Our final plan

Our Drainage and Wastewater Management Plan 2025-2050

Technical Appendices
Appendix U - Resilience

May 2023

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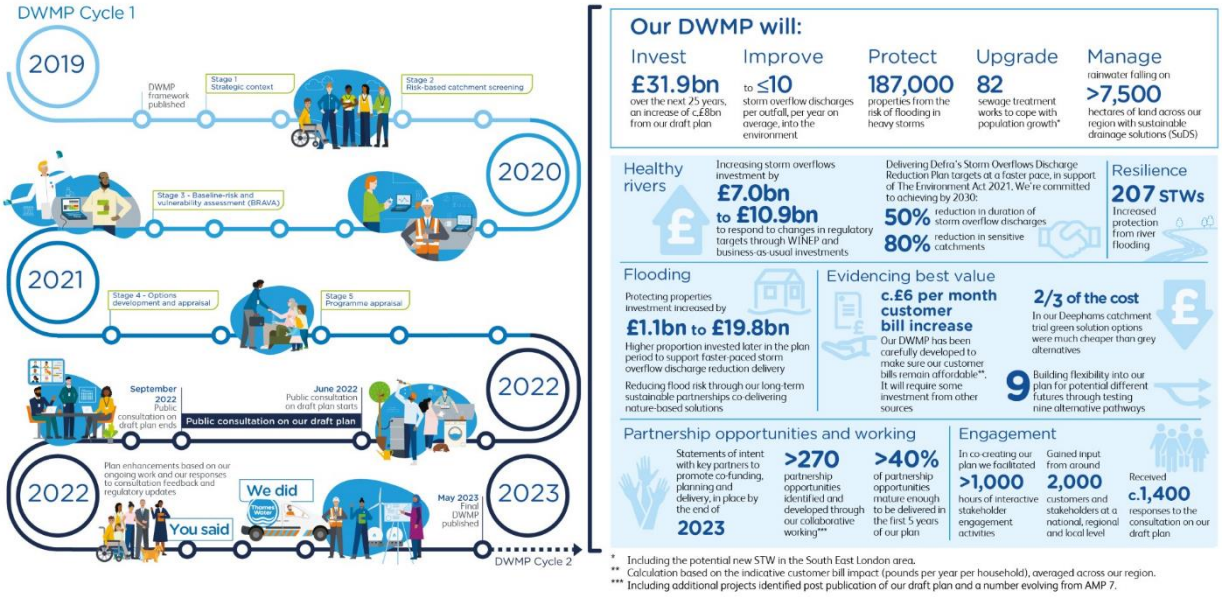
Preface

We're proud to present our first Drainage and Wastewater Management Plan (DWMP) and encouraged by the level of positive feedback we've received. Over the last four years, we've engaged and worked collaboratively with around 2,000 of our customers and stakeholders, to deepen our shared understanding and develop new ways to manage drainage and wastewater across our region. We illustrate our DWMP Cycle 1 and its headlines below.



We've progressed and enhanced our DWMP since we published it for public consultation in June 2022. We were pleased to receive lots of positive comments and support on the quality and ambition of our draft plan as well as useful ideas for making our final DWMP even stronger.

We've updated our draft plan based on our ongoing DWMP work, regulatory updates and our responses to the consultation feedback wherever possible*. Our updates include providing more detail where you felt it was needed and creating new appendices to answer technical queries. For more details on how we've progressed our final plan and responded to the consultation feedback, please see our Non-technical summary and You said, We did Technical appendix.

* Some public consultation feedback didn't require further action or wasn't relevant to the DWMP process. Other feedback was relevant to future DWMP planning cycles and will be used to inform this work.

Progress signposts

We want to make it easy for you to see what's changed. You can spot all the places we've updated our draft plan with our 'progress signposts' which we've used across our final DWMP documents.

For documents newly created for the fDWMP, we've provided a progress summary table upfront, to demonstrate what type of information the document provides.

Progress summary table

The progress signposts summary table for the chapters in this document is outlined below. We've used orange cells to indicate where our draft plan has been updated with progress.

Progress signposts summary: Technical Appendix U - Resilience	Progress updated	More detail or new content	Number(s) updated	Delivery timeframe updated	Informing DWMP cycle 2
2 Introduction					
3 Coastal Resilience					
4 Fluvial Resilience					
5 Power Resilience					
6 Conclusion					

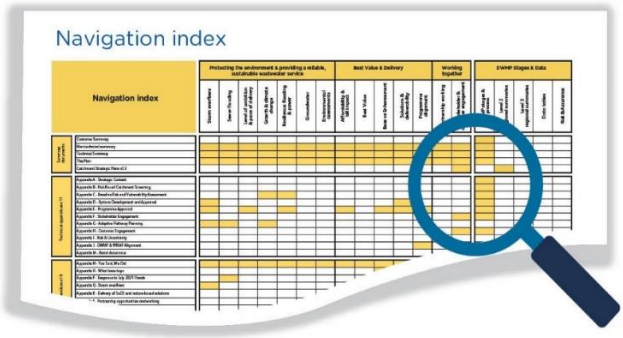
Key DWMP content

This document specifically includes the following key DWMP content:

- Protecting the environment and providing a reliable, sustainable wastewater service:
  - Sewer flooding
  - Growth & climate change
  - Resilience: flooding & power
- Best Value and Delivery:
  - Programme alignment
- Working together:
  - Partnership working
  - Stakeholder & customer engagement

Navigating our documents

To help you navigate around our final DWMP document suite and find where key DWMP content features, we've placed a Navigation index at the back of this document.



