to understand efficiency and demonstrate that at least £414m of the £1,044m is efficient based on growth as a driver alone. The balance of the investment (£630m) is efficient, as we have moved from desktop assessments to bottom-up costing from our Engineering Estimating System, which uses outturn market tested costs.
Section 6	Customer Protection	For the growth element we propose PCDs to protect customers and to hold us to account to deliver this enhancement investment. We are open to this programme being put through Ofwat's Large Scheme Gated Process to add further protection.

The table below summarises the investment that is required in AMP8 based on our latest engineering estimates and optioneering work.

Table 2: WAAP 101 sites broken down across drivers

#	Category	Number of Sewage Treatment Works	Totex £m	Driver
1	Sewage Treatment Works to be upgraded to accommodate for population growth which will address compliance with new requirements.	27	122.5	WAAP Growth
2a	Sewage Treatment Works with both Growth and Compliance drivers (Growth element)	33	291.0	WAAP Growth and New Requirements
2b	Sewage Treatment Works with both Growth and Compliance drivers (Compliance element)		442.3	
3	Sewage Treatment Works have new compliance requirements.	36	135.2	WAAP New Requirements
4	Sewage Treatment Works have new requirements as a result of Dry Weather Flow increases.	5	53.5	WAAP New Requirements
	Total	**101**	**1,044.5**	

Table 3: Annual profile of investment in Table CWW3.181

Line Description	Units	2025-26	2026-27	2027-28	2028-29	2029-30	AMP8
Additional line 1; enhancement wastewater/bioresources capex (AMP7: AR23 Additional 2 - New Development & Growth; AMP8: WAAP)	£m	271.083	311.825	154.833	152.722	153.784	1,044.247

3. Need for investment

In this section, we explain how flow compliance investment is driven by forecast growth at many of the sites in this programme in addition to statutory permit requirements including: inlet screening; macerators upstream of storm separation; flow to full treatment; biological treatment capacity; storm storage capacity; and process return flows. We show that guidance and statutory requirements have changed recently, requiring new investment to ensure that compliance is maintained going forward.

In the table below, we show the growth and compliance needs across all the WAAP sites in the AMP8 programme.

Need for investment	Sites with this driver	AMP8 (£m)
Growth	60	414
Inlet screens	40	67
Macerators	16	10
Storm Storage	45	64
Process Return Flows	35	57
Flow to full treatment	65	249
Process treatment	35	129
Dry Weather Flow	5	54
	Total	**1,044**

Table 4: Investment drivers across sites and AMP8 totex forecast

Throughout this section we provide evidence to demonstrate that the above investment is not included in our base plan and therefore requires enhancement investment.

Growth at WAAP sites

The population in our area is forecast to increase by circa 498,000 (+4%) during AMP8 and circa 2.5 million (+16%) from 2025 to 2050. To maintain compliance, we need to invest to provide additional treatment capacity to accommodate this growth.

Our October 2023 submission included an enhancement case related to investment to cater for growth at 15 Sewage Treatment Works with a forecast totex requirement of £355.15m[3]. This case remains essential for us to continue to ensure compliance with our treated effluent discharge permits, for those 15 sites.

At the time of our original submission, all WAAP investment was included in our Asset Health Deficit case[4]. This case included investment to continue to ensure 157 Sewage Treatment Works maintain compliance in light of the new guidance in calculating FFT. It did, however, also include investment to ensure that this compliance could be achieved in light of short-term growth at 60 of the 157 Sewage Treatment Works.

To enable Ofwat to accurately assess this submission we have split out the growth investment required at these sites.

This 'Growth at WAAP sites' enhancement case aims to upgrade 60 of our Sewage Treatment Works, the detail of which is presented in Table 5 below.

Table 5 - Growth at WAAP sites: Enhancement plan

Site	2024/25 PE	% PE growth in AMP8	Process capacity added by WAAP scheme (PE)
Abingdon	42,770	6.1	1,514
Aldermaston	410	0.5	6
Aldershot	41,033	3.1	5,971
Appleton	7,172	6.5	173
Wokingham	16,086	1.3	798
Aylesbury	128,443	9.4	7,002
Basingstoke	135,816	4.5	5,861
Beckton	3,996,801	3.9	395,307
Beenham	523	0.8	37
Bletchingdon	1,614	1.9	9
Brickendon	209	0.8	41
Broadwell	3,097	4.9	4
Burghfield	7,398	0.3	221
Carterton	17,224	2.4	1,234
Charlbury	2,940	0.7	189

[3] https://www.thameswater.co.uk/media-library/home/about-us/regulation/our-five-year-plan/pr24-2023/sewage-treatment-growth.pdf

[4] TMS15 Asset Health Deficit. See Section 13 - AMP8 Priority - Sewage Treatment Works (Wastewater Asset Assurance Programme)

Site	2024/25 PE	% PE growth in AMP8	Process capacity added by WAAP scheme (PE)
Church Hanborough	8,009	1.0	160
Clanfield	931	0.7	15
Cropredy	1,209	1.6	156
Crossness	2,157,890	3.8	140,224
Esher	128,305	0.6	8,356
Eydon	408	0.5	12
Faringdon	9,545	6.2	993
Farnham	47,989	2.4	182
Finstock	3,604	0.7	31
Gerrards Cross	8,719	1.4	620
Grendon Underwood	1,285	0.4	30
Hatfield Heath	3,022	5.3	56
Hogsmill	409,174	1.9	21,595
Holmwood	6,142	3.5	571
Hook Norton	2,247	1.2	83
Horley (Surrey)	41,576	0.3	3,136
Kingsclere	4,183	4.7	183
Lightwater	20,831	3.5	1,209
Little Compton	384	0.2	7
Little Marlow	188,044	1.0	13,062
Long Reach	927,666	2.4	25,254
Maidenhead	88,500	8.1	7,286
Maple Lodge	591,346	4.5	26,159
Markyate	6,233	2.1	8
Middle Barton	1,535	0.7	42
Mogden	2,055,480	3.8	230,405
Nags Head Lane	37,696	4.1	4,175
Newbury	85,622	0.3	4,044
Princes Risborough	13,408	8.8	1,290
Riverside	421,865	6.1	52,189
Sandhurst	34,393	4.6	1,168
Selborne	583	4.2	8
Sherfield on Loddon	5,957	1.1	222
Sonning Common	5,227	2.0	830
Standon	4,166	0.9	536
Stewkley	1,818	0.5	74
Swindon	232,333	3.6	10,863
Takeley	2,161	9.5	766
Tetsworth	1,232	1.3	83
Theydon Bois	4,186	2.1	103
Waddesdon	3,727	2.6	133
Wargrave	124,909	1.6	12,349
Warmington	279	0.4	14
Whitwell	1,092	0.8	93
Windsor	35,340	2.4	4,867

Other compliance needs

In addition to growth, this enhancement case can be split into a further seven categories of enhancement investment required:

- Inlet screening;
- Macerators upstream of storm separation;
- Flow to full treatment;
- Biological treatment capacity;
- Storm storage capacity;
- Process return flows; and
- Enhancement as a result of dry weather flow increases.

Inlet Screening

We have investigated the trend of climate change on rainfall patterns, groundwater levels, private property misconnections (surface water to foul only systems) and how this influences the performance of our inlet screen facilities to treat received flows. Responding to these weather related changes requires investment to ensure continued compliance with site permits. This investment sits outside of the base allowance, as it is needed to fund system enhancements brought about by climate change. To ensure our screens are resilient to the effects of climate change we are proposing to invest £67m at 40 sites. How climate change is impacting our performance is expanded on below.

Climate change influenced rainfall Trends #1

Trends in rainfall data (see Figure 1.0) highlight that we are observing an increased frequency of heavy rainfall events, this is leading to our inlet screens operating for a greater proportion of their life at the top of the 'design' range, impacting their resilience to robustly screen all received flows. It should be noted that this change/increase in operating trend is not linked to 'wastewater' growth in the catchment.

Climate change influenced rainfall Trends #2

Coupled to the challenge of changing rainfall patterns is the trend of warmer wetter winters leading to increased and prolonged periods of high groundwater levels and pluvial/fluvial flooding, which is leading to increased impact of groundwater infiltration and surface water inundation impacting our sewerage systems. For Thames Water, this is a particular challenge as much of our region is covered by chalk and limestone geology, both of which exhibit highly reactive groundwater fluctuations impacting our sewerage systems (see Figure 3.0).

As with the trend of heavy rainfall, the influence of climate change driven warmer wetter winters is having the impact of causing our inlet screens performance to be stretched, operating for longer periods (see Figures 1.0 & 2.0) at the higher end of the range of their capability.

