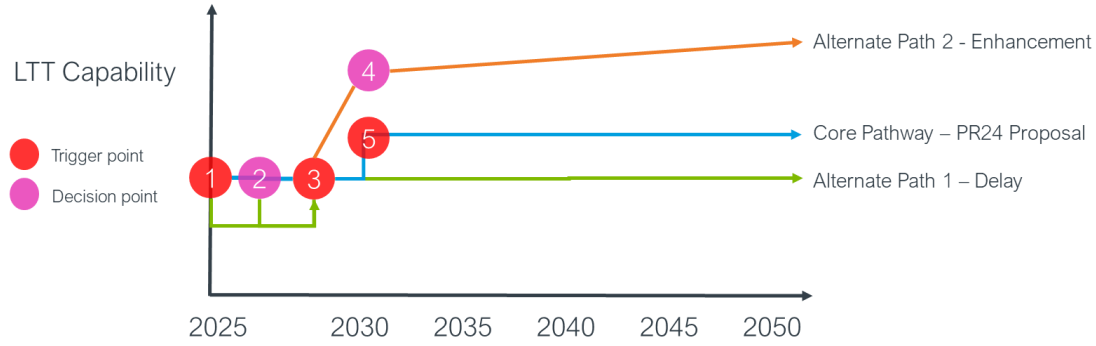
TMS47 Thames Tideway Tunnel

Contents

Executive Summary

Our primary focus will be on integrating the Thames Tideway Tunnel (TTT) within our broader network to build an efficient system. We will complete the commissioning and acceptance phases. This aligns with the 2050 strategy priority to embed the new tunnel within the overall London Network Operations and establish long-term running reliability and efficient maintenance operations for the new assets which complements the existing infrastructure and resourcing.

Delivery of the London Tideway Tunnel (LTT) system and changes in customer perception of the acceptability of untreated sewage spills to rivers has presented a challenge to the TTT price control strategy. This has resulted in changes to System Acceptance planning and review of LTT operations. We will seek opportunities to deliver enhanced benefits beyond the original scope of the system to meet increasing expectations from our customers. The diagram below shows the decision points against various scenarios for when choices will need to be made about handover optimisation and LTT system enhancement.



1. March 2025 – Successful completion of LTT Handover
2. September 2026 – Successful completion of LTT Acceptance (18 Month)
3. February 2028 – Successful completion of LTT Acceptance (35 Month)
4. March 2030 – Optimisation proof of concept established
5. March 2030 – PR24 scope delivery

Figures 1 : LTT Core and Adaptive Strategies alignment with TWUL 2050 vision

This has led to both changed resourcing and additional asset requirements in the core planning for AMP8, and a proposal to embark on a System Enhancement Optimisation activity during AMP8 to explore the feasibility of revised operation post System Acceptance.

This aligns with the overall strategy to pursue a ‘smart network’ strategy through AMP8/9.
The key residual risk within the plan remains delay to AMP7 delivery or a longer than envisaged System Acceptance period which affects the delivery profile in AMP8. The current plan assumes Handover and Acceptance marginally ahead of the current programme forecasts. Enhancement activity implementation proposals are planned at the latest likely acceptance completion date to ensure plans represent a realistic programme which is unlikely to be deferred by changes between now and March 2025.

TTT is delivering customer needs

Background

The London Tideway Tunnel (LTT) is created when the Lee Tunnel and the Thames Tideway Tunnel (TTT) are joined together. Its creation, at the conclusion of the TTT, will significantly improve the quality of the River Thames by reducing the amount of untreated sewage that is discharged into the river. The LTT will be 32 kilometres long and up to 75 meters deep, running beneath the river from Acton in West London to Beckton in East London. The connection of the existing sewer network, North and South of the river, will join 2 large catchments (Beckton and Crossness) together to create the London Tideway System (LTS), which will manage the collection of excess flows and the controlled draining of the LTT.

The current sewer system in London was designed in the 19th century to serve a population of around 4 million people. Today, it serves a population of over 9 million, resulting in frequent sewer overflows that discharge untreated sewage into the river during heavy rain events. These overflows can have a significant impact on water quality, marine life and public health.

The completion of the project in 2024/25 represents the culmination of the Thames Tideway Strategic Study (TTSS), developed in the early 2000's. The TTSS developed a three-phase strategy spanning 25 years to improve London's ageing infrastructure in order to:

1. Expand the 5 Sewage Treatment Works (STW), discharging into the tidal Thames. Delivered in AMP4/5 and intercepted 40% of the Combined Sewer Overflow (CSO) discharge volumes.
2. Intercept the Abbey Mills CSO, the largest CSO in the tidal Thames system, with the Lee Tunnel. Delivered in AMP6 and intercepted 15% of the CSO discharge volumes.
3. Intercept the remaining CSOs in the Beckton and Crossness catchments with the Thames Tideway Tunnel. Expected to begin benefits in 2024 and to intercept 40% of the CSO discharge volumes.

The coming period will primarily focus on the integration of the new asset within the broader Thames Water network to build an effective and efficient system, which completes the requirements of the project and the three-phase strategy.

However, standards and expectations have changed since the inception of the London Tideway strategy. Therefore, in addition to the integration of the TTT project, this period will represent the beginning of a new strategy to reimagine how the asset and the broader network may be changed to deliver Thames Water's Strategic Vision. This reimagination project is beyond that for which the Thames Tideway Tunnel was originally designed.

Public concerns regarding water quality and environmental pollution

One of the main public concerns is the discharge of untreated sewage and other pollutants into rivers and waterways. This can have a significant impact on the environment and public health, as well as on recreational activities such as rowing, swimming and fishing. The Environment Agency has reported that over half of the country's rivers are failing to meet the required standards for water quality, with pollution from sewage being a major contributing factor.

Public concern has been growing in recent years due to a perceived lack of action by UK Water Companies to address the issue. Customers worry that companies are not doing enough to reduce pollution and protect the environment. There have been calls for stricter regulation,

greater investment in infrastructure, and increased transparency from the Water Companies to address these concerns.

How the TTT addresses public concerns

The London Tideway Tunnel is a clear demonstration of Thames Water's commitment to addressing public concerns about the impact of sewerage discharges to the environment. The project has been subject to extensive public consultation and engagement, prior to appointing the Infrastructure Provider, Tideway. Thames Water has then worked closely with Tideway to ensure that the project provides the design benefits while minimising disruption and environmental impact.

The London Tideway System will address this issue by intercepting the overflows from the Crossness and Beckton Catchments and transporting the sewage to the treatment plant at Beckton, where it will be treated before being discharged into the river. This will significantly reduce the amount of untreated sewage that is discharged into the river, improving water quality, and reducing the impact of sewage on the marine environment and public health.

What we did in AMP7

What we have achieved so far

The TTT project is the third and final phase of the TTSS. When finished, the cumulative impact of all 3 phases will reduce discharge volumes into the Thames by 95% and overall spills into the river by 90%. The completion of the third phase will result in the delivery of these four benefits:

- 40% capture of discharge volume (typical year)
- Improvement in river water quality through the reduction of sewer overflows along the tidal Thames
- A reduced health risk to recreational customers
- Mitigation of environmental pollution by reducing sewage derived litter entering the Tidal Thames

In addition, the completion of the project will deliver additional benefit for customers in London and Thames Water through:

- Creation of new public spaces and amenities
- Enhancement of infrastructure with increased capacity for future development

Maintaining TTT as a separate Price Control

After discussion between Thames Water and Ofwat, it has been agreed that the Thames Water TTT price control will be kept separate from the main utility price controls for one final AMP. This will:

- Enable the expenditure history to be kept separate. This will provide a data set that is easier to examine for learning opportunities for use within the water industry and potentially wider in the UK where the business model may be replicated.
- Bring the project to the point when Bazalgette Ltd undergo their first ‘Price Control’ in AMP9
- Permit the Tideway Integration Group (TIG) project team to create a single collaborative and coherent business plan for Thames Water. This will recognise that the TTT project will come to an end during AMP8, and the single business plan will need to be disaggregated to the accountable departments in the AMP9 submission.

As the project continues from the prior AMP, it is subject to change and the Thames Water TTT submission will need to be sensitive to the risk of inaccuracy due to that change. For example, 'Handover' is the point at which Tideway should have returned all 'loaned' property, back to Thames Water. The business plan assumes this is March 2025, the last month of the current AMP. However, if this were to move back, then additional Thames Water property costs, over and above disposal (which would always have been post-Handover), will occur in the AMP8 period.

Thames Water will be offering the enduring operational and legacy contact for our customers, and we must always look to balance swift delivery with delivery to project standards that will withstand external stakeholder and customer scrutiny. While contingency plans may support project objectives and standards, there may come a moment, in the customers interests, for the programme to move its delivery dates back, to ensure best value for our customers.

Optimisation of the Commissioning and Acceptance Plans

To that end, Thames Water has been working collaboratively with Tideway to amend the original agreements made in 2015. The purpose of these amendments is to ensure that the implementation of the commissioning phase can be started as soon as possible. This ensures that the tunnel can be brought into service and the activation of individual sites can be aligned with their completion programmes, which has been impacted by several factors including COVID-19, delaying their readiness.

Further to our support for delivery of the project, we have been working with Tideway and other stakeholders to optimise the commissioning and system acceptance phases through the strategic intent workstreams via a legal Deed of Variation.

Phased Commissioning

The original project agreements required every site to be completely ready before the start of system commissioning, defining System Commissioning start as the moment the isolation between the TTT and the Lee Tunnel has been removed to form the London Tideway Tunnel System. By agreeing to commence preliminary commissioning ahead of all site completion, it brings forward the start of commissioning, allowing the overall programme to be completed sooner.

Strategic Intent

The Strategic Intent seeks to provide greater resilience for the System Commissioning period and for System Acceptance to be successfully achieved ahead of the Planned System Acceptance Date of August 2027.

There will be benefits to the environment from reduced outages of the system to allow its connection and inspection and an optimised programme that benefits customers, leading to an earlier ending of the Government Support Package.

Key elements include an optimised period for Bulkhead removal, reduced from the original 8-week period to 2 weeks and contingencies for Low Rainfall that test the system with smaller storms than prescribed in the project documents. It also streamlines silt removal, testing protocols and revises the System Acceptance tests to align with the current population and better understood flow characteristics of the network. Finally, it provides an assessment at Handover of the data

gathered during 'stable running' of the system during commissioning to reduce the overall period of System Acceptance. For example, 9 months of stable data collection prior to starting System Acceptance will take 9 months off of the end of Systems Acceptance. This in turn reduces the risk of the project completing beyond Planned Systems Acceptance Date (PSAD), which is Tideway's contractual completion date. The Strategic Intent is a comprehensive range of actions to bring forward the end of Systems Acceptance and is the basis of the Deed of Variation. Our proposed third project incentive aligns with the Strategic Intent and the Deed of Variation

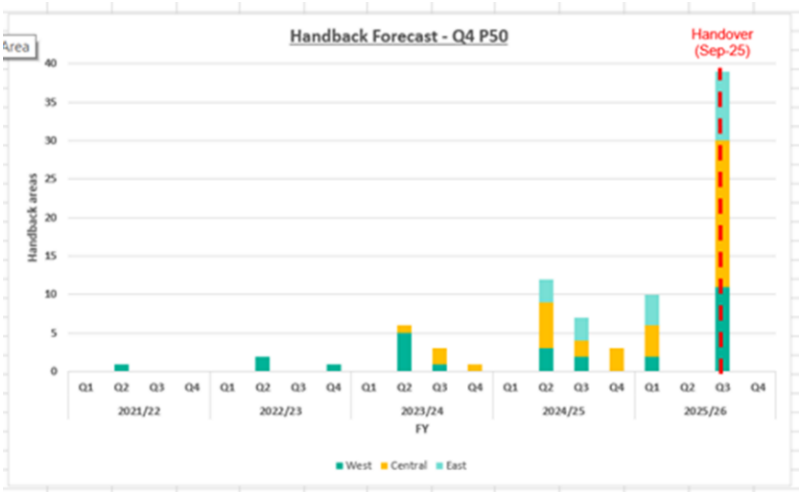
Performance commitments

During the AMP7 period, we have performed well at all Performance Commitment set out in our business plan. Our AMP7 performance, as measured by Ofwat performance metrics, is shown in figure 2