Executive Summary

The DWMP framework[1] has focussed resilience to three catchment specific hazards (Water UK, 2021):

- Coastal Flooding
- Fluvial Flooding
- Power Outages

The purpose of this document is to summarise the current and planned activities to assess and increase the operational resilience of our wastewater assets within the categories above.

Coastal resilience

We are an inland water company however, our systems interact with long stretches of the Thames Estuary, which is tidal.

Tide levels affect the operation of our treatment works that discharge into the Thames Estuary, most noticeably at Beckton STW. This in turn impacts the Lee Tunnel and will also influence the Thames Tideway Tunnel when it comes into operation.

Tide levels have contributed to surface water flooding at locations where surface water discharges into the Thames Estuary by a gravity connection. We expect this to increase as we experience higher tides.

We own a series of tidal defence structures that need to be maintained and upgraded by 2050 to account for higher tide levels.

Engagement with the EA Thames Estuary 2100 (TE2100) team has resulted in a series of three collaborative engagement statements to better manage the impact of increasing tide levels on our wastewater service.

Fluvial Resilience

Flooding from rivers can affect our treatment works and pumping stations with flood waters impacting on their operation and at times stopping them completely. Fluvial flooding is a much larger risk than coastal flooding due to a higher number of our assets potentially being affected and the wider impact when this type flooding occurs. We have a track record of delivery of fluvial protection at our sites through raising electrical assets, installing flood gates and flood doors, and installing additional pumps to drain down flood waters. These were predominantly delivered between 2015 and 2020. Using the latest EA predictions on current fluvial flood maps, we propose interventions at 207 treatment works to mitigate this risk. This has been included in the costs and scope of our DWMP.

Power Resilience

Over multiple investment periods we have invested in power resilience at our treatment works and pumping stations. Historical investment has focussed on high consequence low probability

[1] https://www.water.org.uk/wp-content/uploads/2021/10/DWMP_Framework_Report_Main_Report_September_2021.pdf , Section 4.4.2

electrical failures. In parallel our electricity suppliers have invested in improving resilience across their network especially in urban areas. Our recently installed smart electricity meters have identified a new risk - high frequency low consequence assets that experience short term outages that result in assets becoming unavailable for service. We will propose solutions to address this risk in Cycle 2 of the DWMP.

1 Our Drainage and Wastewater Management Plan (DWMP)

Our DWMP vision

1.1 Working in partnership to co-create a 25-year plan for drainage and wastewater that sustainably benefits communities and the natural environment in our region.

Our DWMP aim

1.2 To identify future catchment risks to our drainage and wastewater treatment systems and develop sustainable, efficient solutions to address them.

What we're trying to achieve

1.3 Protection of our environment, looking after the health of our rivers (aiming for zero harm from spills), being resilient to the risks of flooding and generating wider benefits to the communities we serve. DWMP outcomes for:

- Customers and communities – fair charges, improved health and wellbeing, increased amenity, and a resilient service
- Drainage and wastewater services – reduce sewer flooding and achieve 100% Sewage Treatment Works (STW) compliance
- The environment – increase biodiversity, zero harm from storm overflow spills, environmental net gain

Description of the plan

1.4 A DWMP is a long-term costed plan that is focused on partnership working, which sets out the future risks and pressures for our drainage and wastewater systems. It identifies the actions that are required to make sure we can continue delivering our services reliably and sustainably, while also achieving positive outcomes for our customers, communities and the environment.

1.5 Our long-term, collaborative plan aims to ensure a resilient and sustainable wastewater service for the next 25 years and beyond.

Framework

1.6 This is the first time we've produced a long-term plan for our wastewater service. Based on the national DWMP framework[2] that was developed jointly by regulators and industry bodies including Ofwat, Defra, the Environment Agency, Water UK, Welsh Government, Natural Resources Wales, Consumer Council for Water, Association of Directors of Environment, Economy, Planning and Transport (ADEPT) and Blueprint for Water, the DWMP creates a roadmap for how we adapt our wastewater service to cope with future challenges.

[2] https://www.water.org.uk/wp-content/uploads/2019/09/Working-together-to-improve-drainage-and-environmental-water-quality-an-overview-of-Drainage-and-Wastewater-Management-Plans.pdf

2 Introduction

2.1 This technical appendix is focused on Resilience as outlined in the DWMP framework[3]. Section 4.4.2 of the framework specifies a Resilience Assessment to be completed.

2.2 We did not present a draft resilience assessment for the public consultation on our DWMP. Nor did we include expenditure in the plan for resilience. The Environment Agency highlighted this as a shortfall in their response to our draft DWMP[4].

2.3 This document outlines activities undertaken for a resilience assessment on our wastewater assets within the DWMP framework. It focusses on three elements of resilience as outlined by the framework. They are:

- Coastal resilience
- Fluvial Resilience
- Power Resilience

[3] https://www.water.org.uk/policy-topics/managing-sewage-and-drainage/drainage-and-wastewater-management-plans/
[4] Refer to Table 5-1 in Technical Appendix N - You Said, We Did

3 Coastal Resilience

3.1 We are an inland water and sewerage company, yet we experience increasing risks due to climate change induced sea level rise in the 95 miles (153 km) long tidal Thames Estuary (Figure 3-1). The highest UKCP18 scenario predicts a sea level rise of 1.15 metres between 1990 and 2100 at Southend-on-Sea, relative to land level. (Environment Agency, 2022b).