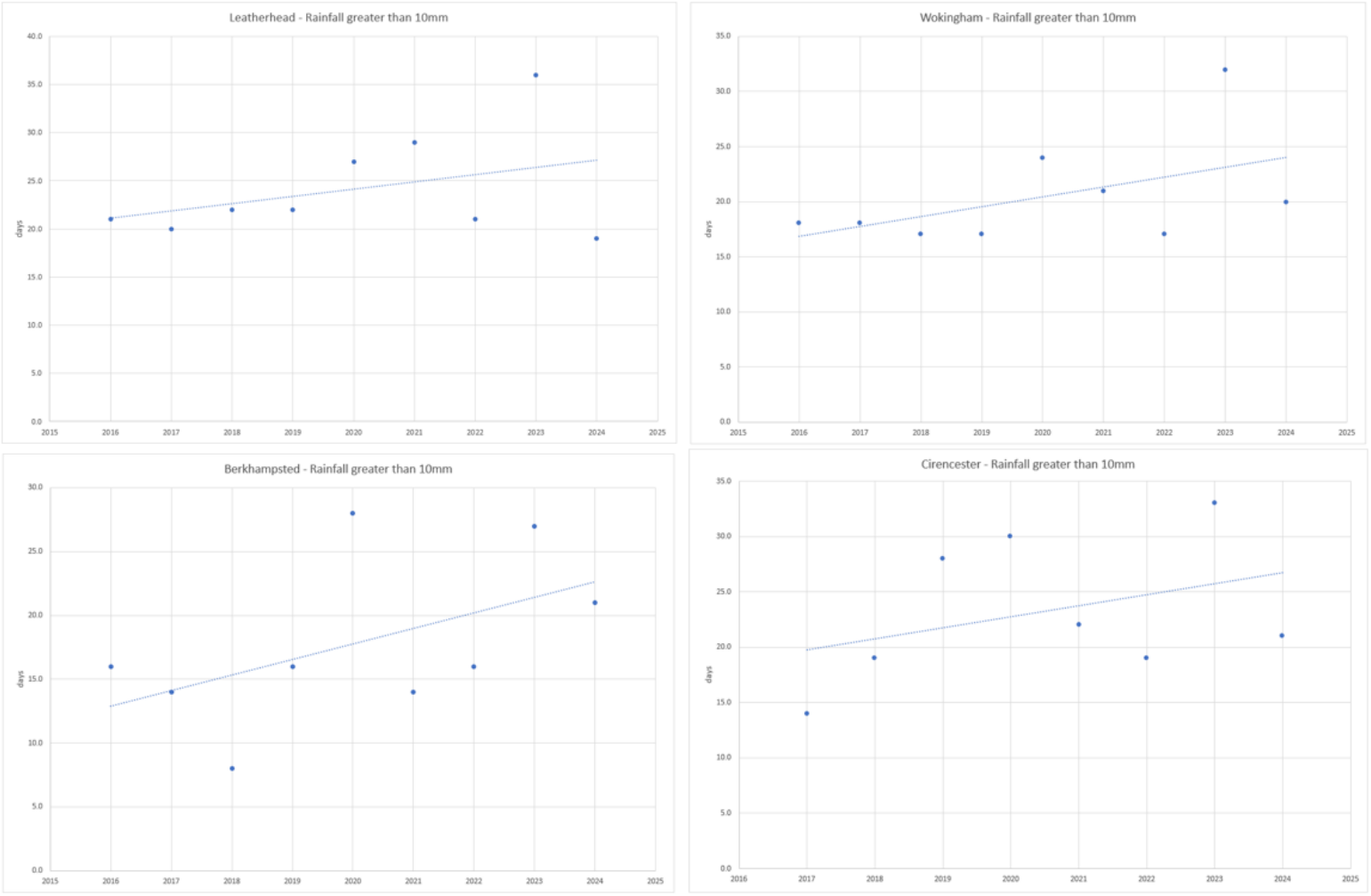

Figure 1 – Rainfall Trends (days exceeding 10mm rainfall)

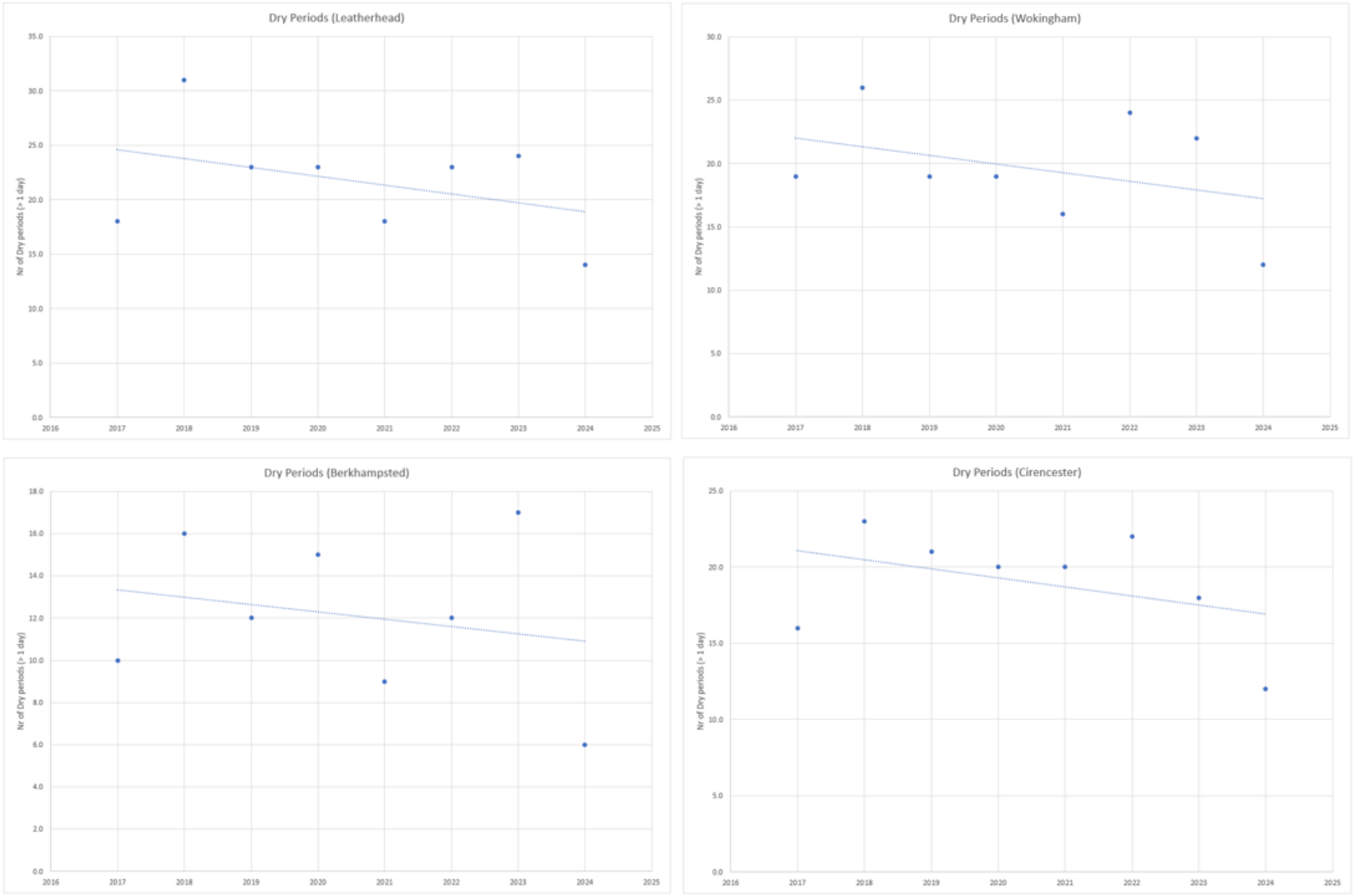

Figure 2 – Rainfall Trends (decline in dry periods > 1 day)