Performance Measure	Financial or Reputational	Forecast
ET01 – Readiness to receive flow at Beckton	£0.1m per month if TW not ready before System Commissioning commencement Date (SCCD)	Forecast ready ahead of Oct-24 Tideway SCCD forecast date. No financial penalty
ET02 – Effective Stakeholder management	Reputational Survey score must be 5 or >5 out of 6 (>83%)	Score has exceeded 5 in all but 1 year, when the score was 4.9 (82%) out of 6
ET04 – Critical Asset Readiness	£6.4m per month if not ready by SCCD	Forecast ready ahead of Oct-24 Tideway SCCD forecast date. No financial penalty
ET05 – Establish an Effective System Operator	Reputational	Forecast ready 6 month ahead of Oct-24 Tideway SCCD forecast date.
ET06 – Maximising the value of land sales	Dependant on the Tideway program and market values for property. Property disposal options are discussed with Ofwat prior to final decision.	
ET07 – Managing early land hand back	£20,000 per site per month reward / penalty measure	All sites ready delivered at maximum reward. All AMP7 site forecasts reporting maximum reward

Figure 2 : Performance commitment summary

With the exception of ET02, in one year, we have met or exceeded the ambitious targets set. For ET07, there has been a significant change to what was envisaged when the business plan was set. Improvements in clarity of the Main Works Contractors access needs during commissioning has changed the plan for land handback, reducing the opportunity for early land handback and deferring a number of land packages into the AMP8 period.



The graph and table opposite show overall impact of this change. In keeping with the desire to reduce over number of bespoke measures, in consultation with Tideway, we propose that ET02 and ET07 only are rolled over from the prior period. This will be covered in the following AMP8 strategy section.

Number of Handback (per sites)	Year1	Year 2	Year 3	Year 4	Year 5	AMP7	AMP8	Total
Current Forecast	1	-	2	5	17	25	54	79
Original Target	3	25	23	36	-	87	-	87
Variance	1	-	2	5	17	25	54	79

Figure 3 : Q4 Land Handback profile (Source : Interface Committee Joint Reporting – June) and Impact of change in MWC access need to plan for land parcel handback.

AMP8 strategy

Our Delivery Strategy

The key aim of the AMP8 strategy is to ensure the successful integration of the new Tideway Tunnel assets, successfully completing the commissioning and system acceptance phases of the project mobilising the team to manage first the Operation and then the Maintenance of the LTT System.

Thames Water's Purpose and Vision 2050

We have a clear purpose – to deliver life's essential service, so our customers, communities and the environment can thrive.

Thames Water has developed a strategic vision, 'Vision 2050', designed to deliver for its customers and wider stakeholders. Our Vision 2050 covers three pillars, under which we state the outcomes we want to achieve and the goals that will see us achieve them, as highlighted in Section 4.

Figure 4 : Thames Water Vision

To inform our Strategic Vision and PR24 plan, we asked our customers what they want. A summary of their views or 'Wants or Outcomes' is shown in Figure 5

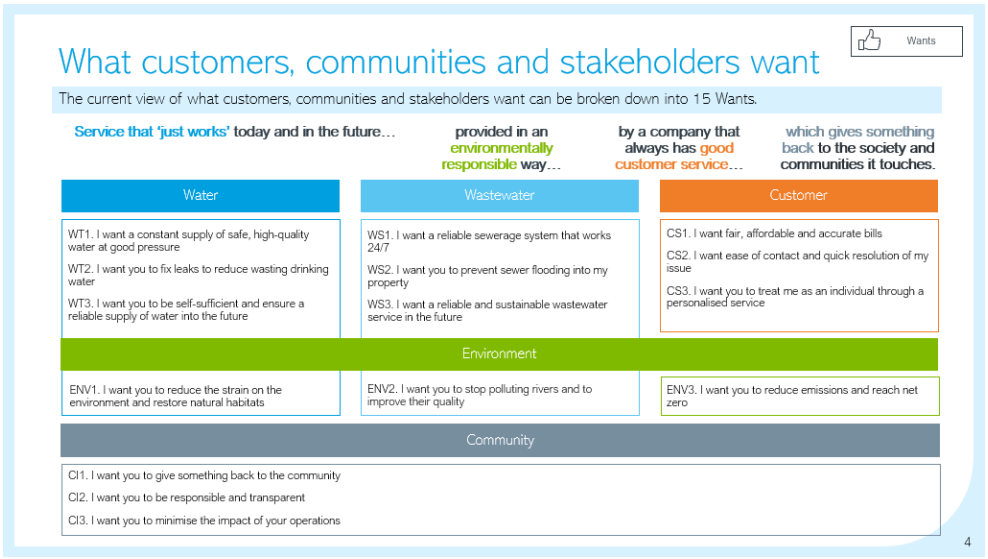


Figure 5 : Customer Wants or Outcomes

We also asked them to rank their 'Wants or Outcomes', which has enabled us to collate a priority list. A summary of this list is shown in Figure 6.

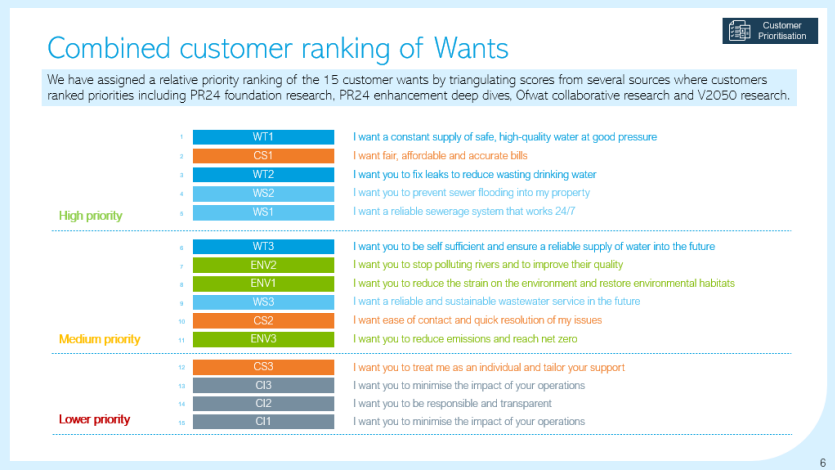


Figure 6 : Customer Wants or Outcomes Ranked

The Thames Tideway Tunnel project is the third and final implementation stage of work defined by the Thames Tideway Strategic Study published in 2005. When complete, Thames Water will operate and maintain the operating assets and the public realm with its artwork and planting.

It is a vital project for Thames Water and as such it is a key input into our ambition to prevent all wastewater pollution and lead wider efforts to restore river health and increase biodiversity. When successfully delivered, this defined project will make a huge step forward in deliver the majority of ENV1 and ENV 2 described in Figure 5.

As an environmental improvement scheme to improve the water quality of the Tidal Thames, and become compliant with the Urban Waste Water Directive (UWWTD) it will be a success. With a planned 95% reduction in CSO discharge volume and a 90% reduction in discharge events.

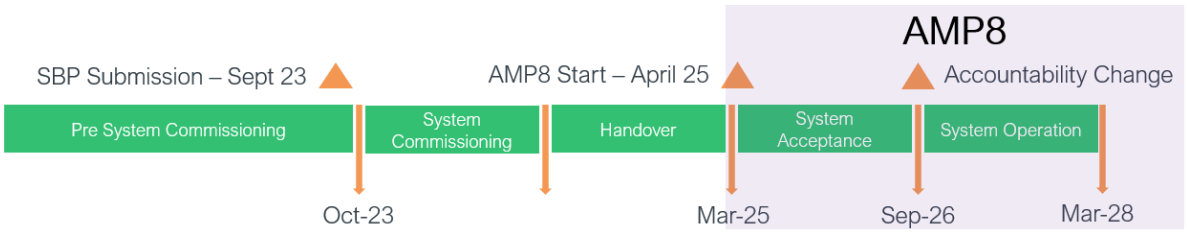


Figure 7: Q1 Sept 2022/23 Risk PMP

The system acceptance period of the TTT project (see Figure 7) is to optimise the system as designed so we can maximise the benefit of the prescribed investment. There will be 3 types of work within this period:

1) Modifications of systems to better comply with the operating techniques.
2) Modifications to the Operating Techniques, with Environment Agency agreement, to tune the system operation rules so as to gain the best use of the prescribed project.
3) Small Capital Works to complete work not envisaged at project definition.

However, customer and stakeholder expectations have grown since the project was set underway and any discharge is now seen as unacceptable. Whereas the project was targeting about 5 CSO discharges in a typical year (2.35million m3 volume of discharges), customers are now

expecting zero CSO discharges. This want or outcome from the Customer Prioritisation that is ranked the 7th most important issue for ThamesWater to focus on as shown in Figure 6.

Therefore, when the project is complete at Systems Acceptance (see Figure 7), further work is required post completion to enhance the system from drain to river to suppress CSO discharges from 5 towards zero, support flood alleviation for our customers and suppress electricity and carbon consumption.

The 2 July 2021 storms demonstrated the power that nature can bring to bear, with each storm having a return frequency at their peak >600yrs, and >100yrs for a sustained period only 2 weeks apart. The Independent Expert Group concluded that the completed tunnel would have had a marginal impact in improving the situation faced by our customers on those days (Independent Expert Group, London Flood Review stage 3). With the greatest flood risk reduction around the interception shafts. WS1, WS2 (Figure 5) and priority 4&5 (Figure 6) lead Thames Water to investigate and where possible enhance the system or the legal operating rules of the LTT to maximise the impact of TTT within the entire waste system. However, an enhanced system will mean more sewage flowing into the LTT and this will make the task of reducing CSO discharges more challenging.

Building on Vision 2050, Thames Water's draft Drainage & Wastewater Management Plan (DWMP) public consultation sets out at a catchment level the specific challenges and targets which need to be reached to achieve the 2050 Vision. Using the DWMP outputs for Beckton and Crossness, we are identifying solutions for the TTT price control that compliment this plan.

We also recognise that achieving the 2050 vision will require us to work smarter by transforming how we work with local partners and work in partnership with system stakeholders to co-create, co-fund and co-deliver results that positively impact our communities and their environment. The new public realm will provide a new place and channel with which we can engage with customers and stakeholders on the 'wants' and priorities, where solutions are beyond our direct control.

Thames Water (TTT) Purpose & Strategic Objectives

For the prescribed TTT project, Thames Water's primary purpose, from the Tideway Integration Group (TIG) strategy, is 'To support the successful delivery of the Tideway Tunnel to function as anticipated and deliver the environmental benefits and financial targets for our customers by the completion of System Acceptance'.

Assuming the tunnel meets the conditions specified for Systems Acceptance, there are 4 specific environmental objectives, measured and tracked in the Benefits Realisation Plan, by the Liaison Committee (DEFRA, Ofwat, Environment Agency, Tideway and Thames Water):

- Improve water quality and reduce biochemical oxygen demands in the Tidal Thames by dramatically reducing CSO discharges into the river
- Reduce the aesthetic pollution by sewage material/litter and sanitary products.
- Reduce the elevated health risks to river users.
- Fully meet the requirements of the Urban Wastewater Treatment Directive (UWWTD) with respect to storm overflows

Between Handover and Systems Acceptance, Thames Water and Tideway will optimise the system based on system performance during climatic conditions. Aside from small capital works

to complete work not envisaged at project definition, there is no further capital work programmed for this period.