3.2 Central London is protected from high tides that might cause tidal flooding from the Thames Barrier located at Woolwich. The barrier is forecast to provide protection up to 2070[5] across the Thames Estuary. The Thames Barrier and other flood defences in the Thames Estuary are shown in Figure 3-2. (Environment Agency, 2022a)

Figure 3-1: The Thames Estuary from Teddington lock to Shoeburyness and Sheerness

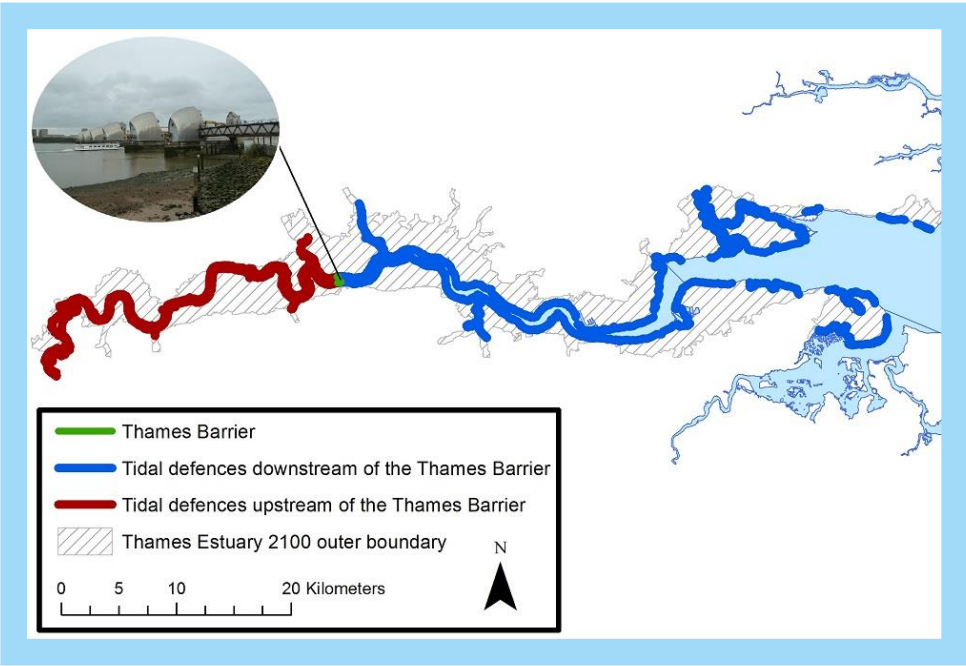


Figure 3-2: Tidal defences along the Thames Estuary

3.3 The Thames Estuary 2100 project, led by the Environment Agency, is currently reviewing tidal flood risk to critical infrastructure. The project seeks to develop an adaptive plan[6] for

[5] https://www.gov.uk/government/publications/thames-estuary-2100-te2100/thames-estuary-2100-te2100

[6] The Adaptive Plan for the Thames Estuary is briefly described in Technical Appendix G - Adaptive Pathway Planning as an exemplar of using an adaptive planning approach.

the future to address tidal flood risk in the Thames Estuary. This is in response to the increasing need for tidal flood protection due to climate change induced sea level rise. We are partners (among others) in developing in the Thames Estuary 2100 plan[7]. The Environment Agency plans to decide on a final option by 2040. Figure 3-4 outlines the three phases of the Thames Estuary 2100 plan.

Phases of the Thames Estuary 2100 Plan

Actions within the Thames Estuary 2100 Plan will happen over 3 phases.

Phase 1a: 2012 until 2022:

- Establish how defences should be managed across the estuary
- maintain and improve current flood risk management assets including walls gates, embankments, and pumps
- monitor how the estuary is changing
- identify land needed for future improvements to flood defences

Phase 1b: 2023 to 2035:

- work with communities to develop visions for their future riversides
- plan for defence raising
- secure land needed for future improvements to flood defences

Phase 2: 2035 to 2050:

- raise existing flood walls, embankments, and smaller barriers
- reshape the riverside through development, to improve flood defences, create habitat and improve access to the river
- determine the preferred option for the future Thames Barrier

Phase 3: 2050 to 2100:

- develop and implement the selected option for the future Thames Barrier
- adapt other flood risk management assets to work alongside this to protect the estuary

Figure 3-3: Phases of the Thames Estuary 2100 Plan[8]

3.4 The 10-year review of the Thames Estuary 2100 project in 2021 completed Phase 1a. Findings included a confirmation that the sea level has risen over the last century and accelerated over the last decade[9]. It also confirmed that 97.5% of tidal defences are meeting or exceeding their target condition.

[7] https://www.gov.uk/government/publications/thames-estuary-2100-te2100/thames-estuary-2100-key-findings-from-the-monitoring-review

[8] https://www.gov.uk/government/publications/thames-estuary-2100-te2100/thames-estuary-2100-te2100

[9] Sea levels relative to land at Southend at Sea have risen about 15 cm between 1911 and 2018, this has accelerated from an average of 1.4 mm per year between 1911 and 2018 to an average of 3.6 mm per year between 1990 and 2018. The highest UKCP18 scenario predicts sea level rise of 1.15 metres between 1990 and 2100 at Southend-on-Sea, relative to land level. (Environment Agency, 2022b).

