TMS20 Cost Adjustment Claim: Network Reinforcement

Contents

1. Executive Summary

In developing our programme for AMP8, we monitor and track Local Authority plans, major housing developments and Opportunity Areas across London. By 2030, we are expecting the completion of some large development areas that will need to connect to our network for water and wastewater services. If we do not reinforce our network in advance of these developments being completed, customers nearby are at risk of experiencing low water pressure and sewer flooding. Lack of reinforcement could also result in increased pollution and storm overflows.

In its PR24 Final Methodology, Ofwat has confirmed that network reinforcement will continue to form part of base expenditure allowances and that Ofwat will consider cost adjustment claims for companies that expect to deliver a higher amount of network reinforcement work than is funded from the base cost models[1]. This claim responds to Ofwat's guidance for both water and wastewater network reinforcement.

In establishing the need for network reinforcement costs above base allowances in AMP8, we have analysed historical industry growth expenditure. Our analysis demonstrates that Thames Water has seen the highest growth in properties connecting for water services over the last decade, and the second highest growth in properties connecting for wastewater services. Conversely, the length of Thames Water's water network and sewerage network has remained relatively static compared to others.

To avoid passing inefficient costs on to developers, in recent years we have focused on optimising our network (using pressure management as an example for water and improved surface water management for wastewater) to ensure that any headroom capacity is utilised. However, the demand for our water per length of main and the load on our sewerage network per length of sewer is now higher than any other company. We therefore consider that and increase in network reinforcement will be required going forward to accommodate new developments.

We have examined carefully Local Authority housing plans, development sites and Opportunity Areas included in the London Plan. We follow an accredited[2] hydraulic modelling approach to determine network reinforcement requirements for water and wastewater services, to prevent any detriment in service to customers. We consider a wide range of options, including network reconfiguration and alternative pumping arrangements before committing to network reinforcement costs. Our plan for AMP8 forecasts a significant increase in network reinforcement and we consider that our costs are efficient.

The timing and location of new development is difficult to predict. At PR19, we were monitoring 4 large development sites in London (Finsbury/Isle of Dogs, Old Oak Common, Ebbsfleet, and Greenwich Peninsula) and Aborfield/Reading Gateway in the Thames Valley. Of these, Old Oak Common and Ebbsfleet have not yet progressed and the others have been slower than forecast. We have nevertheless invested more in Network Reinforcement than assumed in PR19, as new sites have emerged. We confirm that Developers are not being asked to pay for projects

[1] Creating tomorrow together, Our Final Methodology for PR24, Appendix 9 Setting expenditure allowances p13

[2] ISO 9001 - the international Standard for Quality Management

previously funded - maintaining clear triggers for investment, monitoring planning application status, land ownership and developer activity is key.

We did not submit this claim to Ofwat on 9th June 2023 alongside our other cost adjustment claims, as our work on finalising our Developer Services submission for AMP8 had not been completed at that time. However, as we are not proposing any symmetrical adjustments, we do not expect other companies will need to comment on this claim.

In valuing the cost adjustment claim, we have first considered the implicit allowance. We used four separate methods, including expected PR24 Botex+ models with and without historical network reinforcement costs, and took an average of these to determine the implicit allowance for water and wastewater network reinforcement. The calculated implicit allowance is then deducted from our AMP8 forecast. The value of each claim exceeds Ofwat's materiality threshold of 1% of totex for both the water and wastewater network plus price controls. Our claim for water and wastewater is summarised in Table 1.1 below:

Table 1.1: Summary of water and wastewater network reinforcement cost adjustment claim

£m	Water	Wastewater	Total
AMP8 network reinforcement capex	185.9	123.9	309.8
Implicit allowance	29.1	40.9	70.0
Value of Cost Adjustment Claim	156.8	83.0	239.8

Customers do not pay for network reinforcement for water and wastewater, as all costs are offset Infrastructure Charges paid for by Developers. If we fail to invest in network reinforcement on time, it will impact upon our D-Mex score as well as potentially incurring ODI penalties for Performance Commitments such as interruptions to supply, internal and external sewer flooding, pollution and storm overflows. Provided that our determination includes the revenue that we expect to receive from developers (as has been included elsewhere in our plan), we consider no additional customer protection (such as a Price Control Deliverable) is needed for this claim.