Therefore, optimisation could be:

1. Modifications of systems to better comply with the operating techniques.
2. Modifications to the Operating Techniques, with EA agreement, to tune the system operation rules, to gain the best use of the prescribed project.
3. Alteration to operation and maintenance procedures to improve system up time, with less use of contingency operation under the Operating Techniques. This will include 'shaft and Tunnel' O&M as an inspection will require an outage of the entire LTT system.
4. Remedy of a defect in the physical system

For property and commercial matters Thames Water have an obligation, tracked by 2 AMP7 Ofwat ODI's, ET06 and ET07.

- ET06 - Maximising the value of Land Sales
- ET07 – Managing early hand back.

There is a mixed portfolio of land to be handed back to TW:

1. Legacy Sites
2. Public Realm Parks
3. Operational sites
4. Development Opportunities

Though Thames Water and Tideway will have completed the hand back of many sites during AMP7 the timing of the final quantity of land areas being in the last quarter of AMP7, land hand back will run into AMP8.

The Liaison Committee (DEFRA, Ofwat, Environment Agency, Tideway and Thames Water) will continue to meet until the end of Systems Acceptance, hence the need for a Thames Water close down team to manage Thames Water exit from the project.

The closing phases of the TTT project are defined by project milestones with associated dates.

Project Milestones	BP Assumption	Description
Handover	Mar 2025	The point at which all project land is handed back to Thames Water for onward disposal. Thames Water accepts ownership of the public realm operation and maintenance with costs for architecture and landscaping. The Thames Water operational team will be operating the tunnel with Tideway delivering the maintenance.
Early System Acceptance frontier -	Sept 2026	Earliest point Thames Water could be handed the maintenance responsibility and cost by Tideway if we have seen the system perform successfully when tested by climatic conditions. In addition, all project documents must be handed over.

Final System Acceptance frontier	Mar 2028	Point at which Thames Water must be handed the maintenance responsibility and cost by Tideway even if climatic tests have not been completed unless the project documents have not been handed over.

Figure 8 : Business Plan milestone assumption aligned with PMP Q4 2021/2

The project documents allowed for a degree of uncertainty of climatic conditions (rainfall of specific intensity and duration) to test the London Tideway Tunnel (TTT and Lea Tunnel combined). This uncertainty provided a window of project completion, hence 'Early and Final System Acceptance Frontiers'.

When complete, Thames Water will own, operate and maintain all public realm[1] and all operational assets[2] with Tideway (Bazalgette Tunnels Ltd) owning all shafts, drop shafts and Tunnels up to Shaft G at Abbey Mills. From Shaft G onwards all shafts and Tunnels are in Thames Water ownership and need to be included in Thames Water 's operation and maintenance plan.

To make the Thames Water business plan readily understandable, the TTT business plan will describe and cost all Thames Water activity, even if that cost and activity is to be transferred to another place in Thames Water.

However, there is a degree of uncertainty in the forward program and the cost estimates set in this business plan will be insufficient should the overall project move back in time. It may be opportune to include a conditional allowance commensurate with project prolongation to fund the extended life of the embedded TIG team.

As stated in Thames Water's TTT purpose and objectives there is a need to partner and influence system stakeholders to co-create, co-fund and co-deliver results that positively impact our communities and their environment, utilising the new public realm. In recognition of this, the Stakeholder and Land sections will describe how we will begin this journey to engage with customers and stakeholders on the 'wants' and priorities so we can begin the co-create, co-fund and co-deliver journey.

It has recently become clear that the completed LTT system has an opportunity to deliver enhanced benefits beyond its original scope, namely:

1. Suppressing the typical 5 CSO discharges per year by smart 'active' Trunk Network management. A first for the UK.
2. Reducing the risk of customer flooding, with smart 'active' Trunk Network management.
3. As a result of 1, which would hold sewage in the higher trunk system and away from the LTT system, suppressing energy and carbon use.

[1] Public Realm Maintenance is to be split, between that commuted to councils (sweeping, bin emptying etc) and that completed by Thames Water (maintenance of planting, river walls and artwork as examples). As suggested by Consumer Council for Water the split will be written into the Operational O&M so that this knowledge is not diminished by time. In addition, there is a need for a position to 'own' the sites and be a point of contact for all ownership issues. The role of Controller of Premises is therefore being created for these sites and will be the point of contact for all customer and stakeholder issues and will be responsible for H&S aspects of the site.

[2] The split of operational assets is defined to a construction joint and assets on a plan for each site.

The enhancements described above are changes beyond the scope of the optimisation activities required by the prescribed TTT project[3]. These distinctly different activities can only be inserted into the system once the TTT project has exited System Acceptance because they will subtly alter the base Trunk Sewer Network on which the prescribed TTT project is designed with its associated testing regime. To be clear they will not remove the need for the TTT project, only enhance its impact for our customers, but it must be allowed to complete its testing as designed.

The adaptive enhancements will be described in section ii) We will seek opportunities to deliver enhanced benefits beyond the original scope.

Long Term Adaptive Strategy

For PR24, Ofwat requires companies to align their Business Plan submission with the long-term delivery strategies, adopting an adaptive approach. Ensuring investment proposed aligns with the necessary steps in AMP8 to support those strategies with a coordinated plan for future periods that anticipates the climate, technology, demand and environmental changes in the future. This encourages an incremental approach and a clear line of sight between the investment made in AMP8 and the strategic future change required.

The London Tideway Tunnels System is due to complete commissioning by the end of AMP7 and the first 18 months to 3 years of AMP8 will be focussed on achieving System Acceptance for the LTT system. This includes establishing a settled maintenance and operational optimisation so that full compliance to the Operating Techniques is achieved at maximal efficiency.

However specific drivers of change do provide opportunities to pursue stepwise investment (System Operation Enhancements) beyond establishing a stable system at high efficiencies. Examples are listed below.

Ofwat Scenarios	Change	Adaptive Strategy AMP8 Need	AMP8 Investment (examples)
Climate Change	Change in Severity of localised storms	Develop live depth data, improved modelling capability to create an 'active' trunk system to support flood management, reduction of CSO spills and carbon management	Expansion of Trunk Sewer Depth monitors and more capable system models with live control options to either: Hold flow away from the interception sewers, suppresses the use of the LTT and drives down CSO discharges from 5 towards 0. It also reduces pumping and electricity consumption at Abbey Mills and Greenwich During intense storms, create cascade pathways to direct flow to the LTT system
Technology	Improved forecasting to more accurately	Connection of Treatment and LTT modelling capability	Connection of Sewer network models, Digital Twin at

[3] Optimisation activities refer to the prescribed TTT project and Enhancements refer to work beyond the completion of the TTT project.

	predict local intensity. Develop Large Area Sewer Control System (LACS) to support a reduction in flooding risk	Development of a large-scale active control system in the Trunk network	Beckton and Virtual Operating System from the TTT project Trial area to deliver improvements and prove the concept, prior to future AMP investment
Demand	Customer desire for reduced River Pollution due to Storm Overflow	Change to Operating Techniques and move to Active Management	Develop revised flooding based operating regime
Environmental	Increased resistance to LTT outages	Additional serviceability enhancements to increase asset up time	Improved grit management assets to reduce outage periods and increase system up time

Figure 9 : Aims mapped to adaptive pathways.

These have driven additional provisions to be added to the AMP8 investment plan to mark a step change in the usage of the LTT assets beyond the existing prescribed TTT project. To take important first steps to ensure the LTT system considers the opportunities of future improvements in technology, storm forecasting and customer desire to reduce river pollution. Together with the unrealised benefit to develop more sophisticated network and treatment asset control assets to start developing a revised operating regime which is more flexible to the changing climate.

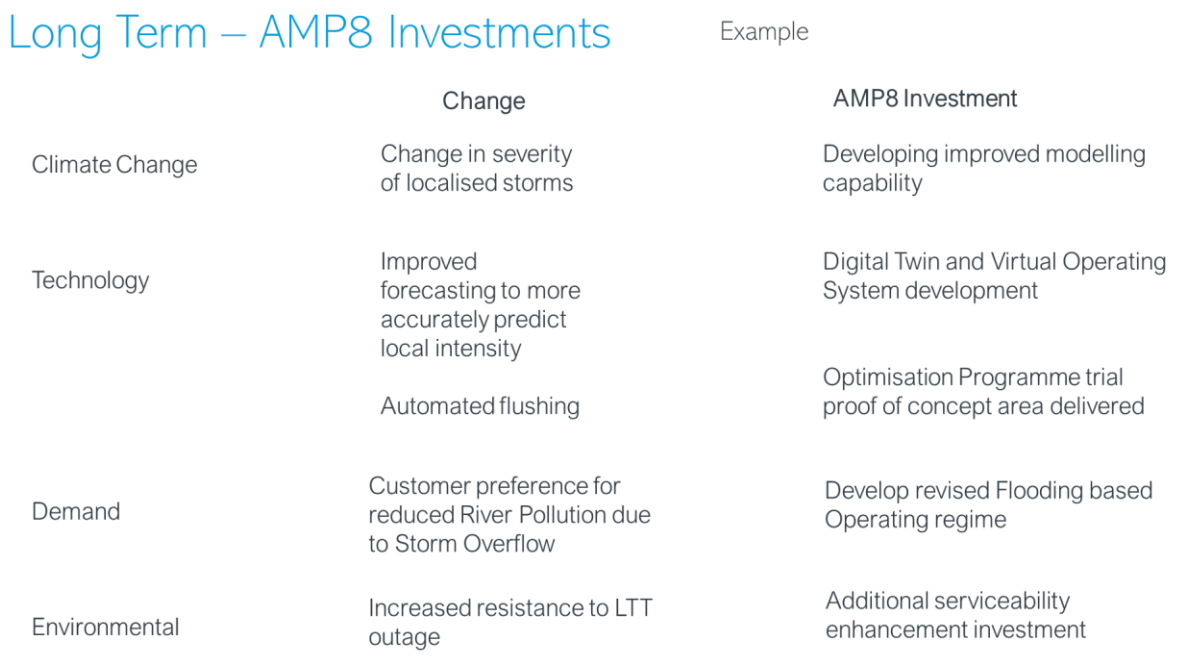


Figure 10 : AMP8 incremental investment toward long term changes

Programme assumptions for LTT Completion

The business plan development began using the Q1 2022-23 PMP forecast. These dates affect the assumption of when maintenance accountability changes from Tideway to Thames Water

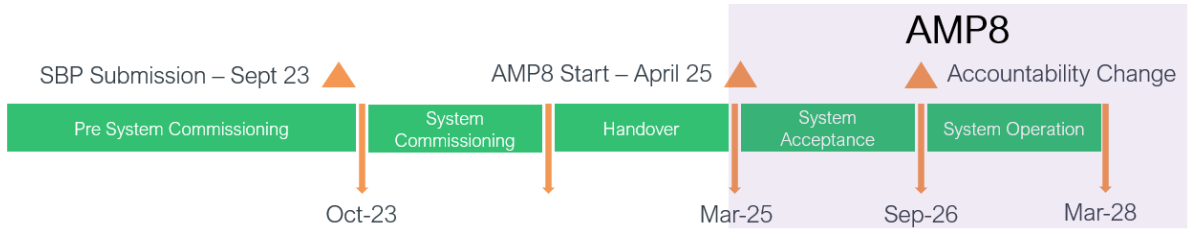


Figure 11: Q1 Sept 2022/23 Risk PMP

The current programme assumptions are shown in Figure 12 below. The current aim is to achieve the target programme with handover occurring 3 months later than the assumed Business Plan programme with the risk programme showing a further 3 months delay. The current business plan assumption recognises the desire to deliver the project as soon as practical and savings relating to maintenance from later completion would be offset by additional costs to support the prolongation of the project.