3.5 Please find more information on the Thames Estuary 2100 project on their dedicated web site:
https://www.gov.uk/government/publications/thames-estuary-2100-te2100/thames-estuary-2100-te2100

3.6 Figure 3-4 outlines the flood risk from rivers and the sea for the Thames Estuary and its tributaries.

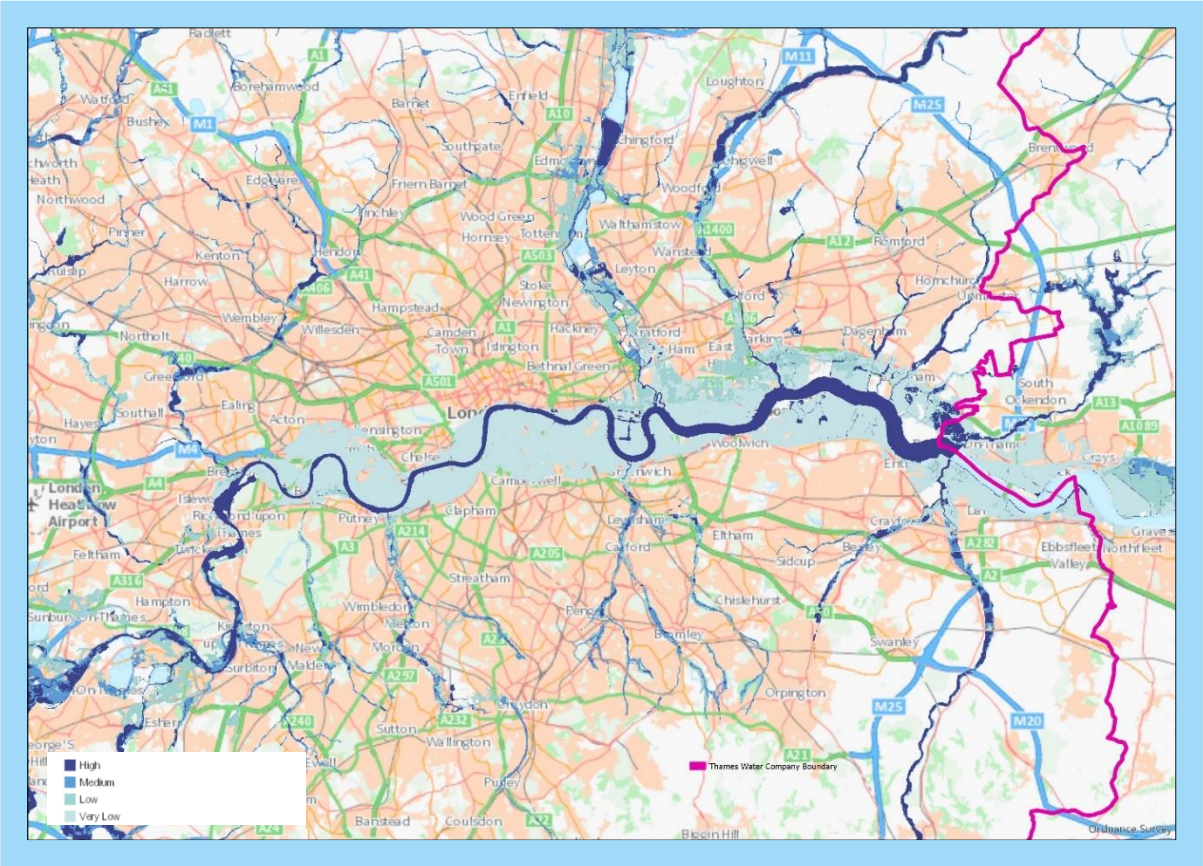


Figure 3-4: Environment Agency flood risk from rivers and the sea

3.7 As sea levels increase over time tide levels will also rise and affect our wastewater assets. We have four key risk elements. They are:

- The effect of tide-locking of the final effluent and storm discharges from our treatment works
- The effect of tide-locking on discharges from surface water sewers that can increase the risk of surface water flooding
- The effect of tide-locking on the ability to spill from foul and combined sewer overflows in wet weather
- The effect of high tides on assets we own and their ability to operate if they were flooded

3.8 Each of these key risks is described below.

Sewage Treatment Works (STW) and London Tideway Tunnels

3.9 Within the Thames Estuary we have five treatment works that discharge into the estuary. They are Mogden (Twickenham), Beckton (Newham), Crossness (Erith), Long Reach (Dartford) and Riverside (Rainham). Riverside discharges into the Rainham Marshes and not directly to the Thames Estuary. Beckton has two discharge locations, one into the

Thames Estuary and a second in the Barking Creek upstream of the Barking Barrier. Only Mogden is upstream of the Thames Barrier.

3.10 These treatment works discharge both final treated effluent and diluted foul sewage (in storm conditions) from their outfalls. All discharges are by gravity except at Beckton where we raise the final effluent using airlift pumping to ensure that we can discharge when the tide rises. These air lift pumps are used intermittently depending on the tide levels.