2. Introduction

2.1. Background and purpose of this report

Population forecasts indicate a significant increase in demand for our water and wastewater services over the next 25 years:

- We currently supply over 10 million people across our water supply area, but projections show that we'll need to provide water for between 11.1 million and 12.3 million people by 2050, so around 10-20% more than now. Our Water Resources Management Plan ensures that we are able to balance supply and demand over the long term, whilst improving resilience to drought
- For wastewater, the population in our supply area is forecasted to increase by 17% from 2025 to 2050. Our Drainage and Wastewater Management Plan, together with the subsequent Long Term Delivery Strategy, maps out what we need to do over the next 5 AMPs to maintain compliance with our environmental permits, reduce storm overflows and sewer flooding

To meet the forecast increase in population, major new housing developments are working their way through the planning process. Our role as a water utility is to ensure that development sites can connect to our water and wastewater networks on time, but without any detriment in service to our legacy customers. To achieve this, we will need to reinforce our water and wastewater networks – upsizing some of our pipes and providing additional capacity at pinch points.

In its PR24 Final Methodology, Ofwat has confirmed that network reinforcement will continue to form part of base expenditure allowances[3].

'We commissioned consultants Arup to analyse whether growth-related expenditure could be robustly assessed separately from base costs in January 2022 based on existing historical data. Arup concluded that a standalone econometric model may be a viable option for assessing growth at wastewater treatment works costs at PR24. But Arup was unable to develop robust standalone models for network reinforcement and reducing risk of sewer flooding expenditure. This was because of cost allocation issues and the absence of relevant cost driver information'.

Following its review of the additional growth-related cost information that Thames Water and the rest of the industry provided in Summer 2022, Ofwat stated it intended to:

'*Include network reinforcement costs in the base cost models due to substantial interactions with capital maintenance expenditure and a close relationship with base cost drivers (eg scale and density). Arup were also unable to develop robust standalone models for network reinforcement. We will consider cost adjustment claims from companies that expect to deliver a higher amount of network reinforcement work than is funded through the base cost models'.*

We expect to deliver a higher amount of network reinforcement than is funded through the base models and this cost adjustment claim includes additional water and wastewater network reinforcement costs to address this.

[3] Creating tomorrow together, Our Final Methodology for PR24, Appendix 9 Setting expenditure allowances p13

It's important that developers, as opposed to customers, pay for network reinforcement activity. The purpose of this Cost Adjustment Claim is to ensure exactly that. In AMP8, we are forecasting a step increase in network reinforcement costs, as major new development sites will be completed at a rate that we have not seen in recent years. We do not believe that our historical cost base used in Ofwat's models will reflect future network reinforcement costs. An adjustment to our totex allowance is needed – this will ensure that customers and developers (through infrastructure charges) pay their fair share when the revenue cap is set in Ofwat's determination.

We did not include this Cost Adjustment Claim in our 9th June submission to Ofwat. At the time, we had not completed our Developer Services plan for AMP8 and the need for an adjustment only become apparent when we compiled our first forecast of network reinforcement later that month. We realised that, without this cost adjustment, developers would be paying a disproportionally higher percentage of revenue within the cap set in the determination. We have not proposed any symmetrical adjustments – other companies would not have had to review and comment on this claim in Spring 2023 consultation. We therefore consider that it is appropriate that Ofwat now considers this claim alongside our business plan submission.

2.2. Structure of this report

Within the remaining sections of this report, we cover the following:

- In section 2, we cover the need for adjustment. Population is increasing but the length of our water mains and sewerage network has not changed. We have optimised our network to avoid passing inefficient costs on to developers, but capacity is now fully utilised and an increase in reinforcement is necessary
- In section 3, we set out our plan for PR24. We describe our strategy to ensure that we meet demand. We track and monitor Local Authority plans and follow an accredited methodology including hydraulic modelling to determine service impact and options
- In section 4, we quantify the value of the claim. We set out our view of the cost adjustment required to support the incremental network reinforcement activity required to achieve the long-term sustainable level. We consider the appropriate approach for identifying the implicit allowance within Ofwat's base allowance. We summarise the approach we have taken to estimate the required cost adjustment.
- In section 5, we discuss customer protection

2.3. Meeting Ofwat's cost assessment criteria

The table below summarises Ofwat's assessment criteria and provides references to our supporting evidence for each of the criteria set out in Ofwat's final methodology.