Whilst this factor is true for maintenance activity, property related costs increase with time. The business plan therefore aligns forecasts with the latest forecast positions to provide the most meaningful forecast.

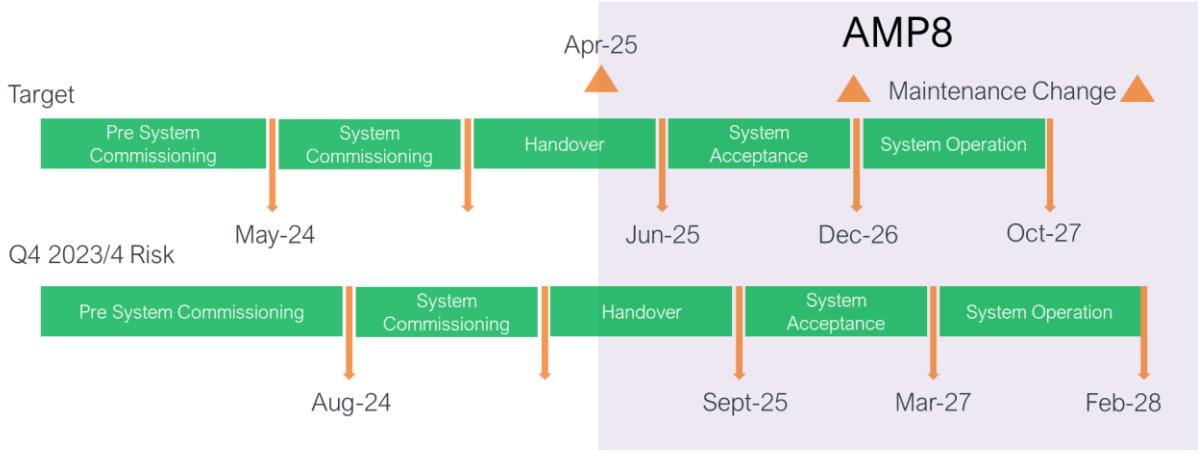


Figure 12 : Current Target and Q4 2023/4 PMP

AMP8 Performance Commitments

We propose that post completion of commissioning and clarity of land disposal strategies during AMP7 that a number of Performance Commitments are not rolled forward into the next Period.

The table below illustrates that proposal.

Performance Measure	AMP8	Rationale
ET01 – Readiness to receive flow at Beckton	None	LTT System in Operation therefore other non LTT penalties apply for asset failure
ET02 – Effective Stakeholder management	Carried forward	Annual survey to continue during AMP8
ET04 – Critical Asset Readiness	None	LTT System in Operation therefore other non LTT penalties apply for asset failure
ET05 – Establish an Effective System Operator	None	LTT System in Operation therefore other non LTT penalties apply for asset failure
ET06 – Maximising the value of land sales	None	Land strategies developed during AMP7
ET07 – Managing early land hand back	Carried forward	Incentive and Penalty still relevant to remaining land handback parcels planned

Figure 13 : Performance Commitment in AMP8

In addition, we propose a new performance commitment for AMP8 which provides incentive for us to accelerate our System Acceptance activities to maximise the chance that System Acceptance period can be completed in 18 months.

This proposal aligns with the Deed of Variation to the Interface Agreement agreed for strategic intent. This reward only incentive balances the aims of earliest possible project completion without undermining the checks and balances planned into the agreements for this key phase.

Our plan for AMP8

(i) Integrating the new asset - Power, Maintenance and LTT Operation

Power

The Lee Tunnel has been in operation since 2016 and has been handling storm flow presented to the Tideway Pumping station since then. The change from Lee Tunnel to London Tideway Tunnel will see additional flows previously going to the river being diverted to the Thames Tideway Tunnel resulting in additional pumping costs. The pumping capacity of the Tideway Pumping Station has been sized for the additional pumping demand but the increase in power usage is not yet factored into the base operating cost of storm pumping from the station.

The sources of additional power costs in total arise from three sources all of which are solely due to the change from Lee Tunnel to London Tideway Tunnel (LTT) operation.
These are:

£m	2025/6	2026/7	2027/8	2028/9	2029/30	AMP8
Additional Pumping at TPS	1.470	1.560	1.600	1.650	1.700	7.980
Tideway Site Power	0.711	0.673	0.657	0.653	0.656	3.350
Public Realm Power	0.046	0.045	0.043	0.043	0.045	0.222
	2.227	2.278	2.300	2.346	2.401	11.552

Figure 14 : Sources of change in Power

Tideway Site Power arises because of the CSO interceptions assets built to connect the existing network with the Tideway Tunnel. Power demand for each site is built up from equipment demand produced by the Main Works Contractors working for Tideway constructing the assets. These estimates have been reviewed and externally validated by Arcadis prior to submission to us. Appendix A shows the output table of specific power demand by site on which the forecast is based.

Similarly, the new Public Realm areas, above the new CSO interceptions have additional power demands. As with the site power estimates these are built up from site demand provided by the Main Works Contractors working for Tideway. These estimates have been reviewed and externally validated by Arcadis prior to submission to us. Appendix A shows the output table of specific power demand by site. The scale of power demand is significantly lower for the Public Realm when compared with the other two power categories.

Additional Pumping at the Tideway Pumping Station is the largest additional power cost arising from the operation of the LTT. The extension of the tunnel system from 7km to 32km captures significant flows within the tunnel system.

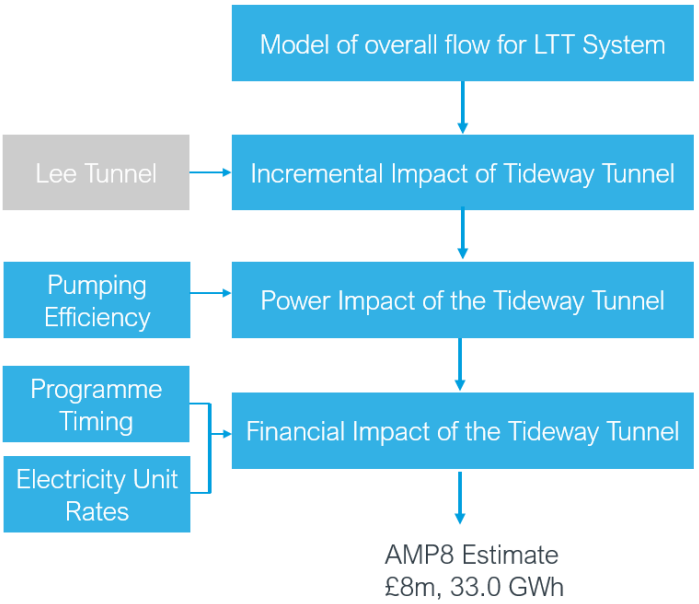
	2018	2019	2020	Average
Tideway PS to Tideway CSO	450,200	0	2,754,500	1,068,233
Flow into Beckton inlet works from TPS	29,947,600	26,098,800	34,801,000	30,282,467
Total Pumped to Beckton Inlet Works	**30,397,800**	**26,098,800**	**37,555,500**	**31,350,700**

Historic Lee Tunnel allowance (5 Yr Av. Flow to Beckton Inlet from TPS 2012/2016)	**9,860,800**
Net increase due to LTT	**21,489,900**

Figure 15 : Modelled total flow based on historic storms if LTT had been in operation (kWh)

The methodology for estimating the flows has changed from that proposed in AMP7. AMP7 was modelled based on typical year assumptions.

The methodology for AMP8 uses a combination of modelled flow based on historical storms for the last three years to create the best estimate of the volumes that would have been captured and pumped out of the LTT. Then, deducting the average flow pumped from the Lee Tunnel calculated from the last 5 years of real data generates the 21.5 million m3 average flow estimate. This is then converted to a kWh estimate of 6.6 GWh using the 'real life' pump efficiency of 84% based on the long-term performance of the pumping station. The methodology is illustrated here.



	Lee Tunnel	Tideway Tunnel	
Capacity	370,288	1,631,772	M³
1 Pump Hrs	34	149	Hrs
Kwh	102,000	447,000	Kwh

Figure 16 : Lee Tunnel and London Tideway Tunnel capacity comparison

Comparison of the capacity of the Lee Tunnel and London Tideway Tunnel capacity this corresponds to annually pumping out 13 times per annum as compared to the 26 times per annum frequency associated with the smaller Lee Tunnel.

The modelled rate of electricity over the recent period has been variable and this makes forecasting forward rates of power challenging. The cost per kWh of power for the AMP8 period uses the central estimate of forward power for Waste Treatment. The rate represents an 18% reduction on the power for the AMP compared with the last 2-year average of AMP7 and 5% lower than the highest estimate for power.

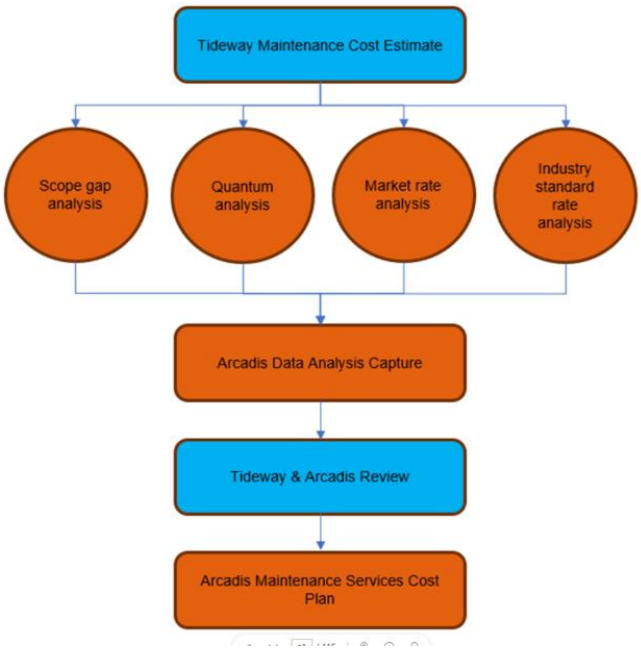
Demand	48.8 GWh	Variation from Estimated incremental demand -5%	0%	5%	10%
Average Unit per kWh	£0.19	£8,815,444	£9,279,414	£9,743,385	£10,207,356
	£0.20	£9,279,414	£9,767,805	£10,256,195	£10,744,585
	£0.21	£9,743,385	£10,256,195	£10,769,005	£11,281,814
	£0.22	£10,207,356	£10,744,585	£11,281,814	£11,819,044
	£0.23	£10,671,327	£11,232,975	£11,794,624	£12,356,273
	£0.24	£11,135,297	£11,721,366	£12,307,434	£12,893,502
	£0.25	£11,599,268	£12,209,756	£12,820,244	£13,430,731

The average unit rate for AMP8 is £0.216 per kWh, with an estimated 5-year incremental demand from the TTT 33.0 GWh for pumping 15.1 GWh for CSO site power and 0.64GWh for public realm. This is a total £48.8 GWh demand for the addition of the new Tideway assets.

Figure 17 : Sensitivity table for unit rate and demand estimation variation

Maintenance

The overall cost of maintenance has been developed over the course of the current phase of the project. Revised maintenance requirements for the new assets at the CSO interception sites have been provided by the contractors constructing the assets. These initial estimates have been consolidated by Tideway and externally assessed by Arcadis a third-party company to validate and provide assurance of the veracity of contractors estimates.



In addition, a new maintenance need has been identified for scour protection assets and an evaluation based on the 7 years running of the Tideway Pumping Station has resulted in revised maintenance regime, including an additional in situ crane at the site. A summary of the overall costs can be seen in the table below.