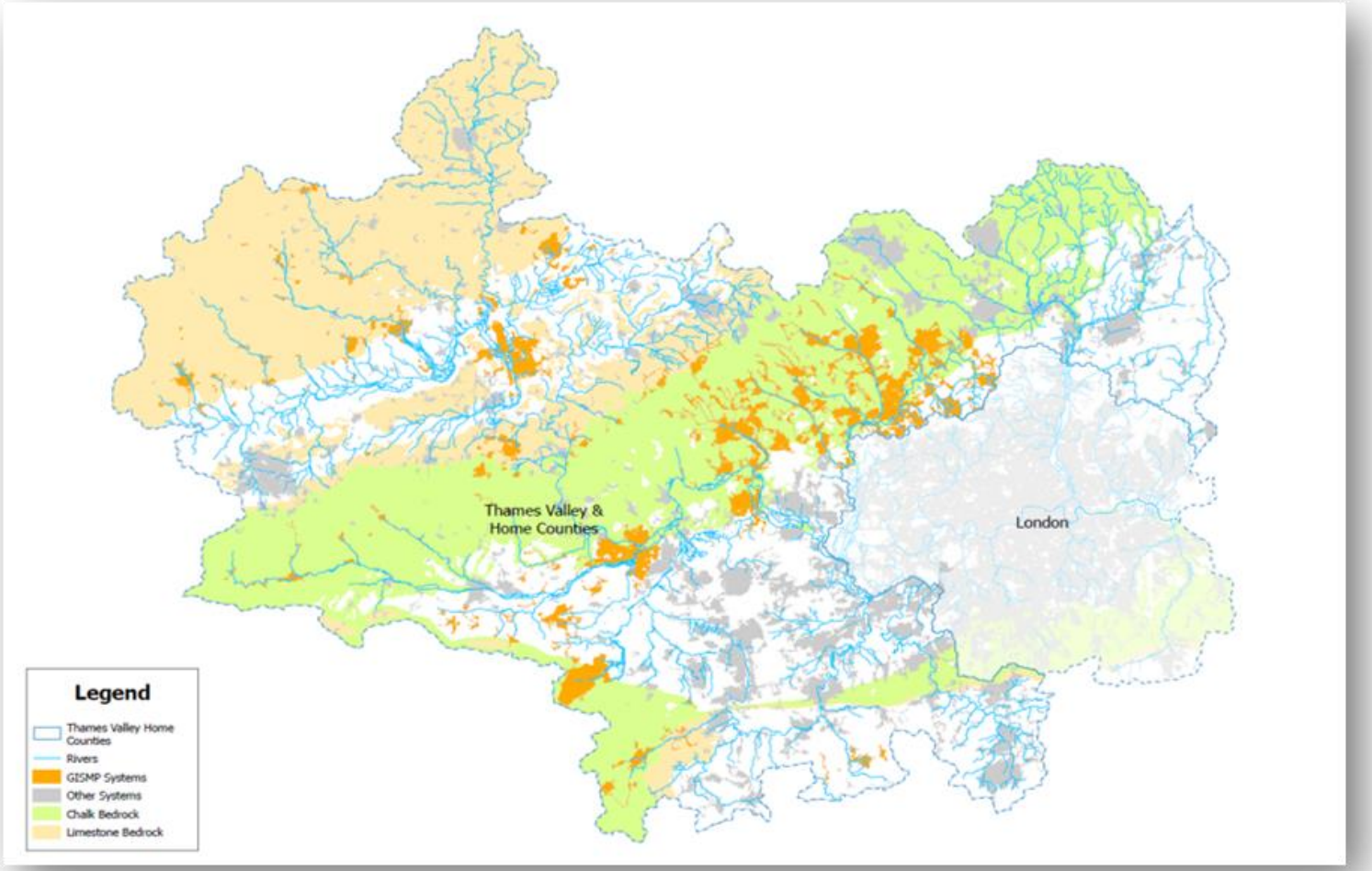

Figure 3 – Groundwater trends

System design and Climate change

Climate change is outside of management control and to a large degree, so is the influence that customer behaviour is having on the performance of our wastewater systems. All the systems we are looking to enhance the inlet screens for are fundamentally separate sewerage systems[5] with alternative surface water systems present in the catchments they serve. However, there is evidence that misconnections of surface water to foul only sewerage have occurred at property level, beyond the extent of the public sewerage system, causing significant amounts of 'unwanted' surface water to enter our sewerage systems.

Misconnections of surface water are, in the main, why our foul only systems are affected adversely by heavy rainfall and whilst we look to manage the risk in collaboration with local authorities and building control, once a connection has been made, no legal powers exist presently to force the correction of these misconnected surface water connections. Climate change, with increased frequency of heavy rainfall as highlighted above, is exacerbating the problem of inlet screening capability being exceeded.

In conclusion, we are proposing the investment of £67m at 40 sites to counter the adverse impact of climate change to ensure we can consistently meet the screening requirements of our permits.

Storm storage capacity

Following a review of the storm storage facilities, we have identified that whilst on average sites contain more than 7% larger storm storage volumes than required by their permit, their performance is also impacted by climate change.

An investment of £64m is proposed for 45 sites to implement enhanced storm storage management of the storm tanks. The investment is focused on looking at optimising the rate at which the storm tanks are emptied to maximise available storm storage availability, particularly during winter months when the mean time between rainfall events reduces and the risk that the storm tanks, whilst compliant with the permit, may not be completely empty and hence risk not providing maximum benefit for the environment.

Figure 2.0 above illustrates how 'mean-time' between rainfall events, particularly during winter months has reduced in recent years.

The proposed investment will look at such elements of the storm storage facilities such as variable speed pumps and SCADA control to improve the rate at which storm tanks can be emptied during and after rainfall events.

The need for this investment is outside of management control as performance is linked to climate change and is not covered by the base allowance as in general terms the conditions of the permit for storm storage are being met.

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[5] Separate sewerage systems comprise of a foul only system and sometimes a separate surface water sewerage system. These systems are more modern and preferable, for protecting the environment, to the older systems found in central London where combined sewerage serves both surface water and foul water needs.

Macerators upstream of storm separation

This enhancement case will ensure that our Sewage Treatment Works are correctly configured to meet the change in descriptive permit condition, a regulatory requirement, relating to use of macerators. This investment is to remove macerators[6] "upstream of the settled storm sewage overflow [condition quoted in the permit]" from Sewage Treatment Works that currently operate with this configuration. This investment is critical to the compliance with this clause of our descriptive Permit Conditions relating to storm discharges. This programme of investment will address the risk of non-compliance at 16 Sewage Treatment Works: prioritisation of interventions will be planned on a risk-based approach targeting sites where the risk of environmental impact is greatest.

Our feasibility study carried out as part of IP2 (outlined below) found that the main options are to replace the macerator and in some cases the macerator can be completely removed.

A change in descriptive permitting requirement has necessitated this enhancement case, which if not progressed will lead to a compliance failure. Discharge consents for sewage treatment works, prior to 2010, were issued under the Water Resources Act (WRA) 1991. The Environmental Permitting Regulations (EPR) 2016), superseding the earlier legislation EPR 2010, consolidated the amendments associated with discharge consents.

With reference to the WRA 1991, the commonly used wording related to macerators and storm discharges, and was captured under the one condition, was:

> *"a) The Discharge shall not contain a significant quantity of solid matter having a size greater than 6 millimetres in more than 2 dimensions.*
>
> *b) the Discharge shall not be comminuted or macerated to achieve the standard in (a) above."*

Macerators are used to protect the downstream treatment process from blocking, from the point they are located. The previous condition, as issued under WRA 1991, did not preclude the presence or use of inlet macerators upstream of storm separation; it stated that we need to remove solids in the storm discharge, greater than a certain size, and we cannot macerate or comminute the discharge to achieve this.

With the introduction of the EPR in 2010, the wording regarding macerators changed to:

[6] Removal of macerators provides additional environmental benefit through the removal of a source of micro plastics in the environment.

"(a) The discharge shall not be comminuted or macerated and shall not contain a significant quantity of solid matter with a particle size greater than any indicated. All screenings shall be removed from the discharge[7]."

Previously, the macerator Condition was intrinsically linked to the particle size. Now, there is a standalone Condition that separates it from being linked to the solid matter requirement and, therefore, has become a requirement in itself, since 2010. This is therefore a material change in the compliance obligations for Thames Water and of our Sewage Treatment Works.

Through discussions with the Environment Agency, it was agreed that Thames Water would accept an Improvement Programme to be included for Sewage Treatment Works Permits in lieu of the new Condition. This Improvement Programme was broken down into three stages, as outlined in the table below:

Table S1.2 Improvement programme requirements		
Reference	**Requirement**	**Date**
IP1	The operator shall notify the Environment Agency in writing of the likely date the inlet macerator is due to be replaced.	12 months of the date of issue of this permit
IP2	The operator shall submit a written feasibility report to the Environment Agency, for approval, summarising improvement options to remove maceration from the inlet works upstream of the settled storm sewage overflow. In the report, the operator shall identify a favoured option, if any is considered feasible, and provide timescales for completion of these works. Timescales shall be based on likely asset renewal date and funding availability during AMP7 & AMP8.	At least 4 months prior to asset renewal date of the inlet macerator notified in IP1 or 31/03/2023 whichever is the sooner
IP3	Following approval from the Environment Agency the operator shall implement the approved option identified in the report required by IP2.	Completion date identified in IP2, or date otherwise agreed with the Environment Agency

Table 6 – 3 stages of the EA Improvement Programme

[7] This Permit reference is from Permit number 2034 for Abbess Roding Sewage Treatment Works. Abbess Roding Sewage Treatment Works does not have a macerator upstream of settled storm separation and therefore is not included in the Improvement Programme.

The above table was extracted from Chadlington Sewage Treatment Works Permit D64; the wording of the Improvement Programme is consistent across all Thames Water's Sewage Treatment Works where a macerator is in operation upstream of the settled storm separation.

IP1 requirement was completed on 22nd February 2019 for all 68 sites, with the list of sites with macerators in situ upstream of storm separation communicated to the EA.

Through further investigations as part of satisfying the Improvement Programme requirements, it was established that between IP1 and IP2 the number of sites reported for IP1 reduced from 68 to 46. This was as a result of the move from an initial desktop assessment to site visits, as well as removal of macerators through other projects.

IP2 requirement was completed and communicated to the EA in April 2023. The feasibility report commissioned and produced by Thames Water confirmed that macerators on 46 sites could be removed.

Though our response to the EA as part of IP2, it was agreed that macerators would be removed from all 46 Sewage Treatment Works by the end of AMP8. In line with the new permit Condition, we are no longer installing macerators upstream of storm separation. As this permit condition was introduced towards the latter end of AMP6, with the IP2 feasibility being completed in April 2023, this funding has not been requested prior to PR24. This investment programme requires expenditure above our base allowance in order to satisfy the Improvement Programme, and IP3, and deliver proactive intervention.