Impact of high tides on Beckton STW treatment capacity

3.11 When the EA inform us that the Thames and Barking Barriers are going to close, we need to discharge final effluent from our secondary outfall into the Barking Creek. This reduces the maximum flow we are required to treat from 27 m^3/s to 17 m^3/s as the Barking Creek does not have enough capacity to accept final effluent flow discharging at 27 m^3/s, due to the lower capacity at Barking Creek. Once the tide recedes, the Barking Barrier opens, and the discharge is returned to our primary outfall and treatment capacity returns to normal.

3.12 Because this changes our treatment capacity at Beckton STW, it also changes the operation of the Lee Tunnel and Thames Tideway Tunnel (once completed). Both tunnels have 'Operating Agreements' with the EA that specify the use of the tunnels that include scenarios for when the Barking Barrier is in operation and our flow is restricted.

3.13 As explained above our wastewater system in London is highly dependent on the operation of the Thames and Barking Barriers. Any future potential changes to the barriers could affect how we operate our assets.

3.14 The barriers provide resilience to central London by ensuring that high tides do not back up though the sewer network and 'bypass' the physical barriers.

Impact of high tides on Crossness STW treatment capacity

3.15 Crossness struggles to discharge final effluent into the Thames Estuary at high tides. This is currently being addressed with the construction of a final effluent pumping station to mitigate the resilience risk we currently face.

Other STWs

3.16 For the current data we hold, tidal impact at Mogden, Long Reach and Riverside STWs is not yet of concern. In future cycles of the DWMP, and as part of the Thames Estuary 2100 project we will investigate the impact of tide levels at these three treatment sites.

3.17 A preliminary study for Mogden is underway that focuses on the hydraulics of the discharge culvert.

3.18 Long Reach is in the proximity of a potential site for a new tidal barrier. We will need to understand the interaction between our assets, and this proposed barrier if these proposals progress.

Increased flood risk from tide-locking

3.19 From the flooding that was observed in July 2021 (and other events) we note a correlation between flood risk and high tides from both surface water and combined outfalls[10].

3.20 There are parts of the network where surface water sewers drain into the Thames Estuary. These outfalls can become tide locked which restricts surface water flowing into the estuary and can cause surface water flooding when the system capacity is exceeded.

3.21 Additionally, some of the combined storm overflows in London discharge by gravity into the Thames Estuary. Many of those overflows will connect directly into the Tideway Tunnel but some will remain, these will discharge significantly less often. When the tunnel is full, all the existing storm overflows will still need to discharge as they do today but less frequently. These outfalls are at risk of being restricted due to high tides.

3.22 As part of the Thames Estuary 2100 and future DWMP cycles we will investigate the joint probability of high tides and rainfall that could together increase flood risk.

3.23 We would also consider the impact on the mechanical flap valves located on the outfalls to the river from increased tidal ranges. These are installed to prevent river water entering the sewer system yet may restrict discharges during higher tides.

3.24 We are not currently proposing to investigate pumped discharges, as they can allow flow to enter the river when the tide is high.

Flood Defence walls

3.25 The EA hold a national register of flood defence structures. These assets are routinely surveyed, and structural concerns are reported to the asset owners.

3.26 In most cases, the owner of the asset is the landowner on which the asset is located. As we own land along the Thames Estuary, we own the associated lengths of flood defence walls.

3.27 Recent surveys have raised structural concerns at Beckton STW as well as along the Channelsea River near Abbey Mills pumping station in Stratford. Both walls are included in our current investment programme for remediation.

3.28 We propose to engage with the EA to:

- Verify ownership of the flood defence structures on our land
- Collect the most recent survey undertaken by the EA
- Propose a flood defence structure resilience programme that includes wall inspection and remediation as appropriate

3.29 There are additional requirements on flood defence structures within the Thames Estuary. Owners need to increase the height of their structures to account for an increase in sea levels. This needs to be delivered in accordance with the Thames Estuary 2100 plan which has forecast the expected height increases. Two phases of increases are required, the first by 2050.

[10] Combined outfalls – allow discharge of overloaded sewers that carry surface and foul water.

3.30 We propose to include these height increases in our flood defence structure resilience programme. We need to start the initial feasibility activity in 2030 and therefore would include it in PR29 to allow for 10 years of feasibility and detailed design followed by 10 years of construction.

Thames Estuary 2100 (TE2100)

3.31 The Thames Estuary 10-year review was consulted on at the end of 2022. We responded to the consultation and held a dedicated workshop with the EA on Wednesday 9 November 2022 to understand the interaction between TE2100 and future cycles of the DWMP.

3.32 All the actions outlined in this section were derived from that workshop and subsequent discussions.

3.33 We have agreed the following three statements with the TE2100 team.

"The Environment Agency and Thames Water will collaborate to ensure increasing numbers of Thames Barrier closures to manage the risk of sea level rise and surge events, does not negatively impact water quality as a result of Beckton Sewage Treatment Works discharges into the Barking Creek, and wider operation of the London Tideway Tunnels across the Thames Estuary."

"The Environment Agency, lead local flood authorities and water companies collaborate to improve management of the interface between tidal, fluvial, and surface water flood risk. This will include assessing joint probability analysis of high tides and rainfall."

"The Environment Agency, lead local flood authorities and water companies collaborate to better understand and manage the flood risk caused by tide locking of outfalls and sewers."