£m	2025/6	2026/7	2027/8	2028/9	2029/30	AMP8
Site Maintenance at Interception Sites	0.104	4.249	8.934	8.321	8.319	29.927
Scour Maintenance	0.800	0.800	0.800	0.800	0.800	4.000
Tideway Pumping Station Maintenance	0.392	0.392	0.392	0.392	0.392	1.959
New Crane Maintenance	0.000	0.000	0.064	0.064	0.064	0.193
	1.296	5.441	10.190	9.577	9.575	36.079

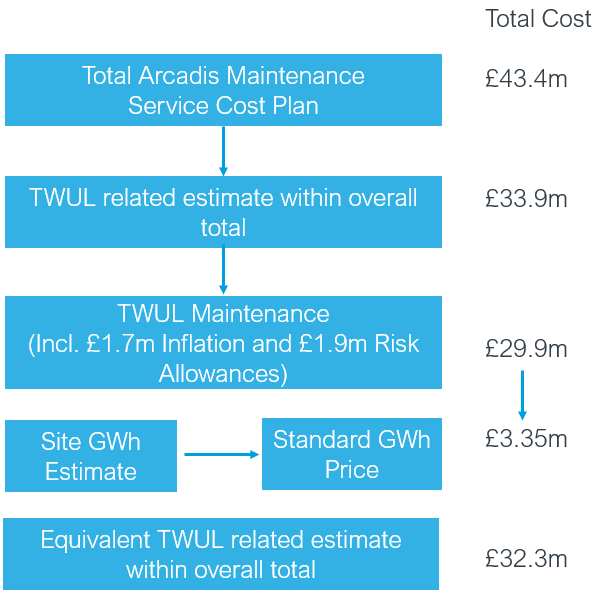
Figure 18 : Incremental Change in Maintenance costs

The process of developing the Maintenance forecast has been a collaborative one. Initial Main Work Contractors activities have been thoroughly reviewed. The diagram opposite illustrates the process followed. [redacted]

Overall maintenance service cost assessment assumes the same activities are completed in the 2025-30 period with transition of responsibility occurring between Thames and Tideway at the

point of System Acceptance. Development is underway to procure a maintenance provider under a contract which can be novated to Thames Water from Tideway. This will allow the most efficient procurement package to be developed and maintenance to be optimised during the System Acceptance period.

Since the activities transfer between the two companies during the period, overall costs within the plan are only a proportion of the overall maintenance costs for the new assets. The Tideway forecast included elements of power. These have been removed from the initial overall position and reforecast based on the GWh estimates and standardised unit rates to ensure power change is aligned within the TTT Price Control. The graphic opposite illustrates the process and reconciliation with the Arcadis Maintenance Service Cost Plan. This resulted in a £1.6m efficiency from the cost plan forecast.



It is planned that maintenance activities will be optimised within the 2025-2030 period. The current plan recognises a stable set of activities during the initial phase to ensure risk of dispute over maintenance practice do not arise until a stable operational tunnel system is established and maintenance handed over to Thames Water .

Further investment is also required to an uprated maintenance regime at the Tideway Pumping station (TPS). The TPS currently has 6 pumps, with only 2 pumps required for Lee Tunnel operation. The Lee Tunnel was designed with 100% redundancy in its pumping capacity (i.e. 2 additional pumps).

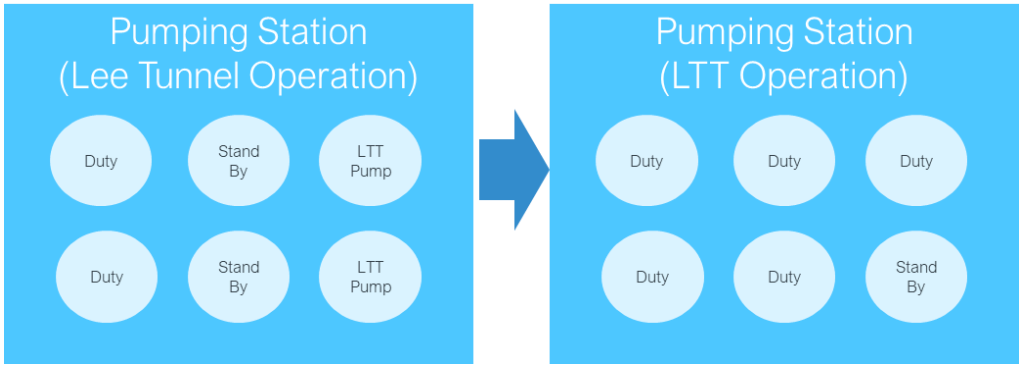


Figure 19 : Reduced redundancy on moving for Lee Tunnel to LTT operation.

A further 2 pumps being available in LTT mode. With 5 pumps necessary for LTT operation this is a 50% reduction in redundancy (i.e., 2 pumps to 1 pump). During running of the system since 2016 when the Lee Tunnel was put into service pump refurbishment has been necessary more often than expected. To address this additional capex funding[4] (see Capex section) for a in situ crane and allocation for additional spare pumps and maintenance cycles is included within the plan.

The schematic opposite illustrates the rationale for purchase of an additional two pumps. This will allow for immediate replacement of a failed pump with the held spare on site and then an exchange of the damaged pump with the supplier to ensure that an additional on-site standby can be restored whilst the original pump is repaired. This will ensure the necessary reliability and redundancy of the system in LTT mode. The additional crane movements making installation of an in-situ crane cost effective in comparison to the alternative of external crane hire when required.

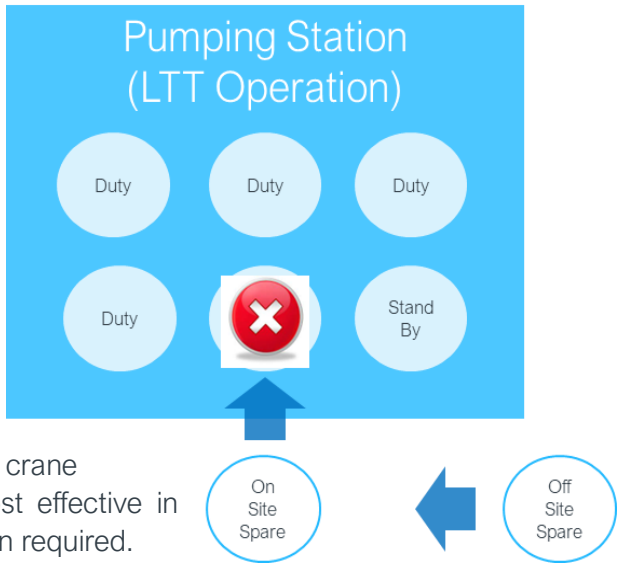


Figure 20 : Rationale for crane and additional pumps availability

LTT Operation

In addition to mobilising a team to manage the LTT Operation the full System Operation team is brought on-line within the AMP8 period. The management team, core roles and LTT operations are in place from the beginning of the period. The table below summarises the detailed individual roles.

£m	Roles	AMP Av. FTE	2025/6	2026/7	2027/8	2028/9	2029/30	AMP8
SO Management	7	6.8	0.417	0.488	0.501	0.513	0.526	2.446
SO Core Team	10	9.4	0.421	0.431	0.380	0.389	0.399	2.020
LTT Operations	7	7	0.247	0.253	0.259	0.266	0.273	1.298
System Operation	24	23.2	1.085	1.173	1.140	1.168	1.197	5.763

Figure 21 : System Operation Resourcing

The Maintenance related resourcing being hired for initial development and optimisation of the maintenance during the acceptance period and the main maintenance staff novated upon completion of the System Acceptance are shown in the table below.

£m	Roles	AMP Av. FTE	2025/6	2026/7	2027/8	2028/9	2029/30	AMP
Near Ground Asset Maintenance	3	3	0.148	0.152	0.156	0.160	0.164	0.779
Public Realm Maintenance	3	3	0.138	0.141	0.145	0.148	0.152	0.723
Maintenance (Novated)	8	0	0.000	0.000	0.000	0.000	0.000	0.000
Operation & Maintenance	14	3	0.293	0.300	0.308	0.315	0.000	0.000

Figure 22 : Maintenance Resourcing

[4] Crane and Maintenance Pricing report can be provided if requested

The decision to consider novation of the Tideway maintenance arrangement has reduced the overall forecast. This arises from a leaner internal team and ensures a consistency of approach during the period. This generates approximately £1.5m in internal resource cost efficiency as well as minimising disruption to maintenance activity during the transfer.

In addition to the System Operation function, a reduced Tideway Integration Team and Closeout function are forecast throughout the AMP to coordinate the System Acceptance and any post-acceptance action required. This function will also oversee the Programme Management of the additional LTT investment discussed in the next section.

£m	Roles	2025/6	2026/7	2027/8	2028/9	2029/30	AMP8
TIG	5	0.394	0.404	0.414	0.425	0.435	2.073
Closeout	4	0.474	0.368	0.341	0.350	0.359	1.892
	9	0.869	0.772	0.756	0.775	0.794	3.966

Figure 23 : Tideway Integration Group and Closeout Resourcing

Additional Capital Needs

In preparation for system commissioning, Thames Water completed a review of all sites impacted by the Thames Tideway Tunnel project from July 2019 to April 2021. The necessary works deliverable prior to the commencement of commissioning (then Oct-22) were packaged up for completion in the AMP7 period.

A number of the elements were deferred - this was as a result of the works being either too large or presenting too large a programme risk to be completed prior to the start of commissioning. In addition, as described earlier, long term operation of the Lee Tunnel has required additional redundancy to pump failure and purchase of two pumps and an in situ crane are also required to ensure LTT can be robustly and reliably operated. The table below illustrates the planned additional elements for AMP8.

£m	**2025/6**	**2026/7**	**2027/8**	**2028/9**	**2029/30**	**AMP8**
Control Room	2.500	7.000	4.000	0.000	0.000	13.500
Additional Pumps (No 2)	7.000	0.000	0.000	0.000	0.000	7.000
Tideway PS In Situ Crane	1.308	4.577	0.654	0.000	0.000	6.539
Deadleg Cleaning System (inc. FS PS)	0.500	4.000	1.710	0.000	0.000	6.210
SCADA/ICA Enhancements	0.000	0.000	0.000	0.900	0.900	1.800
Wharf Removal (Lots Road)	1.400	0.000	0.000	0.000	0.000	1.400
Debris System Improvements	1.100	0.000	0.000	0.000	0.000	1.100
Minor scope itmes	0.472	0.000	0.000	0.000	0.000	0.472
	14.280	15.577	6.364	0.900	0.900	38.021

Figure 24 : AMP8 capital items required for long term operational stability and resilience

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Control room

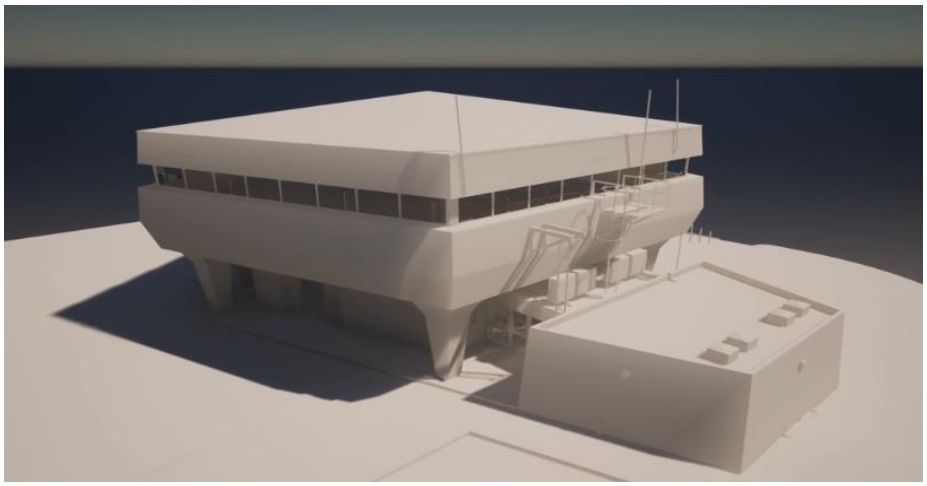


Figure 251 : LTT Control Room

Commissioning of the LTT system is planned to be completed using a temporary control room facility housed on the ground floor of the monitor building at Beckton STW. This decision was taken to ensure the System Integrator (Amey) could progress with preparations with minimal impact to the Tideway programme. However, the facility is not sufficient for the ongoing operation of the LTT.