Table 2.1: Ofwat's criteria for cost adjustment claims

Criteria	Sub-criteria	Questions	Thames' evidence	Reference
Need for adjustment	Unique circumstances	(a) Is there compelling evidence that the company has unique circumstances that warrant a separate cost adjustment?	Yes, a step change in activity is required to supply major new development sites in AMP8. This CAC relates to the additional network	Section 2 establishes need, Section 3 sets out our plans

			reinforcement activity above that is funded in Ofwat's base cost models.	
		(b) Is there compelling evidence that the company faces higher efficient costs in the round compared to its peers?	The CAC is for the incremental network reinforcement not funded in Ofwat's base cost models. Costs are based on development sites considered highly likely to proceed in AMP8	Section 3 describes our plan, Section shows our efficient cost forecast
		(c) Is there compelling evidence of alternative options being considered, where relevant?	Yes, we explain our hydraulic modelling approach and optioneering process	Section 3
	Management control	(d) Is the investment driven by factors outside of management control?	Yes, developers have statutory rights to connect. We have seen higher than average growth in connected properties, whereas the network has not significantly changed	Section 2
		(e) Have steps been taken to control costs and have potential cost savings (eg spend to save) been accounted for?	Yes, we follow a specifically modelling approach to avoid unnecessary investment	Section 3
	Materiality	(f) Is there compelling evidence that the factor is a material driver of expenditure with a clear engineering / economic rationale?	Yes, network reinforcement activity is a significant driver of this CAC. A step change in activity is required to allow major development sites in AMP8 to connect	Section 2 Section 3
		(g) Is there compelling quantitative evidence of how the factor impacts the company's expenditure?	Yes, we set out evidence on the implicit allowance and the efficient costs we will need to incur to undertake the required investment.	Section 4
	Adjustment to allowances	(h) Is there compelling evidence that the cost claim is not included in our modelled baseline (or, if the models are not known, would be unlikely to be included)? Is there compelling evidence that the factor is not covered by one	The CAC is for the incremental network reinforcement costs not funded in Ofwat's base cost models. We set out our view of the historical network reinforcement that is funded through the base models.	Section 4

		or more cost drivers included in the cost models?		
		(i) Is the claim material after the deduction of an implicit allowance? Has the company considered a range of estimates for the implicit allowance?	Yes. In our view, the materiality of the claim for water networks plus is 1.95% and for wastewater network plus is 1.03%.	Section 4
		(j) Has the company accounted for cost savings and/or benefits from offsetting circumstances, where relevant?	We have not identified any offsetting circumstances	Section 4
		(k) Is it clear the cost allowances would, in the round, be insufficient to accommodate the factor without a claim?	Yes, the size of the claim is material. Without the incremental claim, we would not be able to undertake the investment required to fulfil our statutory obligation	Section 4 see graphs of historical versus forecasts costs for water and wastewater
		(l) Has the company taken a long-term view of the allowance and balanced expenditure requirements between multiple regulatory periods? Has the company considered whether our long-term allowance provides sufficient funding?	Yes, a step change in renewals is required in AMP8 to allow major development areas to connect to our network	Section 4
		(m) If an alternative explanatory variable is used to calculate the cost adjustment, why is it superior to the explanatory variables in our cost models?	This criterion is not applicable, we do not propose alternative explanatory drivers.	N/A
Cost efficiency		(a) Is there compelling evidence that the cost estimates are efficient (for example similar scheme outturn data, industry and/or external cost benchmarking, testing a range of cost models)?	Yes, the unit costs we have used follow and Impact Assessment, optioneering process and technical governance	Section 3, Section 4