Process return flows

This enhancement case will ensure that 35 of our Sewage Treatment Works will conform to the recently published definition of Flow to Full Treatment (FFT), confirmed through a meeting of the Environment Agency's Flow Task and Finish Group, a sub-group of the Strategic Water Quality & Waste Planning Group, which is chaired by the EA, and followed up with a guidance note.

This programme of investment will redirect process return flows at 35 Sewage Treatment Works to downstream of the Flow Passed Forward (FPF) point, i.e., downstream from the point in which the FPF is measured using U_MON4 instruments. This will enable Thames Water to be compliant with the new definition of FFT, as well as improving the accuracy of the measured FPF, at these sites.

In December 2021, 18 months after AMP7 began, the Environment Agency published a definition of flow to full treatment for the first time. When referring to process return flows, the guidance states,

"these flow types should not spill into storm tanks[8]".

[8] See the Environment Agency's Proposed Flow passed forward (FPF) definition and guide to how flows should be taken into account in FPF MCERTS certification v1 (December 2021)

Prior to this publication, there was no clear definition as to what flows were to be accounted for when calculating the flow that is passed forward to the continuation flow. Consequently, there has not been a regulatory driver to ensure process return flows are discharged downstream of storm separation. Proactive intervention is needed to ensure compliance with this change in regulation, which requires capital expenditure above our base allowance. As this regulatory change was introduced in AMP7, this investment programme was not required prior to AMP7 and therefore funding has not previously been requested to specifically address this new requirement.

The aforementioned 35 sites are currently configured with process return flows being directed upstream of storm separation and, in times of high flows due to rainfall and/or snow melt, are capable of spilling into storm tanks. Investment is required to comply with the confirmed definition of FFT, which constitutes a change in a regulatory requirement.

The same guidance outlines the requirement that process return flows should not be accounted for in the measured FPF. This results in both an increase in the flow and load that is required to be passed forward and treated in the continuous flow, downstream from the point FPF is measured. Consequently, this has an impact on the level of investment required if increased hydraulic and process capacity is required.

Flow to full treatment

An aspect of this enhancement case is to ensure that the Flow Passed Forward (FPF) at our Sewage Treatment Works is compliant with the new regulatory requirement relating to how compliance with FPF and Flow to Full Treatment (FFT) is measured. Similarly to the new requirement for process return flows outlined above, the new requirement guidance for how FPF and FFT compliance is measured was issued by the Water UK Strategic Water Quality and Waste Planning Group (SWQWPG).

This investment programme will deliver enhancement to 65 STWs to increase hydraulic capacity, as well as ancillaries, to ensure the required flow will be passed forward to the continuation flow as stated in the permit. This will enable Thames Water to be compliant with the new methodology for calculating FFT compliance.

In March 2021, we received an Information Letter[9] from the EA outlining conditions that would be added to EPR Discharge Permits. This Letter followed a meeting of SWQWPG earlier in March 2021 where the EA presented a paper[10] recommending the Planning Group, "recognise the urgent need for the AMP7 Flow conditions to be finalised". The Condition relating to the new FFT Compliance methodology stated:

[9] See EA Information Letter EA/05/2021 (March 2021)

[10] See Environment Agency and Water UK Strategic Water Quality and Waste Planning Group (SWQWPG) Meeting (March 2021)

"At least 95% of all flow passed forward readings taken in any calendar year while the overflow <to storm tank> is operating must be equal to or greater than 92% of the flow passed forward limit specified in schedule 3 table S3.1."

This recommendation by the EA, and subsequent acceptance by the Planning Group, came almost one year after AMP7 began. Prior to March 2021, there was not any published guidance as to how FFT compliance should be confidently assessed and reported. Consequently, there has not been an earlier opportunity to request funding to enhance our Sewage Treatment Works to ensure compliance with this new regulatory requirement. Proactive intervention is needed to ensure compliance with this change in regulation, which requires capital expenditure above our base allowance.

As this proposed investment will increase the hydraulic capacity of our Sewage Treatment Works, there will be a requirement to treat the increase in flow and therefore the process capacity at 65 of these sewage treatment works will require enhancement.

Process treatment capacity

This enhancement case will ensure that 35 of our Sewage Treatment Works ensure continued compliance with their numerical permit parameters, specifically the quality of the final effluent that is discharged to the environment. There are no new requirements specifically relating to final effluent quality that have been introduced driving this expenditure. This enhancement is required because of the regulatory changes that have been introduced relating to aspects of STWs upstream of process treatment, i.e., the Sections above outlining the recent changes to the FFT definition and compliance methodology.

This investment programme will increase the process treatment capacity, required due to the increase in flow passed forward. Each STWs future capacity requirements differ on a site-by-site basis, and the root cause analysis that we carried out supported the understanding of whether the treatment process has enough capacity to manage the resulting increased flow.

Where STWs have process return flows upstream of the U_MON4[11] monitor, the process return flows are currently included when measuring the flow passed forward, i.e., the FFT. With the new definition, the process return flows will need to be excluded from the measured FFT. This results in the process capacity needing to be able to accommodate the process return flows on top of the FFT, and therefore increasing the amount of flow and load that needs to be treated.

When considering new FFT compliance methodology, to improve performance in line with passing forward 92% of the FFT permit for 95% of the time a storm overflow operation occurs, increased reliability of treated flow is required. Coupled with the process return flows, this has an impact on the process capacity required.

[11] Requirement to flow monitoring as close to the overflow as practicable to record FFT at STW.

New requirements because of Dry Weather Flow increases

This enhancement case will ensure that five of our Sewage Treatment Works are enhanced to meet the change in numerical permit conditions because of seeking to increase the Dry Weather Flow (DWF) permitted value. This programme of investment will provide an increase in hydraulic and process treatment capacity to accommodate the increased flows, whilst improving the quality of final effluent discharging into the watercourse.

There are three core arguments of the need for enhancement investment:

- Increasing the DWF permit to provide increased hydraulic and treatment capacity to a 2036 design horizon,
- A decrease in the total daily load being discharged into the environment via the final effluent stream, due to "no-deterioration" principles being applied,
- The introduction of 'first-time' phosphorus and ammoniacal nitrogen limits indicated by the Environment Agency through the pre-application service provided by the EA.

Where it is necessary to increase the DWF at a site, a permit variation from the EA is required. The EA offer a "pre-application" service, whereby an indicative permit with flow and quality parameters is given, based on an assessment undertaken by the EA. This is then used as the basis of design and costing for the scheme.

The DWF limits proposed on the permit pre-applications take account of the recent daily flow trends and future required capacity up to 2036.

DWF is a key factor in the assessment of quality parameters in the new permit, as an input to water quality modelling to ascertain the appropriate quality parameters necessary to ensure no deterioration to the current WFD status and limit within-class deterioration. The outputs of the pre-applications received back from the EA for the STWs are shown in the table below[12].

Sewage Treatment Works	Current DWF (m3/day)	Final Effluent Quality Parameter	Current Load Entering Watercourse (kg/day)	Proposed DWF (m3/day)	Proposed Load Entering Watercourse (kg/day)
Chieveley	800	Ammoniacal N BOD SS Total P	4.0 8.0 12.0 0.8	1000	3.0 8.0 12.0 0.3
Bibury	122	Amm. N BOD SS Total P	No limit 3.7 5.5 No limit	262	3.1 3.7 5.5 0.3
Long Crendon	440	Amm. N BOD SS Total P	0.9 3.1 6.6 No limit	573	0.6 2.9 5.7 0.6

[12] The pre-application for Long Crendon STW is still in progress, and therefore the parameters outlined on Table 7 for Long Crendon are indicative of the methodology being applied to the other four STWs.

Sewage Treatment Works	Current DWF (m3/day)	Final Effluent Quality Parameter	Current Load Entering Watercourse (kg/day)	Proposed DWF (m3/day)	Proposed Load Entering Watercourse (kg/day)
Longborough	79.5	Amm. N BOD SS Total P	No limit 2.4 3.6 No limit	132	2.6 2.0 2.6 0.1
Willingale	266	Amm. N BOD SS Total P	1.6 4.8 9.3 0.1	339	1.0 3.7 5.8 0.1

Table 7 – Current and proposed future DWF limits and loads to the environment

Out of the five STWs, four have had no-deterioration principles applied to improve the quality of the watercourse they are being discharged into:

- Chieveley STW – improvement on ammoniacal nitrogen and phosphorus loads.
- Long Crendon STW – improvement on ammoniacal nitrogen, Biochemical Oxygen Demand (BOD) and Suspended Solids (SS) loads.
- Longborough STW – improvement on BOD and SS loads.
- Willingale STW – improvement on ammoniacal nitrogen, BOD and SS loads.

This enhancement case is based on the difference between load standstill and no-deterioration. The basis for load standstill is no increase or decrease in the total daily load entering the watercourse. For example, Chieveley STW has a current DWF permit of 800 m^3/day and an ammoniacal nitrogen permit of 5 mg/l, resulting in a permitted load entering the watercourse of 4 kg/day. If load standstill principles are applied, and with a DWF increase to 1,000 m^3/day, the new ammoniacal nitrogen permit would be 4 mg/l to ensure the daily permitted load entering the watercourse is maintained at 4 kg/day. The pre-application returned an ammoniacal nitrogen limit of 3 mg/l, constituting a 25% improvement of the daily permitted ammoniacal nitrogen load entering the watercourse.