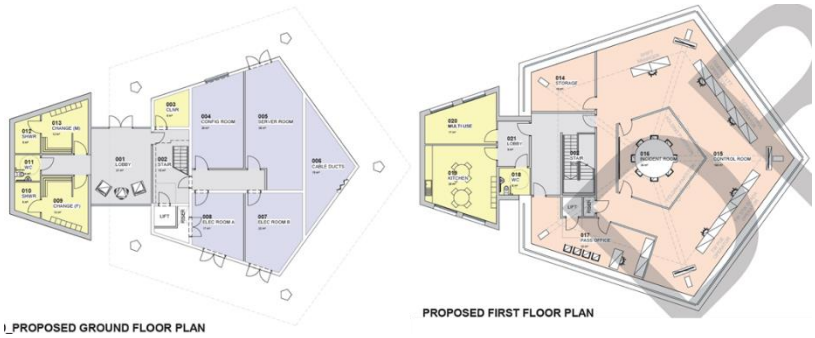


Figure 262 : Control Room layout

A scheme to provide a facility compliant with COVID (pandemic planning), security and finalised organisational arrangements has been scoped for delivery. Construction is planned post system handover so that the impact to commissioning can be removed, with construction complete before the end of the acceptance period.

The project scope was established and benchmarked using EES comparators. [5]

Dead-leg Cleaning

In addition to the control room, it is proposed to create a new dead-leg cleaning system in the redundant gravity overflow at Beckton[6]. In Lee Tunnel operation the outfall to river when the system is beaten it flows via gravity over a weir wall at the outlet to the river at Beckton. In LTT

[5] Control Room - Solution Options Study Report can be provided if requested

[6] Weir Wall and Deadleg Option Report can be provided if requested

mode the Weir Wall is modified creating a dead-leg and the system is pumped via the bypass tunnel to river. This creates a sealed end in which silt and debris will accumulate over time.

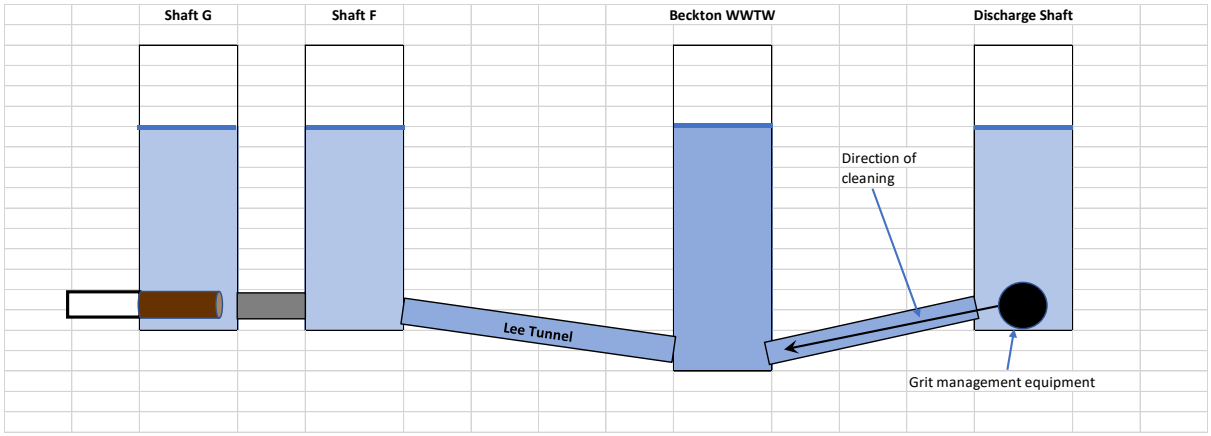


Figure 27 3: Overall tunnel system schematic

This accumulation will be a source of odour and will create issues, which would necessitate additional system outages to resolve. As part of the strategic intent to optimise the System Commissioning and Acceptance tests, it is proposed to remove the Thames Water obligation to remove grit and material accumulations from the tunnel to speed up the commissioning of the LTT, which in turn decreases the risk of a discharge at Abbey Mills. This decision was supported by a survey in 2023, which estimated that there was a very limited volume (~80m^3) of grit in this 'dead leg'. A volume that can be removed/maintained by a cleaning system, to control the production of an odorous atmosphere and limit the challenge on the installed odour management system, to that in the design for the tunnel.

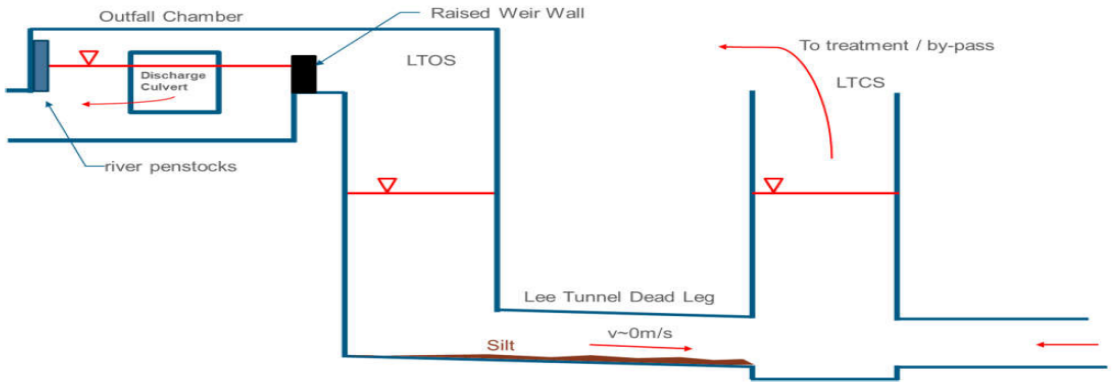


Figure 28 4: Deadleg schematic

It is proposed therefore to install a permanent cleaning system which will expedite cleaning and reduce future LTT outage periods, due to grit accumulations in this section of tunnel.

ii) We are committed to disposing of our surplus land and engaging with our local communities.

(1) Land disposal and Compensation

Overall summary of land driven cost within the overall plan is illustrated in the table below

£m	2025/6	2026/7	2027/8	2028/9	2029/30	AMP8
Land Disposal	(136.800)	(12.000)	0.000	(2.000)	0.000	(150.800)
Related Costs	7.356	4.770	3.900	3.900	0.200	20.126
Rental Income	(0.229)	0.000	0.000	0.000	0.000	(0.229)
	(129.673)	(7.230)	3.900	1.900	0.200	(130.903)
Compensation	21.207	0.000	0.000	0.000	0.000	21.207
Resources	0.363	0.186	0.000	0.000	0.000	0.549
Land	21.570	0.186	0.000	0.000	0.000	21.756
Public Realm	14.540	0.000	0.000	0.000	0.000	14.540
Land	(93.563)	(7.044)	3.900	1.900	0.200	(94.607)

Figure 29 : Total Land related costs included in the Price Control

The overall land and compensation position for AMP8 is primarily as a result of deferral from AMP7. The has affected both the timing and the quantum of expenditure and income.

Timely disposal of surplus land

The 2020-2025 period has seen significant challenges to the property estate purchased to facilitate the construction of the project. The delays and market impact associated with the COVID pandemic, together with development of Tideway and its Main Works Contractors strategies for handing back surplus land, has meant that timing of land disposal and estimates for revenue have changed from the 2015-2020 assessments. This has meant that 8 of the 12 land parcels originally expected to be disposed of in the 2020-2025 period are now planned in AMP8.

Site	2025/26	2026/27	2028/29	AMP8	Total
Camelford House, Albert Embankment	0.0	0.0	2.0	2.0	2.0
Chambers Wharf, Bermondsey	63.5	0.0	0.0	63.5	63.5
Whiffin Wharf, Carnwath Riverside	0.0	0.0	0.0	0.0	0.6
Carnwath Industrial	0.0	0.0	0.0	0.0	10.0
Cringle Wharf, Kirtling Street	12.5	0.0	0.0	12.5	12.5
80 Kirtling Street, Battersea	24.0	0.0	0.0	24.0	24.0
2a Battersea Park Road, Battersea	13.3	0.0	0.0	13.3	13.3
88 Kirtling Street (ex V&A stores)	21.0	0.0	0.0	21.0	21.0
8 Brooks Court, Battersea	0.5	0.0	0.0	0.5	0.5
1 Brooks Court, Battersea	0.5	0.0	0.0	0.5	0.5
Oyster Pier, Mooring Berths 1, 2 & 3	0.0	0.0	0.0	0.0	1.5
Oyster Pier, Mooring Berths 5 & 6	0.0	0.0	0.0	0.0	0.8
Total	**135.2**	**0.0**	**2.0**	**137.2**	**150.1**
Hurlingham Wharf	0.0	12.0	0.0	12.0	12.0

EHP	2025/26	2026/27	2028/29	AMP8	Total
Croft St	0.0	0.0	0.0	0.0	0.6
Luna House	0.0	0.0	0.0	0.0	0.9
Fountain House	0.0	0.0	0.0	0.0	0.5
Earl	1.6	0.0	0.0	1.6	1.6
Total	**1.6**	**0.0**	**0.0**	**1.6**	**3.5**

	2025/26	2026/27	2028/29	AMP8	Total
Total	**136.8**	**12.0**	**2.0**	**150.8**	**165.6**

Figure 30 : Land Disposals forecast.

Camelford House valuation in particular has reduced (down from £50m) due to recent revaluations. Disposal is planned later in the period to maximise the chance that the market improves, however this does incur additional costs (£13m) to the point of disposal. The £13m made up of head lease rent (£2.15m pa) and some costs of managing the building. We will manage this process by relocating existing tenants and stripping out all remaining office space and repurposing existing budget and switching off all void business rates charges

Key strategic focus remains maximising the returns for customers in a challenging market.

Discussions on options for Land disposal are ongoing which may result in further package change before the end of the period to maximise the return for customers in the future. However, the currently identified AMP8 packages are unlikely to change from AMP8 since disposal is primarily limited by the completion of construction programme.

Ongoing change would then only determine the expenditure with the period.

Site	Land Handback
Camelford House, Albert Embankment	30/09/2025
Chambers Wharf, Bermondsey	30/09/2025
Whiffin Wharf, Carnwath Riverside	30/09/2025
Carnwath Industrial	30/09/2025
Cringle Wharf, Kirtling Street	30/09/2025
80 Kirtling Street, Battersea	30/09/2025
2a Battersea Park Road, Battersea	30/09/2025
88 Kirtling Street (ex V&A stores)	30/09/2025
8 Brooks Court, Battersea	30/09/2025
1 Brooks Court, Battersea	30/09/2025
Oyster Pier, Mooring Berths 1, 2 & 3	15/07/2024
Oyster Pier, Mooring Berths 5 & 6	15/07/2024

Figure 30: Land Handback forecast dates based on Q4 2023 Tideway PMP

Agreement of Deferred Compensation

Extension of the construction programme and its corresponding impact to the land handback plans has increased overall compensation and lease extension costs in AMP7 but also in AMP8. In addition to this £1.2m increase the finalisation of compensation at Hammersmith St Georges (£8m) due the impact to the construction of flats near the site as a result of the Project taking possession of their land, and a new acquisition or compensation risk at Hurlingham Wharf (£12m) have driven increased cost in this area. The latter being offset by an assumption that the Wharf will be disposed of later in the AMP.