	(b) Does the company clearly explain how it arrived at the cost estimate? Can the analysis be replicated? Is there supporting evidence for any key statements or assumptions?	Yes, we have explained in detail how our AMP8 Network Reinforcement programme has been produced bottom-up and we explain how we deducted the implicit allowance.	Section 3, Section 4
	(c) Does the company provide third party assurance for the robustness of the cost estimates?	All costs subject to technical governance and assurance.	Section 3
Need for investment	(a) Is there compelling evidence that investment is required?	Yes, we have provided case studies and details of Impact Assessments	Section 3, Annex 1
	(b) Is the scale and timing of the investment fully justified?	Yes, our view is development sites identify will proceed in AMP8	Section 3, Annex 1
	(c) Does the need and/or proposed investment overlap with activities already funded at previous price reviews?	We have described projects from PR19 and have confirmed Developers will not be funded projects previously proposed	Section 3
	(d) Is there compelling evidence that customers support the need for investment (both scale and timing)?	N/A as Developers rather than customers pay for this investment	Section 2
Best option for customers	a) Did the company consider an appropriate range of options to meet the need?	Yes, we have described our optioneering approach and use of hydraulic modellin	Section 3
	b) Has a cost–benefit analysis been undertaken to select proposed option? There should be compelling evidence that the proposed solution represents best value for customers, communities and the environment in the long term? Is third-party technical assurance of the analysis provided?	Developers have a statutory right to connect, therefore we have not considered cost benefit. Our approach is to ensure that reinforcement is least cost and no regrets. We have described out approach to hydraulic modelling and optioneering	Section 3

	c) Has the impact of the investment on Performance Commitments been quantified?	Annex 1 shows examples of development sites where Performance Commitment impact is considered.	Section 3 case studies Annex 1
	d) Have the uncertainties relating to costs and benefit delivery been explored and mitigated? Have flexible, lower risk and modular solutions been assessed – including where utilisation will be low?	We have utilised the unit costs associated with recent tendered work	Section 3
	e) Has the company secured appropriate third-party funding (proportionate to the third party benefits) to deliver the project?	Network reinforcement activity should be managed by Thames Water. All costs are offset by income from Infrastructure Charges, so customers rather than developers pay for this activity	Not applicable
	f) Has the company appropriately presented the scheme to be delivered as Direct Procurement for Customers (DPC) where applicable?	Network reinforcement activity should be managed by Thames Water. This activity does not pass Ofwat's operational and maintenance discreteness test	Not applicable
	g) Where appropriate, have customer views informed the selection of the proposed solution, and have customers been provided sufficient information (including alternatives and its contribution to addressing the need) to have informed views?	Not applicable as Developers as opposed to customer are paying for this investment through Infrastructure Charges	
Customer protection	a) Are customers protected (via a price control deliverable or Performance Commitment) if the investment is cancelled, delayed or reduced in scope?	Customer do not pay for network reinforcement costs. All network reinforcement is offset by income from Infrastructure Charges from developers. No further protection mechanisms deemed necessary.	Section 5

	b) Does the protection cover all the benefits proposed to be delivered and funded (eg primary and wider benefits)?	Yes, full offset by Infrastructure Charges	Section 5
	c) Does the company provide an explanation for how third-party funding or delivery arrangements will work for relevant investments, including the mechanism for securing sufficient third-party funding?	All network reinforcement activity is offset by income from developers through Infrastructure Charges	Not applicable

3. Need for Adjustment

In this section, we demonstrate that Thames Water has seen the highest growth in connected properties over the last decade, whilst the length of our water mains and sewerage network has remained comparatively static. To avoid passing inefficient costs on to developers, in recent years, we have focused on optimising our networks. For water services, we have been using pressure management and CALM techniques to ensure that any headroom capacity is utilised. For wastewater, our focus has been on managing headroom through improved surface water management (delivering sustainable drainage solutions as an example). Going forward, for new developments to connect to our networks without a performance detriment to legacy customers, developers will need to pay for increased network reinforcement through Infrastructure Charges.

The purpose of this section is to demonstrate that historical costs used in Ofwat's models are not an appropriate predictor for Thames Water's future network reinforcement requirements. In Section 3, we set out a step change in network reinforcement investment in AMP8, building on this need for adjustment.