We recognise that no-deterioration is not a new principle *per se* however it is being newly applied to the above STWs through the permit variation process and therefore we have not been funded to provide this level of enhancement. As this is regarding improving the watercourse, this investment programme requires expenditure above our base allowance.

There are three STWs that have had first time permit limits applied to the final effluent quality:

- Bibury STW – first time ammoniacal nitrogen and phosphorus limits.
- Long Crendon STW – first time phosphorus limit.
- Longborough STW – first time phosphorus limit.

This programme of investment is required to enhance the treatment process to ensure the required first-time permit limits can be met. As these quality parameters are not currently permitted at the above three STWs, this represents a change in regulatory expectations of the performance of our assets. Therefore, expenditure above our base allowance is required to be compliant with the new final effluent parameters.

4. Best option for customers

In this section, we explain our original approach to identifying 157 priority sites. Through ongoing engineering work and programme optimisation, we have rationalised the numbers of sites that require investment from 157 to 101. We explain why costs have increased from £677m in October 2023 to £1,044m in this submission, as confidence in scope and outputs has improved.

Identification of 157 sites of concern

The high-level process for addressing compliance risks at sewage treatment works is shown below. Each site is subject to a Root Cause Analysis. If necessary, a site progresses through to solution delivery via one of the routes outlined further in this section.

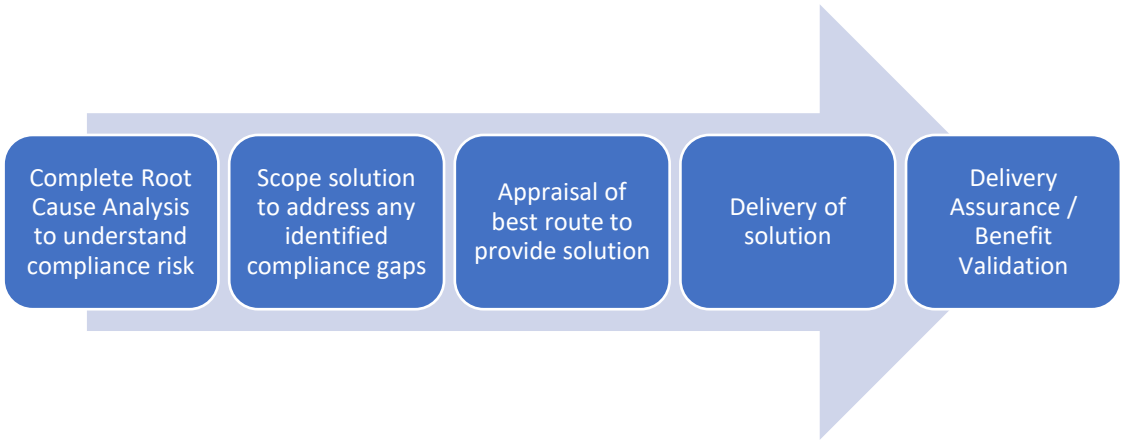

Figure 4: WAAP programme development process

A review of flow data recorded in 2020 and 2021 resulted in the identification of 157 "sites of concern" which were passed forward for Root Cause Analysis. Initial priority for Root Cause Analysis was given to understanding the compliance position where no investment was forecast to take place in AMP7.

Once a Root Cause Analysis is completed, solutions are scoped and costed in outline for each site. Sites are then prioritised for delivery by determining a measure of the current risk of potential environmental impact. This is done by assessing both impact and consequence on a 1-5 scale.

Risk of potential environmental impact is calculated as:

Impact (1-5) x Likelihood (1-5) giving a range of 1-25.

Impact is assessed as the average of recorded spills duration and watercourse sensitivity according to the tables below.

Spill duration classification	Rating
Zero	1
Not used	2
1000 hrs	3
2000 hrs	4
3000 hrs and above	5

Table 8 – Spills duration ratings

Watercourse sensitivity	Rating
Not used	1
Low	2
Medium	3
High	4
Very High	5

Table 9 – Watercourse sensitivity ratings

Likelihood is based on the information on spill frequency gathered over 2021 and 2022. The ratings are shown in the table below.

Spill frequency classification	Rating
Non-spiller	1
Low	2
Medium	3
High	4
Very High	5

Table 10 10 – Spill frequency ratings

This approach is broadly consistent with those factors outlined by the Environment Agency. For sites where solution scoping and outline costing has been carried out, it is possible to calculate a ratio of *Risk of Environmental impact / Cost*. Sites are ranked by this measure and the cumulative investment required to address the sites and plotted to give a risk vs cost curve to form a basis for prioritisation of delivery.

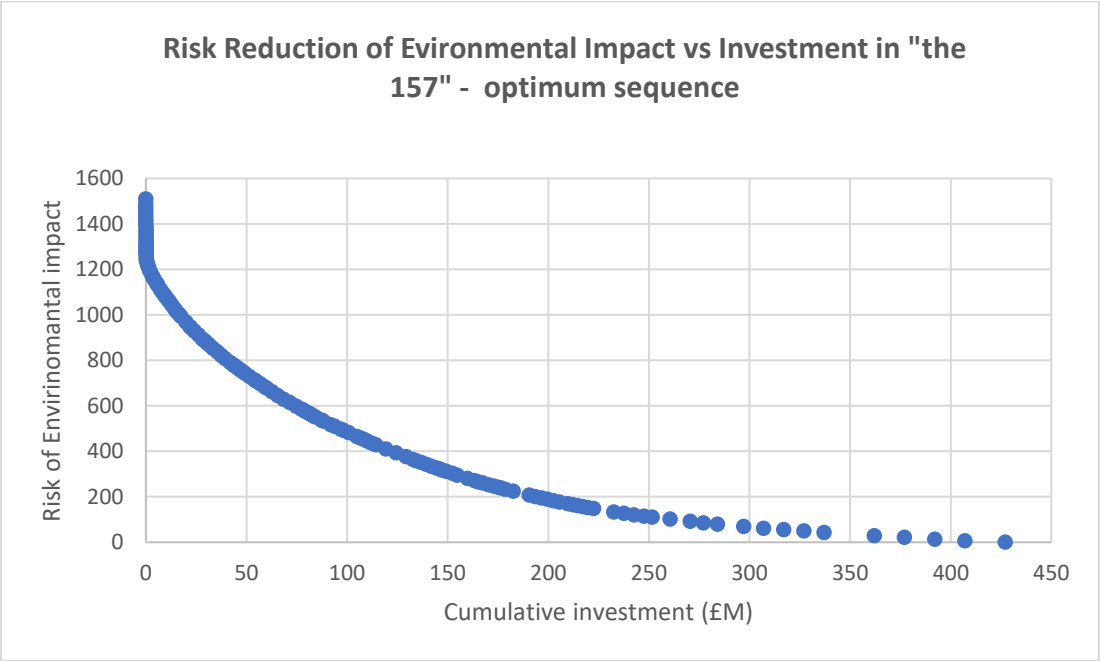

Figure 5: Risk reduction of potential environmental impact versus investment

A final consideration for managing priorities is the impact of the site on the planned changes to the Environmental Performance Assessment (EPA) as notified by the EA[13]. This gives notice that an assessment of flow compliance in 2026 onwards will count towards the existing or a new EPA metric and will contribute to penalties or rewards under the Discharge Permit Compliance common performance commitment.

Investigation and site selection

The 157 sites in the first wave of Root Cause Analysis were selected following a review of flow data derived from MCERTS Final Effluent (FE) monitors and spill to environment Event Duration Monitors (EDMs).

Analysis was carried out during 2020 and 2021, the results were amalgamated to produce the 157 “sites of concern”. The completion of Root Cause Analysis assessments was prioritised for these sites.

The Root Cause Analysis for all 157 sites of concern were completed by end December 2022 and details of the findings were shared with Ofwat in January 2023.

[13] Water & Sewerage Company Environmental Performance Assessment (EPA) methodology (version 10) – February 2023

Solution scoping

Low complexity and lower value solutions ('quick wins') are passed to Thames Water Operations for direct delivery.

All other projects are taken through Thames Water's Stage Gate process, at which point the delivery route for each project will be confirmed.

Further Engineering work completed since October 2023

Since October 2023, considerable work has been completed to move sites through the Stage Gate process and increase understanding of the required scope and costs.

- Through delivery of the AMP7 programme and early optimisation work for AMP8, we have been able to determine that some WAAP outputs will be realised without the need for additional investment.
- In addition to sites moving through the Stage Gate process, the process itself now introduces a greater degree of cost certainty much earlier. These include supply chain de-risking/buildability reviews in advance of Stage Gate 1 and the production of Engineering Estimating System (EES) estimates as part of Engineering Technical Governance reviews.