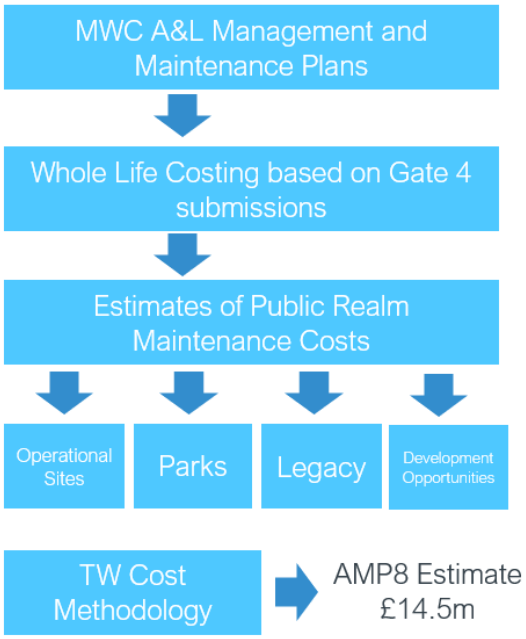
As with land impacts in prior period, it is envisaged that these costs will be handled on a No Pain No Gain basis.

iii) We will use our new public realm spaces to conduct stakeholder engagement

(1) Public Realm and Customer Engagement

Public Real Maintenance Costing

The Thames Tideway Tunnel project will produce new public realm spaces at 14 sites along the route of the river. The ongoing maintenance of the spaces is planned to be transferred back to the London Borough responsible for the areas with small elements of specific activities retained in house. Estimation of the cost for maintenance has been completed using the methodology opposite.



The Main Works Contractors (MWC) have prepared Architecture and Landscape (A&L) Management and Maintenance Plans (MMP) for each site. In addition, they have prepared a Whole Life Cost (WLC) report for the Architecture & Landscape (A&L) work package for each site for Stage Gate 4 resubmission. The WLC reports prepared by the MWC have been scrutinised to estimate public realm maintenance costs. The A&L assets for a site vary according to the characteristics of the site.

- **Legacy sites** - Through location and construction necessity these sites form new public realm sites on the river embankment in well recognised central London locations.
- **Public realm parks** – Sites with high benefit to local communities that are attached to existing parks with little infrastructure to maintain.
- **Operational sites** - Little opportunity for commercial activity and little benefit to local communities that form part of a wider operational site with little public exposure
- **Development opportunities** - Public realm maintenance costs will vary for each site given the anticipated level of development and how wider public realm considerations will be progressed in terms of the development proposition under discussion between the developer and the local planning authority.

Figure 31 : Types of sites

Thames has then developed a methodology for reviewing each site to translate the provided costs into a maintenance estimate for the site. This have then been cumulated to a lump sum for the site. The value for all the sites being £14.5m

Public Realm Customer Engagement

The benefit of new public realm spaces will be significant. They will provide new opportunities for people to engage with the River Thames and its surroundings, improving access to green spaces and enhancing the quality of life for residents and visitors alike.

To maximise this opportunity, investment is proposed for an IT application to connect customers with the benefits of the LTT. This will achieve community engagement with the system and legacy benefits of the tunnel as well as providing valuable insight to inform and influence customers towards changed understanding and behaviour.

For us to be ready from the full opening of the sites, a resource will be recruited into the TIG team to prepare an engagement plan and fully utilise the new locations. As the sites open, in spring 2025 (according to Sept 22 program) these roles and funding will transition to Retail where it will be sustained.

The channels to engage our customers include:

1. An App that will be triggered by scanning a QR code at the site. This will describe the points A, B and C above
2. The potential for push notifications via Bluetooth. However, the push notifications channel may be considered too intrusive for general engagement especially if it interferes and/or distracts vehicular traffic on the embankment.
3. The placement of water fountains on the embankment adjacent to the sites
4. Thames Water events on the external realm sites to proactively engage our customers, describing the work we do that they don't see and how we can co-create, co-fund and co-deliver a better future.
5. Use the sites for school visits and education purposes.
6. Venue to host art installations and exhibitions for the benefit of the public.
7. The placement of "green transport" – hub for hiring and charging bikes or scooters
8. Investigating the opportunity for local charities helping people develop new skills, gain their first job or reintegrate into society by carrying out the maintenance activities which would be provided by Thames Water.

iv) We will seek opportunities to deliver enhanced benefits beyond the original scope.
(1) Enhancement project

Smart Networks and Advanced Sewerage Control Systems

Smart networks and advanced sewerage control systems are seen as a key part of improving sewerage systems. By using sensors and real-time data, smart networks can help to identify problems in the sewerage system before they become major issues. This allows for more efficient maintenance and repairs, reducing the likelihood of sewer overflows and other problems.

Advanced sewerage control systems can also help to optimise the treatment of wastewater. By using real-time data on flow rates, pollution levels, and other variables, these systems can adjust the treatment process to ensure that the wastewater is treated as efficiently and effectively as possible. This can lead to cost savings and improved environmental outcomes.

The London Tideway Tunnel is already a highly sophisticated piece of infrastructure, but there may be opportunities to further enhance its performance in the future. One potential area for improvement is the use of smart networks and advanced sewerage control systems. By using real-time data on sewer flows and other variables, it may be possible to further improve the efficiency of the tunnel and reduce the risk of sewer overflows.

Needs to be addressed.

The needs to be addressed via this workstream are:

- Reduce the risk of flooding.
- Use energy wisely.
- Improve water quality further in line with public and stakeholder expectation.

To be clear this ‘enhancement’ work is only possible because of the LTT tunnel. As the tunnel provides additional storage capacity and therefore thinking can be applied to haw that may be used differently.

Figure 32 :Existing sewer network

As can be seen in Figure 32 the current arrangement of London’s Trunk Sewers, flow West to East. As a general principle the closer the sewer is to the river, both North and South, the lower (in height) it is in the catchment. In practice the higher sewers can cascade into the lower sewers when they overtop fixed weirs, until the flow reaches Low Level 1 North (LL1N) and the Southern Outfall Sewer (SOS). Any flow entering the lower sewers must be then pumped at specific points (Abbey Mills and Greenwich) to reach Beckton or Crossness. When LL1N and the SOS are full they will discharge into the London Tideway Tunnel, to prevent a CSO discharge to the river.

The weir system is no more complicated than a board or set of boards, which are added or removed manually. North of the river 3 Trunk Sewers deliver to Beckton by Gravity and South of the river 2 Trunk Sewers deliver to Crossness by gravity. This lack of active control means the system cannot be adjusted while in use to manage the variability of rainfall across the area. As has been experienced in recent summers, the London network is impacted by high intensity, but very localised, storm events which cause flooding in some areas whilst others remain unaffected. Inherently this means there will be capacity either within the LTT or Trunk Network that is not utilised, which presents a compelling case for changing how the network is operated.

Support for Change

As the construction of the LTT nears completion, thinking with regards to long term planning, Thames Water is now considering what benefit the LTT could provide in meeting our strategic objectives.

The DWMP has identified a need to invest £2.4bn on top of day-to-day maintenance activities to tackle the impact of growth and climate change and keep the percentage of properties at risk of flooding at 3% for a 1 in 50-year return period. Part of the £2.4bn investment is allocated to the

provision of below ground attenuation storage and new sewers, all to be built within the constraints of London. However, as the required work is based on the current LLT operating techniques there is a clear need to identify how much of the benefit that could be provided through improved utilisation of the LTT. Not only would this provide cost savings, the utilisation of an existing asset results in a reduction in embodied carbon and customer disruption.

In addition to the DWMP the London Flood Review Stage 3 Report Final completed a limited hypothetical model analysis which assumed the LTT was in operation. The modelling predicted the flood volume for the 12th July 2021 event would have been reduced by 15% based on current operating protocols. This limited study evidence's how the LTT provides benefit above the current water quality objective and the opportunity to increase those benefits.

As detailed above the future of the network is for automated real time control, and the first phases of that journey has already been planned with the development of the Beckton Digital Twin allowing for the inclusion, in AMP8, of the LTT Virtual Operating System (VOS).

Future enhancement, reimagining Bazalgette for the future

To meet the future expectations of customers and stakeholders and to improve the overall efficiency of the system, the 2025-2030 period will involve investigation into the use of additional flow and level control devices and the enhancement of modelling and training tools to assess the potential of the system to be operated in different ways. The cost model for this enhancement is detailed in Appendix C. The two mechanisms being considered are:

1) Keeping stormwater at higher levels to limit power usage when sewer capacity is available.
2) Proactively diverting water to lower levels, providing specific locations with additional capacity to deal with high intensity, localised storms to reduce flooding risk.

A necessary enabler of this is firstly to increase flow and level measurement throughout the trunk network to allow more sophisticated assessment of the base flows and free capacity in normal operation and storm scenarios. This will allow improved knowledge and enhancement to modelling capabilities, including bringing together of the virtual operating system for the London Tideway Tunnel with the Digital Twin for Beckton to develop a fully integrated system model with which to optimise the system. This would include improved connection to live weather forecasting and prediction to generate scenarios on which operation of the system could be altered.

The second part of the 2025-2030 strategy is to establish specific locations within the trunk network where trials of new dynamic assets could be implemented to achieve points 1 & 2 above. This phase would only be implemented following completion of LTT System Acceptance as an agreed change to the established function of the approved system.

The alternative pathway is to automate the weirs within the Trunk Network with up and downstream sewer depth monitors. These assets should then link to a means of intelligent control to manage levels within the Trunk Network:

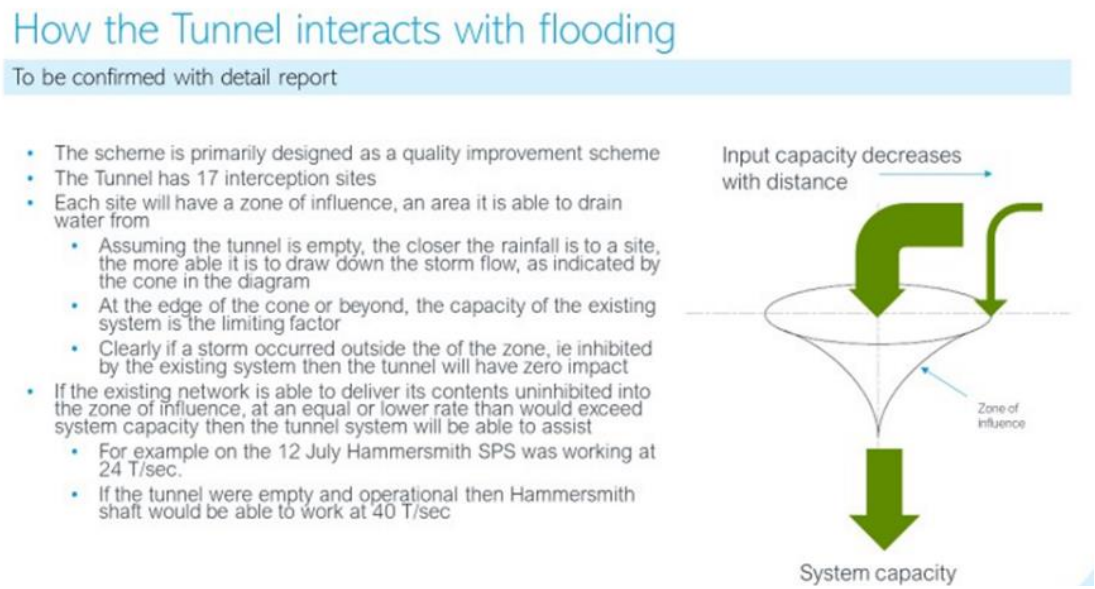


Figure 33 :Zone of influence

The figure above shows the zone of influence depicted by a cone, of an interception shaft on the tunnel. Active management as described by point 2 above, in principle increases the width of the cone and increases its flood alleviation support to a wider area.