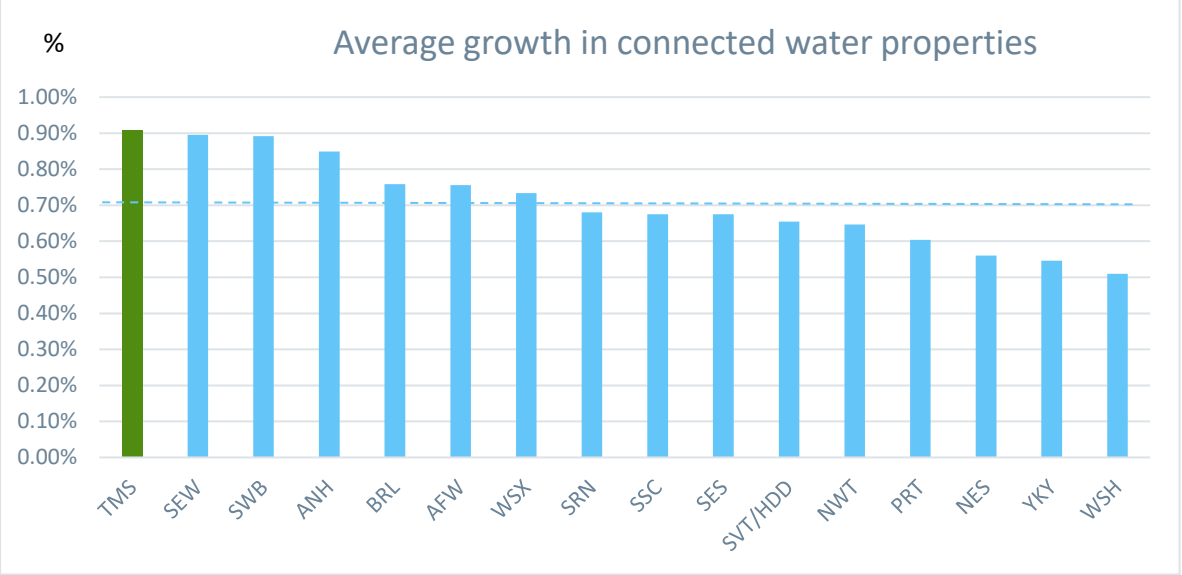
3.1. Growth in properties connecting to water services uses available headroom

The following analysis is taken from PR24 cost assessment datasets. We demonstrate that:

- Thames Water has seen the highest average growth in properties connecting to water services over the last decade, compared to other companies
- Year on year, the growth in properties connecting for water services in the Thames Water area has been higher than the industry average
- The total length of Thames Water's water mains has remained comparatively static to other companies over the last decade, as growth has occurred predominantly in dense urban area
- The volume of water used by customers per length of water main is now the highest in the industry

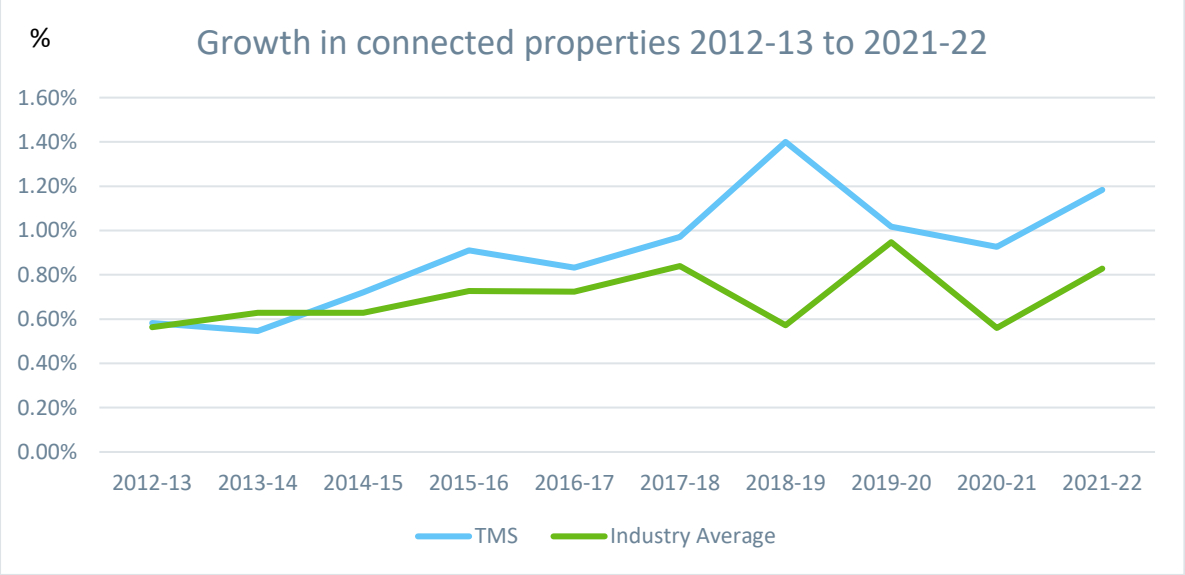
Figure 3.1: Average growth in connected water properties below shows the average growth in connected water properties, using cost assessment data over the last decade (2011/12 to 2021/22). Thames Water has on average seen the highest growth in the industry during this period.