4 Fluvial Resilience

4.1 River flooding and inundation can negatively impact our ability to operate assets such as treatment works, storm overflows, and pumping stations. Flooding can stop the operation of electrical assets, drown out assets, and lock outfalls so that they are unable to discharge. Our pipe network can receive considerable amounts of flows from fluvial inundation, which can carry suspended river sediment, this can be deposited in our assets and reduce network capacities.

4.2 We have experience in delivering programmes of work to address river flooding. In AMP6 (2015-2020) we delivered a flood resilience programme to ensure that our most at risk assets were protected from fluvial flooding.

4.3 As part of this DWMP we have again assessed the impact that river flooding will have on our treatment works using revised fluvial flood risk data from the EA[11]. We aim to ensure that our assets remain operating even if they were to flood from river water. An example of this is provided in Figure 4-1. This helped us to understand which assets are located within the flood zone, however we were unable to complete a comprehensive BRAVA as the EA do not produce flood mapping that shows the extent of future flooding (only current baseline). We intend to repeat this analysis as part of our DWMP cycle 2.

[11] Data from the Environment Agency 'Flood map for Planning: Rivers and Sea - Flood Zone 3' was used.

Figure 4-1: Example of fluvial flood risk at a treatment works

4.4 Our proposed solution is not to protect our sites with flood defences that could move the flood to other locations, but to raise electrical and control assets to allow the treatment works to operate or recover quickly during the flood event, install flood gates/doors and sump pumps to clear flood waters quickly. We have implemented this previously at many

sites and have experience in the scale and types of solutions. Table 4-1 outlines the costs and number of sites being upgraded.

fDWMP	Unit	2025 – 2030	2030 - 2035	2035 – 2040	2040 - 2045	2045 - 2050	Total
Capex	£m	0	7	5	4	0	16
Number of treatment works	No.	0	80	60	67	0	207

Table 4-1: Cost and number of treatment works protected from fluvial flooding

5 Power Resilience

5.1 Power resilience assesses the redundancy that exists in the event of a power interruption. This could be due to the electricity supplier or a failure of our electrical assets.

5.2 We have historically implemented a power resilience programme for high consequence, low probability assets at our treatment works and pumping stations. These assets often serve large populations and were made resilient with standby generators. In some cases, we procure two independent supplies from the electricity district network operator (DNO). This is very common at our strategic pumping stations in London.

5.3 In parallel, our electricity suppliers are implementing programmes to increase the resilience of their networks especially where other major infrastructure or key assets like hospitals are located.

5.4 We have advanced incoming electricity meters on our sites. These record minor disturbances in the electricity supply, often yielding higher resolution data than the electricity supplier holds. This data has developed our understanding of power resilience, it has identified that some low-risk assets have a high frequency of incoming electrical failures. Many of these assets have limited or no automation and require manual intervention to reset them. These increase the risk of pollution and flooding due to the time it takes to attend these sites and reset them.

5.5 Having implemented a range of power resilience upgrades at high consequence assets we believe that our next step is a power resilience programme across the smaller assets that experience a high frequency of incoming electrical failures. This will be developed during DWMP cycle 2.

6 Conclusion

6.1 Despite being an inland water company, coastal resilience is still relevant to us as we operate along the Thames Estuary. The operation of our treatment works, and the future operation of the London Tideway Tunnels will be impacted by rising sea levels and high tides caused by climate change.

6.2 The risk of high tides affecting discharges from our treatment works is being addressed at Crossness STW, and will require further investigation for Mogden, Riverside and Long Reach STW's. The current risk at these sites is considered to be low.

6.3 Tide locking of outfalls contributed to the flooding observed in July 2021 in London. We propose a series of investigations in collaboration with the Thames Estuary 2100 Team to further understand these risks.

6.4 The Fluvial flood risk to our treatment works is understood and solutions to mitigate this are included within this DWMP.

6.5 Our understanding of the risk associated with power resilience is changing due to better information and we propose a new programme of work to be included in cycle 2 of the DWMP.

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Glossary

Term	Description
1 in 30-year storm	A storm that has a 1 in 30 chance (3.33% probability) of being equalled or exceeded in any given year. This does not mean that a 30-year flood will happen regularly every 30 years, or only once in 30 years.
1 in 50-year storm	A storm that has a 1 in 50 chance (2% probability) of being equalled or exceeded in any given year. This does not mean that a 50-year flood will happen regularly every 50 years, or only once in 50 years.
Asset Management Plan (AMP)	A five-year planning cycle used by English and Welsh water industry regulators to set allowable price increases for privately owned water companies and for the assessment of performance indicators such as water quality and customer service.
Baseline Risk and Vulnerability Assessment (BRAVA)	Following Risk Based Catchment Screening (RBCS), more detailed risk assessments on those catchments where we believed there was an adverse risk to performance over time. We modelled their performance to 2020 (baseline), 2030, 2035 and 2050.
Business Plan	Business Plans are produced by water companies every 5 years. They set out their investment programme to ensure delivery of water and wastewater services to customers. These plans are drawn up through consultation with the regulators, stakeholders and customers and submitted to Ofwat for detailed scrutiny and review.
Catchment Strategic Plans (CSPs)	Summary reports to promote system thinking across large wastewater catchments. These provide early sight of our final plans enabling co-authoring opportunities for our stakeholders. Each document outlines the challenges that the catchment will face in the future and the long-term plans to address these issues.
Combined sewer	A sewer designed to receive both wastewater and surface water from domestic and industrial sources to a treatment works in a single pipe.
Customer Challenge Group (CCG)	An independent body that challenges both our current performance and our engagement with customers on building our future plans.
Cycle 1 and Cycle 2 DWMP	Our current DWMP is referred to as Cycle 1, it covers a planning period of 2025-2050. Our next plan will be published in five years' time and is referred to as our Cycle 2 DWMP, it will cover a planning period of 2030-2055.
Department for Environment, Food and Rural Affairs (Defra)	UK government department responsible for safeguarding the natural environment, food and farming industry, and the rural economy.
Drainage and Wastewater Management Plan (DWMP)	A Drainage and Wastewater Management Plan (DWMP) is '*a long-term strategic plan that sets out how wastewater systems, and the drainage networks that impact them, are to be extended, improved and maintained to ensure they are robust and resilient to future pressures*'. The planning period is 25 years, from 2025 to 2050. DWMP is iterated every five years; the first known as 'Cycle 1', published as a final plan in May 2023.
dDWMP	The draft version of the Drainage and Wastewater Management Plan, published in June 2022.
fDWMP	The final version of the Drainage and Wastewater Management Plan, to be published in May 2023.
Dry Weather Flow (DWF)	Dry Weather Flow is the average daily flow to a Sewage Treatment Works (STW) during a period without rain.