In the table below, we present a view of the stage at which the 157 sites were at prior to our October 2023 business plan submission, and the changes and progress that has been made since then. In summary, programme optimisation has reduced the number of sites that require investment to remain compliant, and a greater proportion of sites that do require investment are now at Stage Gate 1 onwards and so have a higher confidence cost associated with them, derived from our Engineering Estimating System.

Status	Oct 2023 number of sites	August 2024 number of sites	Cost confidence
Site closed / compliant / existing scheme delivers / permit revoked	31	0	No WAAP investment needed
Quick Wins	3	0	<£100k Capital Maintenance activity
Root Cause Analysis – Stage Gate 1	77	28	Scope not defined. High level Engineering estimate based on Root Cause Analysis desktop assessment and site knowledge or, where available a high level estimate produced from our Engineering Estimating System for Technical Governance Gate 1.
Stage Gate 1 – Stage Gate 2	33	43	Cost based on Stage Gate 1 Engineering Estimating System estimate with updates based on deliverer design development activities and supply chain pricing once available.

Status	Oct 2023 number of sites	August 2024 number of sites	Cost confidence
Stage Gate 2 – Start on site	6	21	Cost based on market tested supply chain estimates and contract values once available. Cost estimate based on deliverers' forecasts including internal costs and risk allowance.
Start on site - Completion	7	4	As above.
Complete	0	0	
Dry Weather Flow sites	0	5	4 of the 5 DWF sites are pre-SG1 and as such the scope is undefined and estimates for these sites remain at a high level.
	157	101	

Table 11 – Progress of WAAP sites through Stage Gates

Optioneering

Category	Option considered	Option retained or not?	Reasons
Capital investment	Yes	Yes	Improvements to sewage treatment works within the footprint of the site
Operational interventions	Yes	Yes	Operational 'quick wins' have been considered during the optioneering process
Nature-based solution	Yes	No	Considered, but opportunities very limited in practice due to scale
Partnership workings	No	No	Not appropriate for this enhancement case
Catchment management	Yes	No	Considered, but opportunities very limited in practice due to scale
Behavioural change	No	No	Not applicable for this enhancement case

Table 12 – Initial consideration of technology options

We have completed over 100 Engineering Technical Governance reviews in developing this programme of work that asset individual site needs, options, and recommended solutions. Costs were built up from our Engineering Estimating System (EES). Please refer to document TMS-DD-085 (Sewage Treatment Waste Asset Assurance Programme - Optioneering evidence) which

contains examples of Technical Governance reviews for Horley Sewage Treatment Works and Marlborough Sewage Treatment Works.

Direct procurement for customers

In our PR24 assessment of Direct Procurement for Customers[14], we aim to standardise the identification process of DPC suitable projects that could be used going forward. This takes into account guidance on PR24 states that Ofwat is moving towards "DPC by default" model for all eligible schemes, meaning the assessment must be more future proof. This position aims to deliver value for customers, where the costs of delivering schemes is high and a competitive delivery process could bring additional benefits.

Overall, we very much support Ofwat's policy aims and recognise the potential that competitive tendering of large, discrete schemes (through DPC or SIPR) offers. In the context of competitive delivery, Thames Water's goals align with Ofwat's objectives to deliver greatest value to customers. Thames Water has demonstrated our commitment and drive to consider and make DPC work through the RAPID process in developing the SROs. We see how DPC could play an important role in bringing innovation, resilience, and novel approaches through competition. It is with that overall lens of customer interest that we need to view DPC as a default.

The PR24 guidance splits the discreteness assessment into three separate tests. 'Interactions' tests from PR19 have been combined under construction and failure and 'outputs' tests are combined under operations. The guidance recognises that "technical discreteness is a spectrum – with at the one end, wholly independent, separate projects and, at the other end, projects that are heavily integrated with existing assets and operations. Most DPC projects sit between the two extremes."[15]

The tests are binary (pass / fail), rather than the scale used in PR19. Companies are required to submit evidence supporting their assessment against each aspect of the test.

Our DPC assessment for this Enhancement Case is summarised in the table below.

Discreteness assessment		
Scalability	Construction	Operations & Maintenance
Fail	Fail	Fail

Table 13 - DPC Assessment

This enhancement case is assessed as not suitable for DPC. Based on the risk assessment, no DPC variant would be suitable.

[14] https://www.thameswater.co.uk/media-library/home/about-us/regulation/our-five-year-plan/pr24-2023/dpc.pdf
[15] Page 6 of the Technical Discreetness guidance

5. Cost efficiency

In this section, we demonstrate that our latest cost estimates are efficient by proportionally allocating costs across growth and new compliance drivers. To do this, we use insight from the Draft Determination cost assessment to understand efficiency and demonstrate that at least £414m of the £1,044m is efficient based on growth as a driver for this Enhancement Case alone. The balance of the investment (£630m) is efficient, as we have moved from desktop assessments to bottom-up costing from our Engineering Estimating System, which uses outturn market tested costs.

WAAP costs proportionally allocated to growth are efficient

- We have applied Ofwat's Draft Determination enhancement feeder model for growth at sewage treatment works[16] to determine the efficient cost of growth at 60 WAAP sewage treatment works.
- We have created a version of data table ADD19 for the 60 WAAP growth sites, which provides the inputs to the cost calculations[17]
- We have used the forecast growth at 60 WAAP sites set out in Table 4 of Section 3 above and have then applied other data from ADD19 to derive efficient costs.

Please refer Appendix 2 which contains a list of the 60 sites and the resultant cost of from the Draft Determination feeder model. The total efficient cost for addressing growth across the 60 WAAP sites where growth is forecast is £414m.

The balance of the WAAP programme to address compliance has been market tested and is efficient

From Table 8 in the Best Value Option for Customers section above, we demonstrate the number of WAAP solutions that have moved from a desktop Root Cause Analysis through our stage gate process and on to delivery:

- A total of 28 solutions are currently at Stage Gate 1. A high-level estimate has been produced using our Engineering Estimating System which is founded upon outturn costs from projects that we have previously delivered.
- A total of 43 solutions are between Stage Gate 1 and 2. Engineering Estimating System estimates have been produced with updates based on deliverer design development activities and supply chain pricing in some cases.

[16] https://www.ofwat.gov.uk/wp-content/uploads/2024/07/PR24-DD-WW-Growth-at-STWs-2.xlsx

[17] See TMS-DD-088 - Version of data table ADD19 for 60 WAAP growth sites.

- A total of 21 solutions have started on site. Costs are based on market tested supply chain estimates and contract values. Cost estimates are based on deliverers' forecasts including internal costs and risk allowance.

In summary, there has been significant progress in engineering design, procurement, and engagement with our supply chain since our October 2023 business plan submission. We have improved the confidence in our cost estimates, which are now substantially market tested. We consider that our costs are efficient.

6. Customer protection

In this section, we propose PCDs to protect customers and to hold us to account to deliver this enhancement investment. We are open to this programme being put through Ofwat's Large Scheme Gated Process to add further protection.

The 4 PCDs below align to those set by Ofwat in the Draft Determination for our sewage treatment growth enhancement case. Included with this representation is a version of data table ADD19[18] from which the table below has been populated:

Table 14 – PCD forecast deliverables for growth

Deliverable	Unit	Forecast deliverables (cumulative)				
		2025/26	2026/27	2027/28	2028-29	2029/30
Absolute change in population equivalent (PE) served	PE					450,762
Process capacity added	PE					991,709
Change in Dry Weather Flow (DWF) permit level	m3/day					No change
Change in the ammonia permit level	mg/l					No change

The version of ADD19 that we have created would allow non delivery PCD rates to be calculated on a site by site basis. As with the sewage treatment growth PCD set in the Draft Determination (PCDWW27), we do not consider that timing incentives are appropriate.

We do not consider that additional PCDs for the new compliance needs that we have identified in Section 3 are required. This is because customers are already protected through the Discharge Permit Compliance common performance commitment and the EA's permitting regime.