Figure 3.1: Average growth in connected water properties



The annual growth in water connected properties over the last decade is presented in Figure 3.2 below. Annual growth in Thames Water's supply area has consistently been above the industry average in all but one year in the last decade.

Figure 3.2: Growth in connected water properties 2012-13 to 2021-22



Whilst Thames Water's growth in the number of properties connecting to water services has been the highest in the industry, Figure 3.3 below shows that the length of water mains has not kept pace with this. Many major new development sites have connected to already highly urbanised areas (including London), using up headroom in the local water distribution network to meet new demand.

Figure 3.3: Average growth in water mains length

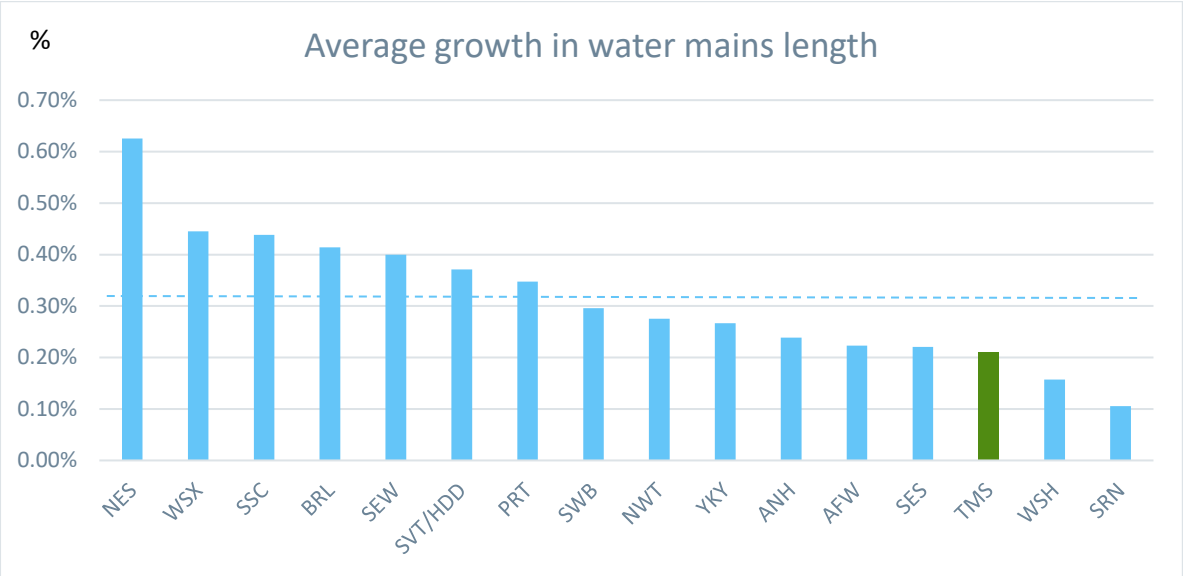


Figure 3.4 shows that, after adjusting for leakage (i.e. so that we are left with customer usage), Thames Water's network distributes more water per kilometre to meet demand than any other company – by a significant margin.