The plan is that by the end of year 3 of AMP8 the workstream would be suitably matured to a position where implementation/construction planning could commence.

Scope of workstream

The scope for AMP8 is to build on the current AMP7 studies and gain greater understanding of the benefits, feasibility of implementing changes both from an operational and construction perspective. The key scope items are.

- Installation of depth monitors to provide improved data to gain greater confidence in the modelled outputs.
- Feasibility and optioneering studies – identify the zones of influence and works needed to realise the benefit.
- Integrate the VOS into the Becton Digital Twin
- Develop an end-to-end delivery plan aligned with the wider DWMP schemes.
- Implementation of any enhancement works identified in the AMP7 studies.

Conclusion

Summary of key points

The 2025-2030 strategy for implementing the integration of the London Tideway Tunnel with the broader Thames Water asset base involves four key elements.

- Integration and optimisation of the Thames Tideway Tunnel into the existing assets to create a successful system.
- Capital investment to support the additional demands of the TTT project in the most efficient manner.
- Timely disposal of surplus land
- Engaging community with partners on the new public realm to begin the process of co-creation and co-delivery of improvements beyond our individual remits in support of the outputs of the London Flood Review 2021

However, the strategy for the period must also look to the future, beyond establishing a robust and reliable asset. It must evolve and enhance the Bazalgette system, leveraging the benefits of new technology and building a system which can maximise the opportunity of the LTT system. Additional development to shape the system beyond the original design is a necessary step in this period. The key parts of this strategy are:

- Expansion of the use of flow and level monitoring in the trunk network
- Drawing together the Tunnel System modelling with Beckton STW Digital Twin to develop a fully integrated system including improved weather forecasting tools.
- Identifying areas where dynamic assets can meet the dual aims of keeping stormwater high to save power and proactively diverting flow to lower levels to reduce flooding risk in localised storms.

Reiteration of the importance of the London Tideway Tunnel project in meeting public, environmental, and regulatory concerns

These factors meet the concerns and generate a strategy for the TTT Price control which seeks to engage communities, explores new technology and assets, seeks sustainable solutions and business practices which set a platform for onward development of the control and operation of the London Tideway Tunnel system.

Final thoughts on the potential future of the project

The 2025-2030 period will be the completion of Phase 3 of a 25-year strategy to improve the River Thames for Londoners in line with designed standards and aligned with the original Bazalgette vision for the system.

We must, however, continue to look to the future recognising the unacceptability to our Customers and Stakeholders of any spills to rivers and the strong desire of our communities that we continue to operate an increasingly efficient and sustainable operation, reducing the risk of customer flooding. The 2025-2030 strategy for the LTT and its development express the appropriate next steps in going beyond Bazalgette to provide a starting platform for the future.

Data Tables and Assumptions

Overall expenditure

£m	2025/6	2026/7	2027/8	2028/9	2029/30	AMP8
Enhancement	6.312	16.924	11.347	11.769	11.782	58.134
Capital	14.280	15.577	7.429	0.900	1.965	40.151
Maintenance	1.758	6.002	10.752	10.139	10.136	38.786
Power	2.227	2.278	2.300	2.346	2.401	11.552
Resources	2.239	2.238	2.196	2.251	2.307	11.231
Other	0.453	0.453	0.453	0.453	0.453	2.265
Corporate	0.384	0.325	0.328	0.332	0.336	1.705
Land	(93.563)	(7.044)	3.900	1.900	0.200	(94.607)
Total	(65.911)	36.754	38.704	30.090	29.580	69.217

Land

£m	2025/6	2026/7	2027/8	2028/9	2029/30	AMP8
Compensation	21.207	0.000	0.000	0.000	0.000	21.207
Disposal	(136.800)	(12.000)	0.000	(2.000)	0.000	(150.800)
Disposal Cost	7.356	4.770	3.900	3.900	0.200	20.126
Public Realm	14.540	0.000	0.000	0.000	0.000	14.540
Rental Income	(0.229)	0.000	0.000	0.000	0.000	(0.229)
Resources	0.363	0.186	0.000	0.000	0.000	0.549
Land	(93.563)	(7.044)	3.900	1.900	0.200	(94.607)

Table 1 – Overall costs and Land breakdown

Sensitivity Analysis

There is a degree of uncertainty in the forward program and the cost estimates set in this business plan will be insufficient should the overall project move back in time. We have estimated the financial impact of a programme change for six-month, one year and two years which is summarised below.

	Impacted spend	Impact of a 6-month delay	Impact of a 1-year delay	Impact of a 2-year delay
Change in cost (£m)	56	6	11	21

Table 2 - Modelled change in AMP8 costs linked to a delayed handover and/or acceptance

Note: We expect only £56m of our total spend of £69.2m to be impacted by a change in timescales.

Assumptions

- CSO site maintenance will transfer to Thames Water at System Acceptance
- Public Realm maintenance will transfer at the point of Handover.
- Maintenance assumptions were built on System Acceptance occurring 18 months after Handover.
- No specific allowance is included for PLA mitigations arising from DRA / NRA assessments.
- No specific allowance is included for EA requirements arising from Environmental Management System requirements as a result changes to Operational Contingencies
- Staff and resourcing is aligned with Mar-25 Handover, additional prolongation costs from these dates will offset savings in maintenance (see sensitivity analysis).
- No S106 costs will apply in AMP8.

Appendix A – Incremental Change in Power and New Maintenance

Tideway Site Power

Site	WLC Years - kW/hr	**2025/26**	**2026/27**	**2027/28**	**2028/29**	**2029/30**
Abbey Mills	36,506.35	37,900.19	39,420.00	41,570.18	44,399.37	48,289.50
Beckton	-	-	-	-	-	-
Chambers	234,901.30	127,837.95	130,494.80	134,253.64	139,199.47	146,000.00
Deptford	73,420.38	76,972.11	80,848.08	86,327.06	93,539.59	103,455.64
Earl Pump	144,398.51	147,268.80	150,398.48	154,826.26	160,652.29	168,663.08
Greenwich	110,993.45	113,249.22	115,140.23	117,620.24	119,704.01	121,883.03
King Edward	97,623.90	101,175.63	105,048.32	110,527.30	117,736.49	127,649.12
Acton	234,321.24	234,321.24	234,321.24	234,321.24	234,321.24	234,321.24
Barn Elms	69,646.38	69,646.38	69,646.38	69,646.38	69,646.38	69,646.38
Carnwath	246,646.56	246,646.56	246,646.56	246,646.56	246,646.56	246,646.56
Dormay	58,258.38	58,258.38	58,258.38	58,258.38	58,258.38	58,258.38
Hammersmith	533,293.34	533,293.34	533,293.34	533,293.34	533,293.34	533,293.34
King George	65,266.38	65,266.38	65,266.38	65,266.38	65,266.38	65,266.38
Putney	67,412.58	67,412.58	67,412.58	67,412.58	67,412.58	67,412.58
Albert	290,260.76	291,490.65	292,831.69	294,728.96	297,225.36	300,657.92
Blackfriars	96,909.45	97,833.42	98,840.89	100,266.23	102,141.68	104,720.42
Chelsea	179,791.82	180,973.64	182,262.27	184,085.38	186,484.20	189,782.59
Cremorne	88,388.40	88,388.40	88,388.40	88,388.40	88,388.40	88,388.40
Falconbrook	68,766.00	68,766.00	68,766.00	68,766.00	68,766.00	68,766.00
Heathwall	118,320.60	119,438.53	120,657.49	122,382.04	124,651.19	127,771.26
Kirtling	137,729.41	138,605.70	139,561.19	140,912.99	142,691.67	145,137.36
Victoria	98,953.77	100,099.41	101,348.59	103,115.88	105,441.28	108,638.69
Total	3,051,809.96	2,964,846.52	2,988,854.28	3,022,619.42	3,065,870.85	3,124,653.86
Unit Rate (£/kWh)	0.25	0.24	0.23	0.22	0.21	0.21
Total (£)	764,173.21	710,970.20	673,089.98	656,512.94	652,723.90	656,489.78
Cumulative (£)		710,970.20	1,384,060.18	2,040,573.12	2,693,297.02	3,349,786.80

Public Realm Site Power

kW/h	kW/per annum	**2025/26**	**2026/27**	**2027/28**	**2028/29**	**2029/30**
ACTST	0	0	0	0	0	0
ALBEF	11,873	2,847	2,674	2,579	2,528	2,495
BAREL	500	120	113	109	106	105
BLABF	40,951	9,820	9,222	8,895	8,718	8,604
CARRR	4,504	1,080	1,014	978	959	946
CHAWF	1,577	378	355	342	336	331
CHEEF	8,378	2,009	1,887	1,820	1,784	1,760
CREWD	500	120	113	109	106	105
DEPCS	2,102	504	473	457	448	442
DRMST	438	105	99	95	93	92
EARPS	500	120	113	109	106	105
FALPS	5,291	1,269	1,192	1,149	1,126	1,112
GREPS	500	120	113	109	106	105
HAMPS	0	0	0	0	0	0
HEAPS	8,958	2,148	2,017	1,946	1,907	1,882
KEMPF	10,000	2,398	2,252	2,172	2,129	2,101
KNGGP	5,960	1,429	1,342	1,295	1,269	1,252
KRTST	4,937	1,184	1,112	1,072	1,051	1,037
PUTEF	9,602	2,303	2,162	2,086	2,044	2,017
VCTEF	11,685	2,802	2,631	2,538	2,488	2,455
Site Total		30,756	28,883	27,857	27,306	26,947
BLABF - water feature		16,500	16,500	16,500	16,500	16,500
Unit Rate (£/kWh)		**0.24**	**0.23**	**0.22**	**0.21**	**0.21**
Total (£)		47,256	45,384	44,358	43,806	43,447
Cumulative (£)		47,256	92,640	136,997	180,803	224,250

[redacted]

[redacted]

Appendix C – Enhancement Project – Beyond Bazelgette

Cost Model for Enhancement Project

Monitor Install

	Unit Cost	Quantity	Cost	Year 1	Year 2	Year 3	Year 4	Year 5	AMP8
Depth Monitors	5,000	1000	5,000,000	1,500,000	3,500,000	0	0	0	5,000,000
Flow Monitors	20,000	250	5,000,000	2,500,000	2,500,000	0	0	0	5,000,000
Outlet Probe Monitors	50,000	10	500,000	0	500,000	0	0	0	500,000
			10,500,000	4,000,000	6,500,000	0	0	0	10,500,000
Monitor maintenance (Opex) Depth					225,000	750,000	750,000	750,000	2,475,000
Monitor maintenance (Opex) Flow					375,000	750,000	750,000	750,000	2,625,000
Monitor maintenance (Opex) Outlet Probe									

Project Team

	Unit Cost	Quantity	Cost	Year 1	Year 2	Year 3	Year 4	Year 5	AMP8
Per annum cost	500,000	5	2,500,000						
Specialist consultant			1,000,000						
			3,500,000	830,000	830,000	840,000	500,000	500,000	3,500,000
	Capital Investment		30,000,000	0	7,500,000	7,500,000	7,500,000	7,500,000	30,000,000
	Contingency		3,500,000	0	0	0	1,750,000	1,750,000	3,500,000
	AMP8 Estimate		47,500,000	4,830,000	14,830,000	8,340,000	9,750,000	9,750,000	47,500,000

Monitor	4,000,000	6,500,000	0	0	0	10,500,000
Penstock Automation	830,000	8,330,000	8,340,000	9,750,000	9,750,000	37,000,000
Total	4,830,000	14,830,000	8,340,000	9,750,000	9,750,000	47,500,000
Opex	0	600,000	1,500,000	1,500,000	1,500,000	5,100,000
Total	4,830,000	15,430,000	9,840,000	11,250,000	11,250,000	52,600,000

It's everyone's water