[18] See TMS-DD-091 Version of data table ADD19 for 60 WAAP growth sites

Appendices

Appendix A – Proposed schemes

Site Name	Included in April Business Plan (157 sites total?)	Included in Draft Determination response (101 sites total)?	WAAP Growth Costs (Ofwat STW Growth Feeder Cost Model)	WAAP New Requirements (22/23 incl. D&PG)
ABINGDON STW	Y	Y	£4,746.63k	£9,784k
ALDERMASTON STW	Y	Y	£3,257.53k	£5,311k
ALDERSHOT STW	Y	Y	£4,523.55k	-
APPLETON STW	Y	Y	£3,515.45k	£104k
ARBORFIELD STW	Y	Y	-	£154k
ASCOT STW	Y	Y	-	£8,932k
ASHRIDGE (WOKINGHAM) STW	Y	Y	£3,442.96k	-
ASTON LE WALLS STW	Y	Y	-	£978k
AYLESBURY STW	Y	Y	£10,176.85k	£13,201k
BARKWAY STW	Y	Y	-	£1,534k
BASINGSTOKE STW	Y	Y	£6,975.11k	£1,218k
BECKTON STW	Y	Y	£122,949.93k	-
BEENHAM STW	Y	Y	£3,262.01k	-
BENTLEY STW	Y		-	-
BICESTER STW	Y		-	-
BLETCHINGDON STW	Y	Y	£3,272.28k	-
BLOXHAM STW	Y		-	-
BODDINGTON STW	Y		-	£136k
BORDON STW	Y		-	-
BRACKNELL STW	Y		-	-
BRICKENDON STW	Y	Y	£3,260.94k	-
BROADWELL STW	Y	Y	£3,334.84k	-
BUCKLEBURY STW	Y	Y	£0.00k	£833k
BUNTINGFORD STW	Y		-	-
BURGHFIELD STW	Y	Y	£3,290.52k	£1,507k
BURSTOW STW	Y		-	-
CADDINGTON STW	Y		-	£102k
CAMBERLEY STW	Y		-	-

Site Name	Included in April Business Plan (157 sites total?)	Included in Draft Determination response (101 sites total)?	WAAP Growth Costs (Ofwat STW Growth Feeder Cost Model)	WAAP New Requirements (22/23 incl. D&PG)
CARTERTON STW	Y	Y	£3,598.51k	-
CASSINGTON STW	Y	Y	£0.00k	£828k
CHALGROVE STW	Y	Y	£0.00k	£193k
CHAPEL ROW STW	Y	Y	£0.00k	£4,221k
CHARLBURY STW	Y	Y	£3,285.68k	-
CHERTSEY STW	Y		-	-
CHILTON FOLIAT STW	Y		-	-
CHINNOR STW	Y		-	-
CHIPPING NORTON STW	Y	Y	-	£912k
CHIPPING WARDEN STW	Y		-	-
CHOBHAM STW	Y		-	-
CHURCH HANBOROUGH STW	Y	Y	£3,313.87k	-
CLANFIELD MARSH STW	Y	Y	£3,260.70k	£2,196k
COMPTON STW	Y	Y	-	£4,449k
COTTERED STW	Y		-	-
CRANLEIGH STW	Y		-	-
CRAWLEY STW	Y		-	-
CRICKLADE STW	Y		-	-
CRONDALL STW	Y	Y	-	£1,106k
CROPREDY STW	Y	Y	£3,281.51k	-
CROSSNESS STW	Y	Y	£60,152.88k	£57,513k
CUDDINGTON STW	Y	Y	-	£1,458k
CULHAM STW	Y	Y	-	£9,030k
CULWORTH STW	Y	Y	-	£570k
DAGNALL STW	Y	Y	-	£180k
DEEPHAMS STW	Y		-	-
DORCHESTER STW	Y		-	-
DORKING STW	Y	Y	£0.00k	£8,057k
DRAYTON STW	Y		-	-
EARLSWOOD STW	Y		-	-
EAST HYDE STW	Y		-	-
EAST SHEFFORD STW	Y		-	-
EASTHAMPSTEAD PARK STW	Y		-	-

Site Name	Included in April Business Plan (157 sites total?)	Included in Draft Determination response (101 sites total)?	WAAP Growth Costs (Ofwat STW Growth Feeder Cost Model)	WAAP New Requirements (22/23 incl. D&PG)
ESHER STW	Y	Y	£4,523.76k	£21,784k
EYDON STW	Y	Y	£3,258.10k	-
FARINGDON STW	Y	Y	£3,661.02k	£76k
FARNBOROUGH STW	Y	Y	-	£3,215k
FARNHAM STW	Y	Y	£3,865.99k	£10,735k
FINSTOCK STW	Y	Y	£3,272.22k	-
FLEET STW	Y		-	-
FOREST HILL STW	Y	Y	-	£5,065k
FYFIELD STW	Y		-	-
GERRARDS CROSS STW	Y	Y	£3,381.83k	£3,734k
GREATWORTH STW	Y	Y	£0.00k	£3,507k
GRENDON UNDERWOOD STW	Y	Y	£3,261.71k	-
GUILDFORD STW	Y		-	-
HADDENHAM STW	Y		-	-
HAMPSTEAD NORREYS STW	Y	Y	-	£3,389k
HARPENDEN STW	Y		-	-
HARTLEY WITNEY STW	Y		-	-
HASLEMERE STW	Y	Y	-	£20,877k
HATFIELD HEATH STW	Y	Y	£3,344.73k	£1,287k
HOCKFORD STW	Y	Y	-	£4,033k
HOGSMILL STW	Y	Y	£9,396.29k	-
HOLMWOOD STW	Y	Y	£3,423.73k	£1,242k
HOOK NORTON STW	Y	Y	£3,278.39k	-
HORLEY (OXFORDSHIRE) STW	Y		-	£358k
HORLEY (SURREY) STW	Y	Y	£3,644.88k	£11,437k
HORTON CUM STUDLEY STW	Y	Y	-	£4,223k
HUNGERFORD STW	Y		-	-
KINGSCLERE STW	Y	Y	£3,376.99k	£4,862k
KINGSTON BAGPUIZE STW	Y		-	-
KINTBURY STW	Y		-	-
LEATHERHEAD STW	Y		-	-
LIGHTWATER STW	Y	Y	£3,753.95k	£5,036k

Site Name	Included in April Business Plan (157 sites total?)	Included in Draft Determination response (101 sites total)?	WAAP Growth Costs (Ofwat STW Growth Feeder Cost Model)	WAAP New Requirements (22/23 incl. D&PG)
LITTLE COMPTON STW	Y	Y	£3,257.18k	-
LITTLE HALLINGBURY STW	Y	Y	-	£4,714k
LITTLE MARLOW STW	Y	Y	£5,564.40k	£16,538k
LONGREACH STW	Y	Y	£17,138.37k	-
LUDGERSHALL STW	Y	Y	-	£1,302k
MAIDENHEAD STW	Y	Y	£7,685.53k	-
MAPLE LODGE STW	Y	Y	£19,751.12k	£83,092k
MARKYATE STW	Y	Y	£3,323.22k	£1,280k
MARLBOROUGH STW	Y		-	-
MARSH GIBBON STW	Y		-	-
MERSTHAM STW	Y		-	-
MIDDLE BARTON STW	Y	Y	£3,265.79k	£2,538k
MIDDLETON CHENEY STW	Y		-	-
MILL GREEN STW	Y	Y	-	£1,970k
MILTON UNDER WYCHWOOD STW	Y		-	-
MOGDEN STW	Y	Y	£67,319.68k	£47,998k
MORTIMER (STRATFIELD) STW	Y		-	£17k
NAGS HEAD LANE STW	Y	Y	£4,475.21k	£6,933k
NEWBURY STW	Y	Y	£3,796.77k	£19,319k
NORTH WEALD STW	Y		-	-
NORTHLEACH STW	Y		-	-
OXFORD STW	Y		-	-
PANGBOURNE STW	Y	Y	-	£565k
PRINCES RISBOROUGH STW	Y	Y	£3,996.84k	£4,934k
PURTON STW	Y	Y	-	£127k
RAMSBURY STW	Y		-	-
READING STW	Y	Y	-	£15,584k
RIVERSIDE STW	Y	Y	£21,749.12k	£85,805k
SANDHURST STW	Y	Y	£4,188.34k	-
SELBORNE STW	Y	Y	£3,269.28k	-
SHABBINGTON STW	Y		-	£9k
SHAMLEY GREEN STW	Y	Y	-	£2,263k

Site Name	Included in April Business Plan (157 sites total?)	Included in Draft Determination response (101 sites total)?	WAAP Growth Costs (Ofwat STW Growth Feeder Cost Model)	WAAP New Requirements (22/23 incl. D&PG)
SHERFIELD ON LODDON STW	Y	Y	£3,311.38k	£3,526k
SHUTFORD STW	Y		-	-
SILCHESTER STW	Y	Y	-	£9,691k
SONNING COMMON STW	Y	Y	£3,394.98k	£2,193k
SOUTH LEIGH STW	Y		-	-
SOUTH MORETON STW	Y	Y	-	£1,378k
STANDON STW	Y	Y	£3,329.58k	£1,375k
STANSTED MOUNTFITCHET STW	Y		-	-
STANTON HARCOURT STW	Y		-	-
STEWKLEY STW	Y	Y	£3,268.34k	£3,326k
STONE STW	Y	Y	-	£121k
SWINDON STW	Y	Y	£8,644.21k	£7,325k
TAKELEY STW	Y	Y	£3,439.74k	-
TETSWORTH STW	Y	Y	£3,272.70k	£23k
THAME STW	Y	Y	-	£5,445k
THERFIELD STW	Y	Y	-	£3,798k
THEYDON BOIS STW	Y	Y	£3,312.25k	-
THORNWOOD STW	Y		-	-
UFFINGTON STW	Y		-	£12k
WADDESDON STW	Y	Y	£3,320.16k	-
WANBOROUGH STW	Y		-	£1,246k
WARGRAVE STW	Y	Y	£5,555.94k	-
WARMINGTON STW	Y	Y	£3,257.86k	-
WASHWATER STW	Y		-	£23k
WHITE RODING STW	Y		-	-
WHITWELL STW	Y	Y	£3,269.96k	-
WINDSOR STW	Y	Y	£4,183.45k	£5,083k
WINGRAVE STW	Y	Y	-	£470k
WISLEY STW	Y		-	-
WOKING STW	Y		-	-
WOODSTOCK STW	Y		-	-
WORMINGHALL STW	Y		-	-
BIBURY DWF	Y	Y	-	

Site Name	Included in April Business Plan (157 sites total?)	Included in Draft Determination response (101 sites total)?	WAAP Growth Costs (Ofwat STW Growth Feeder Cost Model)	WAAP New Requirements (22/23 incl. D&PG)
HUNTERCOMBE STW	Y		-	-
LONGBOROUGH STW	Y	Y	-	
LEWKNOR STW	Y		-	-
LONG CRENDON STW	Y	Y	-	
CHIEVELEY STW	Y	Y	-	
WILLINGALE STW	Y	Y	-	£6,209k
SLOUGH STW	Y	Y (Major Projects)		

Appendix B – WAAP sites growth costs

The 60 sites in the table below have been costed using the sewage treatment growth Draft Determination feeder model. The total efficient cost of growth in AMP8 is £414m for these 60 WAAP sites.