Figure 3.4: Average distribution input less leakage per length

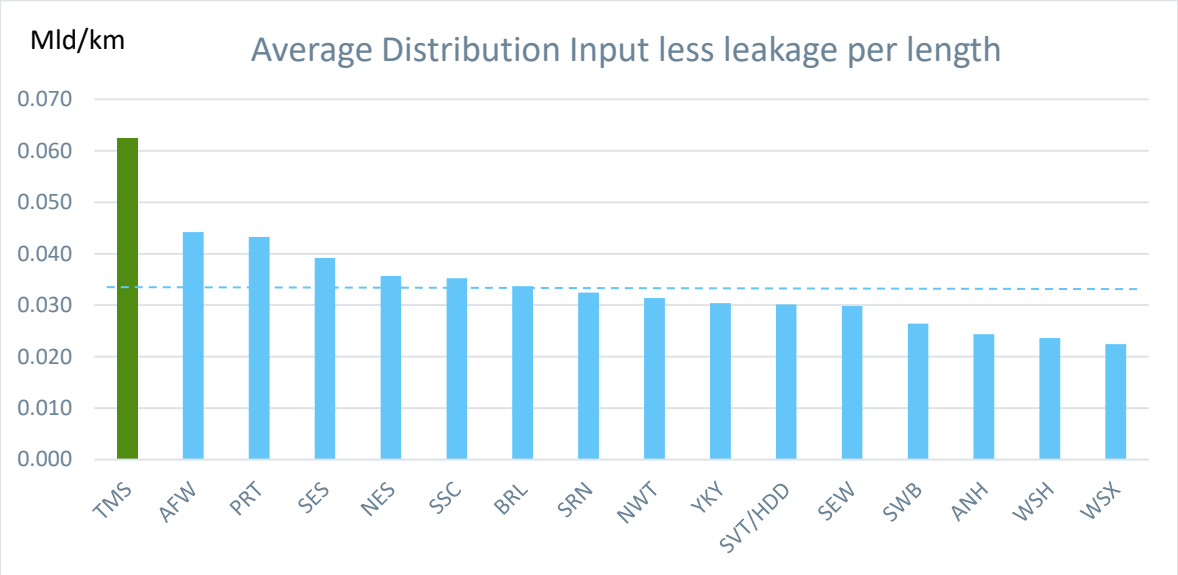
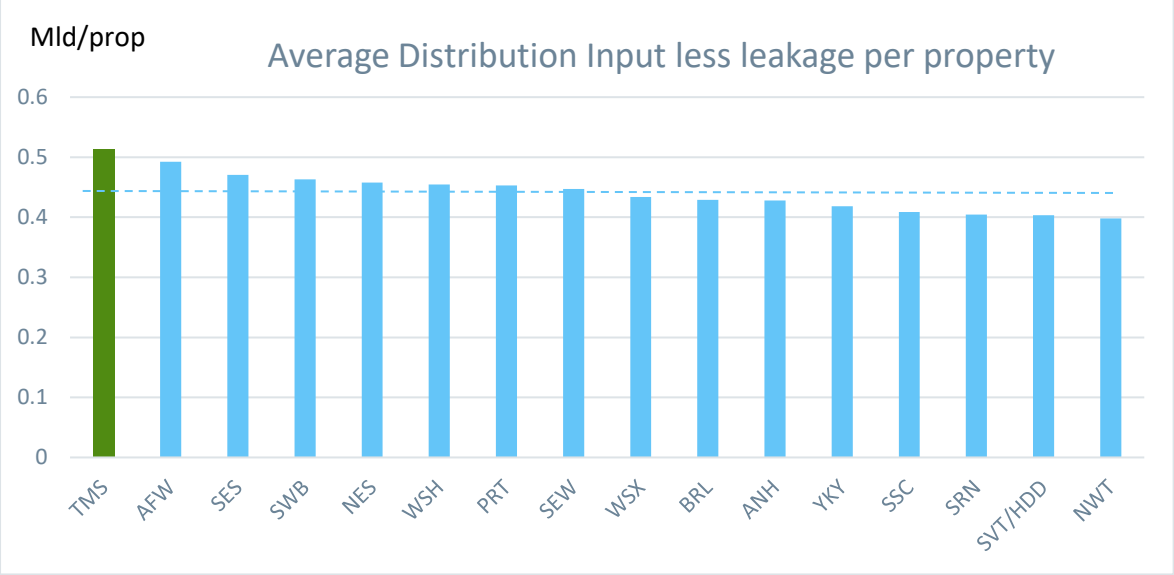


Figure 3.5 below shows a similar story when industry volumes are normalised by the number of properties.