Environment Agency (EA)	UK government agency whose principal aim is to protect and enhance the environment in England and Wales.
EA Pollution Categories 1 to 3	Category 1 incidents have a serious, extensive or persistent impact on the environment, people or property. Category 2 incidents have a lesser, yet significant, impact. Category 3 incidents have a minor or minimal impact on the environment, people or property with only a limited or localised effect on water quality. Further Ofwat guidance available here: WatCoPerfEPAmethodology v3-Nov-2017-Final.pdf (ofwat.gov.uk)
Event Duration Monitoring (EDM)	Event duration monitoring (EDM) measures the frequency and duration of storm discharges to the environment from storm overflows.
External hydraulic sewer flooding	External flooding occurs within the curtilage of a property due to hydraulic sewer overload. Further Ofwat guidance available here: Reporting-guidance-sewer-flooding.pdf (ofwat.gov.uk)
Foul sewer	A foul sewer is designed to carry domestic or commercial wastewater to a sewage works for treatment. Typically, it takes wastewater from sources including toilets, baths, showers, kitchen sinks, washing machines and dishwashers from residential and commercial premises.
Grey infrastructure	New sewers, sewer upsizing and attenuation storage to provide additional capacity in the wastewater networks. Also covers new pumping stations, rising mains and/or civil structures at STWs.
Green infrastructure	Sustainable surface water management solutions, including sustainable drainage systems (SuDS), that are designed to mimic naturally draining surfaces. Typically applied to surface water or combined sewerage systems, but can also be applied to land, highway or other forms of surface drainage.
Historic England (HE)	A non-departmental public body of the government whose aim is to protect the historical environment of England by preserving and listing historic buildings, ancient monuments.
Hydraulic overload	Hydraulic overload occurs when a sewer or sewerage system is unable to cope with the receiving flow.
Internal hydraulic sewer flooding	Flooding which enters a building or passes below a suspended floor caused by flow from a sewer. Further Ofwat guidance available here: Reporting-guidance-sewer-flooding.pdf (ofwat.gov.uk)
L2 Area (Strategic Planning Area)	An aggregation of level 3 catchments (tactical planning units) into larger level 2 strategic planning areas. The level 2 strategic planning areas allow us to describe strategic drivers for change (relevant at the level 2 strategic planning area scale) as well as facilitating a more strategic level of planning above the detailed catchment assessments.
L3 Catchment (Tactical Planning Unit)	Geographical area in which a wastewater network drains to a single STW. Stakeholders may be specifically associated with this area. Includes for surface water sewerage that may exist which serves the wastewater geographical area but drains to a water course.
Lead Local Flood Authorities (LLFAs)	LLFAs are Risk Management Authorities as defined by the Flood and Water Management Act 2010. They have statutory duties with respect to flood risk management, investigating flooding and the compilation of surface water management plans.

Long-Term Delivery Strategy (LTDS)	A requirement by Ofwat on water companies, to ensure that short term expenditure meets long term objectives for customers, communities, and the environment. These will be submitted as part of the Price Review.
Misconnections	Misconnections are where either surface water drainage or foul water is connected to the wrong system e.g., surface water to foul only or foul to surface water systems.
Natural capital accounting	The process of calculating the total stocks and flows of natural resources in a given system, either in terms of monetary value or in physical terms.
Natural England (NE)	A non-departmental public body sponsored by the Department for Environment, Food and Rural Affairs to protect the natural environment in England, helping to protect England's nature and landscapes.
Non-governmental organisation (NGO)	An organisation that operates independently of any government, typically one whose purpose is to address a social or political issue.
Options Development and Appraisal (ODA)	A method to focus the level of planning effort, i.e., proportionate to the risks identified, with a view to providing a measure of consistency across the industry.
Ofwat	The regulatory body responsible for economic regulation of the privatised water and wastewater industry in England and Wales.
PR24	Every five years, water companies set out their plans for what they'll deliver and how much they'll charge customers[12]. Their plans over the next five years should include how they will: • Provide a safe and clean water supply • Provide efficient sewerage pumping and treatment services • Control leaks • Install meters • Maintain pipes and sewers • Maintain and improve environmental standards This process is known as the price review, and the next one will be in 2024, when Ofwat will make its final decisions. We call this PR24.
Risk-Based Catchments Screening (RBCS)	A first-pass screening exercise of catchment vulnerability against 17 different risk indicators. To understand which catchments are low risk catchments and those that are likely to be at risk in the future if not supported by our long-term plan.
Risk Management Authorities (RMAs)	Authorities responsible for Flood Risk as defined in the Flood and Water Management At 2010. These include, Lead Local Flood Authorities, Highway Authorities, Local Planning Authorities, Natural England and the Environment Agency.
Sewage Treatment Works (STW)	A sewage treatment works receives and treats wastewater to a standard legally agreed with the Environment Agency, before it is released back into the environment.
Specific, Measurable, Achievable, Relevant, and Time-Bound (SMART)	A framework for setting effective targets.
Storm overflow discharges	Storm overflows are used to manage excess flows, which typically occur as a result of heavy rainfall. Excess flow that may otherwise have caused flooding is released through a designated outfall to a water course, land area or alternative drainage system.