Scheme name	Units	DPs	AMP8 £m	Current DWF permit (m3/day)	Current FFT permit (l/s)	Historical BOD permit (mg/l)	Historical ammonia permit (mg/l)	Historical suspended solids permit (mg/l)	Historical phosphorus permit (mg/l)
Abingdon STW - AMP8 Growth	£m	3	4.747	210	7.3	10.0	3.0	25.0	2.00
Aldermaston STW - AMP8 Growth	£m	3	3.258	136	5.6	30.0	None	45.0	None
Aldershot STW - AMP8 Growth	£m	3	2.512	11,435	320.0	9.0	2.0	20.0	2.00
Appleton STW - AMP8 Growth	£m	3	3.515	1,368	47.5	16.0	4.0	45.0	5.00
Wokingham STW - AMP8 Growth	£m	3	2.434	7,700	TDC	6.0	2.0	15.0	2.00
Aylesbury STW - AMP8 Growth	£m	3	10.177	26,775	715.0	10.0	2.0	15.0	1.00
Basingstoke STW - AMP8 Growth	£m	3	6.975	Max Permit only (65,000m3/day)	752.3	10.0	1.0	10.0	0.50
Beckton STW - AMP8 Growth	£m	3	64.889	1,344,000	27,036.0	18.0	2.5	45.0	None
Beenham STW - AMP8 Growth	£m	3	0.082	181	6.5	30.0	None	45.0	None

Scheme name	Units	DPs	AMP8 £m	Current DWF permit (m3/day)	Current FFT permit (l/s)	Historical BOD permit (mg/l)	Historical ammonia permit (mg/l)	Historical suspended solids permit (mg/l)	Historical phosphorus permit (mg/l)
Bletchingdon STW - AMP8 Growth	£m	3	1.061	382	8.3	10.0	5.0	25.0	None
Brickendon STW - AMP8 Growth	£m	3	2.509	130	1.6	15.0	None	20.0	None
Broadwell STW - AMP8 Growth	£m	3	1.150	1,010	TDC	26.0	3.0	45.0	None
Burghfield STW - AMP8 Growth	£m	3	3.291	2,200	46.0	7.0	2.0	15.0	0.30
Carterton STW - AMP8 Growth	£m	3	0.669	3,884	115.0	15.0	4.0	30.0	0.60
Charlbury STW - AMP8 Growth	£m	3	0.711	727	18.0	30.0	None	45.0	None
Church Hanborough STW - AMP8 Growth	£m	3	0.500	1,455.000	50.520	13.0	3.0	30.0	None
Clanfield STW - AMP8 Growth	£m	3	3.261	463.000	7.300	10.0	5.0	25.0	None
Cropredy STW - AMP8 Growth	£m	3	2.905	788.000	10.700	15.0	10.0	45.0	None
Crossness STW - AMP8 Growth	£m	3	60.153	597,000.000	12,939.000	18.0	2.5	45.0	None
Esher STW - AMP8 Growth	£m	3	4.524	35,200.000	720.000	12.0	2.0	25.0	1.00
Eydon STW - AMP8 Growth	£m	3	0.557	150.000	5.000	30.0	9.0	45.0	0.50
Faringdon STW - AMP8 Growth	£m	3	3.661	2,812.000	68.000	10.0	3.0	45.0	None
Farnham STW - AMP8 Growth	£m	3	3.866	13,300.000	TDC	10.0	3.0	20.0	2.00

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Finstock STW - AMP8 Growth	£m	3	1.140	635.000	17.000	30.0	17.0	45.0	None
Gerrards Cross STW - AMP8 Growth	£m	3	3.382	3,994.000	TDC	10.0	2.0	25.0	None
Grendon Underwood STW - AMP8 Growth	£m	3	1.415	Max Permit only (495m3/day)	7.500	30.0	14.0	45.0	None
Hatfield Heath STW - AMP8 Growth	£m	3	3.345	811.000	25.000	15.0	3.0	25.0	None
Hogsmill STW - AMP8 Growth	£m	3	5.732	Two permits: 1) 68,905 (DWF), 2) 20,000 (Max)	2,344.000	7.0	1.0	25.0	1.00
Holmwood STW - AMP8 Growth	£m	3	3.424	1,211.000	41.000	15.0	10.0	15.0	0.30
Hook Norton STW - AMP8 Growth	£m	3	1.910	633.000	13.000	13.0	4.0	45.0	None
Horley (Surrey) STW - AMP8 Growth	£m	3	3.645	9,622.000	265.000	15.0	4.0	30.0	2.00
Kingsclere STW - AMP8 Growth	£m	3	3.377	1,261.000	38.000	12.0	4.0	30.0	None
Lightwater STW - AMP8 Growth	£m	3	3.754	5,200.000	137.700	10.0	2.0	25.0	2.00
Little Compton STW - AMP8 Growth	£m	3	1.097	90.000	3.100	25.0	10.0	45.0	None
Little Marlow STW - AMP8 Growth	£m	3	5.564	40,300.000	1,442.000	9.0	5.0	15.0	1.00

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Long Reach STW - AMP8 Growth	£m	3	12.334	186,000.000	3,912.000	22.0	4.5	50.0	None
Maidenhead STW - AMP8 Growth	£m	3	4.632	21,000.000	TDC	12.0	2.0	15.0	2.00
Maple Lodge STW - AMP8 Growth	£m	3	19.751	130,000.000	3,470.000	15.0	1.0	15.0	1.00
Markyate STW - AMP8 Growth	£m	3	3.323	Max Permit only (3,393m3/day)	33.500	7.0	3.0	15.0	None
Middle Barton STW - AMP8 Growth	£m	3	3.266	Max Permit only (1,188m3/day)	13.700	30.0	None	45.0	1.00
Mogden STW - AMP8 Growth	£m	3	67.320	559,000.000	12,315.000	18.0	2.5	45.0	None
Nags Head Lane STW - AMP8 Growth	£m	3	4.475	9,000.000	230.000	8.0	1.0	20.0	None
Newbury STW - AMP8 Growth	£m	3	3.797	24,614.000	TDC	10.0	2.0	30.0	0.70
Princes Risborough STW - AMP8 Growth	£m	3	3.997	3,900.000	112.000	20.0	6.0	30.0	2.00
Riverside STW - AMP8 Growth	£m	3	21.749	103,000.000	2,384.000	18.0	2.5	45.0	None
Sandhurst STW - AMP8 Growth	£m	3	0.759	13,000.000	TDC	9.0	5.0	20.0	0.50
Selborne STW - AMP8 Growth	£m	3	1.831	102.000	2.700	15.0	None	20.0	1.00

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Sherfield on Loddon STW - AMP8 Growth	£m	3	3.311	2,034.000	43.000	21.0	3.0	45.0	None
Sonning Common STW - AMP8 Growth	£m	3	3.395	1,650.000	TDC	20.0	5.0	30.0	None
Standon STW - AMP8 Growth	£m	3	3.330	977.000	23.000	30.0	3.0	45.0	None
Stewkley STW - AMP8 Growth	£m	3	3.268	275.000	8.300	30.0	5.0	45.0	0.50
Swindon STW - AMP8 Growth	£m	3	8.644	48,275.000	1,423.000	11.0	1.0	17.0	1.00
Takeley STW - AMP8 Growth	£m	3	1.970	667.000	TDC	15.0	5.0	20.0	0.90
Tetsworth STW - AMP8 Growth	£m	3	3.273	324.000	6.900	30.0	11.0	45.0	None
Theydon Bois STW - AMP8 Growth	£m	3	1.218	3,440.000	TDC	20.0	5.0	40.0	None
Waddesdon STW - AMP8 Growth	£m	3	3.262	680.000	22.000	15.0	3.0	45.0	None
Wargrave STW - AMP8 Growth	£m	3	3.648	30,000.000	1,041.600	18.0	5.0	45.0	1.00
Warmington STW - AMP8 Growth	£m	3	0.807	78.000	2.500	30.0	None	45.0	None
Whitwell STW - AMP8 Growth	£m	3	0.757	169.000	5.900	20.0	10.0	20.0	None
Windsor STW - AMP8 Growth	£m	3	4.183	13,500.000	TDC	20.0	10.0	30.0	2.00