[12] https://www.ccwater.org.uk/priorities/price-review/

Strategic Environmental Assessment (SEA)	A systematic decision support process to ensure that environmental and other sustainability aspects are considered effectively in policy, plan and programme making.
Surface water sewer	A surface water sewer collects rainwater from domestic and commercial roofs, driveways, patios etc to a local watercourse or suitable surface water drainage system.
Sustainable Drainage systems (SuDS)	Drainage solutions that provide an alternative to the direct channelling of surface water through networks of pipes and sewers to nearby watercourses. SuDS aim to reduce surface water flooding, improve water quality, and enhance the amenity and biodiversity value of the environment. SuDS achieve this by lowering flow rates, increasing water storage capacity and reducing the transport of pollution to the water environment.
Thames Regional Flood and Coastal Committee (TRFCC) area	The TRFCC area was established by the Environment Agency under the Flood and Water Management Act 2010 that brings together members representing the Constituent Authority. Featured TRFCCs are listed here on our DWMP portal: Drainage and Wastewater Management Plan (arcgis.com)
Water Industry National Environmental Programme (WINEP)	The framework under which Defra and the EA require environmental improvements to be delivered by water companies. Guidance is released by regulators, which water companies interpret for their geographical area, and resubmit the outputs back to regulators for endorsement.

Navigating our DWMP

We've developed a comprehensive document suite to share our final DWMP. This includes five summary documents that contain increasing levels of detail. To help you to navigate around our document suite and to find key DWMP content, we provide a Navigation index below and on our DWMP webpage. The orange cells refer to where key DWMP content can be found across our final document suite.

Navigation index		Protecting the environment and providing a reliable, sustainable wastewater service							Best value and delivery					Working together		DWMP stages and data				
		Storm overflows	Sewer flooding	Level of ambition & pace of delivery	Growth & climate change	Resilience: flooding & power	Groundwater	Environmental assessments	Affordability & bill impact	Best Value	Base vs Enhancement	Solutions & deliverability	Programme alignment	Partnership working	Stakeholder & customer engagement	DWMP stages & process	Level 2 regional summaries	Level 3 regional summaries	Data tables	Risk & Assurance
Summary documents	Customer summary	■	■											■	■	■				
	Non-technical summary	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	Technical summary	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	The Plan	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
	Catchment Strategic Plans x13	■	■	■	■	■	■	■	■	■	■	■	■	■	■		■	■		
Technical appendices x11	Appendix A - Strategic context												■			■				
	Appendix B - Risk-Based catchment screening															■				
	Appendix C - Baseline risk and Vulnerability assessment				■	■										■				
	Appendix D - Options development and appraisal	■										■				■				
	Appendix E - Programme appraisal	■		■		■			■	■	■	■	■			■				
	Appendix F - Stakeholder engagement														■	■				
	Appendix G - Adaptive pathway planning	■	■		■															
	Appendix H – Customer engagement Part A – Draft DWMP														■	■				
	Appendix I - Risk and uncertainty											■								■
	Appendix J - DWMP and WRMP alignment												■							
	Appendix M - Assurance																			■
New technical appendices x9	Appendix N - You Said, We Did (YSWD)	■	■	■	■	■	■	■	■	■	■	■	■	■	■					
	Appendix O - What base buys										■									
	Appendix P - Response to July 2021 Floods		■	■	■	■			■			■	■	■	■					
	Appendix Q - Storm overflows	■		■	■				■			■	■							
	Appendix R - Delivery of SuDS and nature-based solutions	■	■	■	■	■			■	■		■	■	■	■					
	Appendix S - Partnership opportunities and working			■								■		■	■					
	Appendix T - Groundwater quality						■													
	Appendix U - Resilience		■		■	■							■	■	■					
	Appendix V – Customer engagement Part B – Consultation Survey Report														■					
Environmental assessments	Appendix K - Strategic environmental assessment (SEA)							■												
	Appendix L - Habitats regulations assessment (HRA)							■												
Portals and data	Customer portal	■	■							■		■		■	■	■	■	■		
	Practitioner portal	■	■											■	■		■	■		
	Data tables			■							■								■	
	Data tables commentary																		■	

We welcome your views on our DWMP. Please share them with us by emailing: DWMP@thameswater.co.uk.

This document reflects our DWMP 2025-2050 as published in May 2023.