Figure 3.5: Average distribution input less leakage per property



Throughout AMP6 and AMP7 despite using up headroom, we have continued to deliver service to customers, reduce interruptions to supply and avoid low pressure issues by optimising our network. For example, the London Water Improvement conditional allowance includes a CALM network and pressure management programme to optimise hydraulic performance (see case study below).

3.1.1. Case Study: Lower Riverside Pressure Management Area

As part of the optimisation of the Riverside Lower Pressure Management Area (PMA), one of the key actions was to put the Deptford Pressure Reduction Vale at Deptford Water Treatment Works on the fixed outlet to control pressure, but also erratic pressure spikes into the PMA.

Step 1 was completed in November 2021 and has shown a drastic improvement in the high-pressure control into the PMA. In addition to improvements in meeting demand, leakage benefits in the area were also recorded.

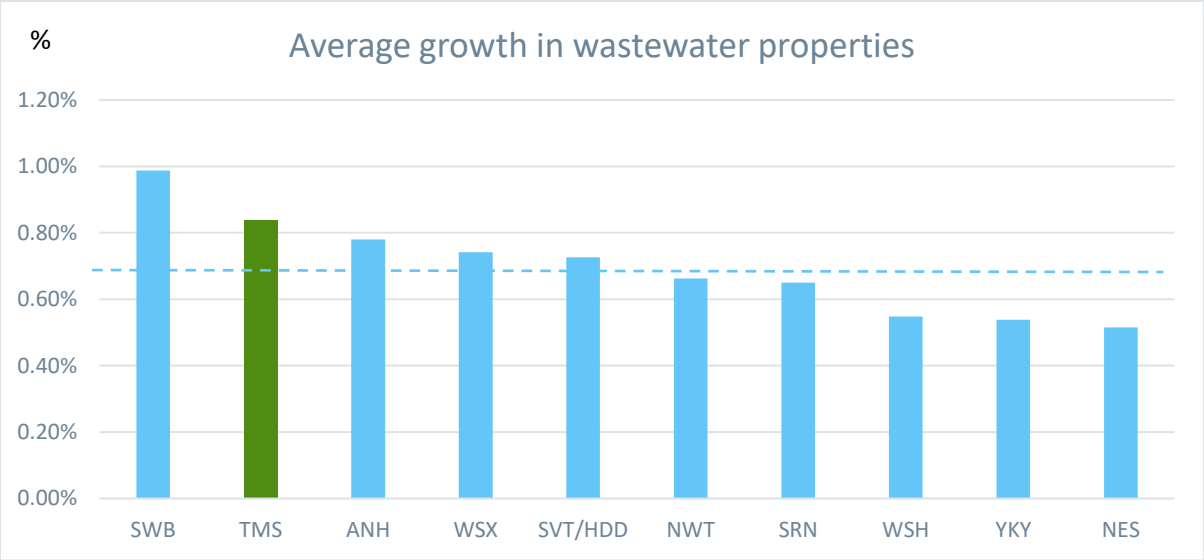
3.2. Growth in properties connecting to wastewater services uses available headroom

The following analysis is taken from PR24 cost assessment datasets. We demonstrate that:

- Thames Water has seen high average growth in properties connecting to wastewater services over the last decade, compared to other companies
- Year on year, the growth in properties connecting for wastewater services in the Thames Water area has been higher than the industry average
- The total length of Thames Water's sewers has remained comparatively static to other companies over the last decade, as growth has occurred predominantly in dense urban areas
- The load on the sewerage system is now the highest in the industry when normalised by length of sewer

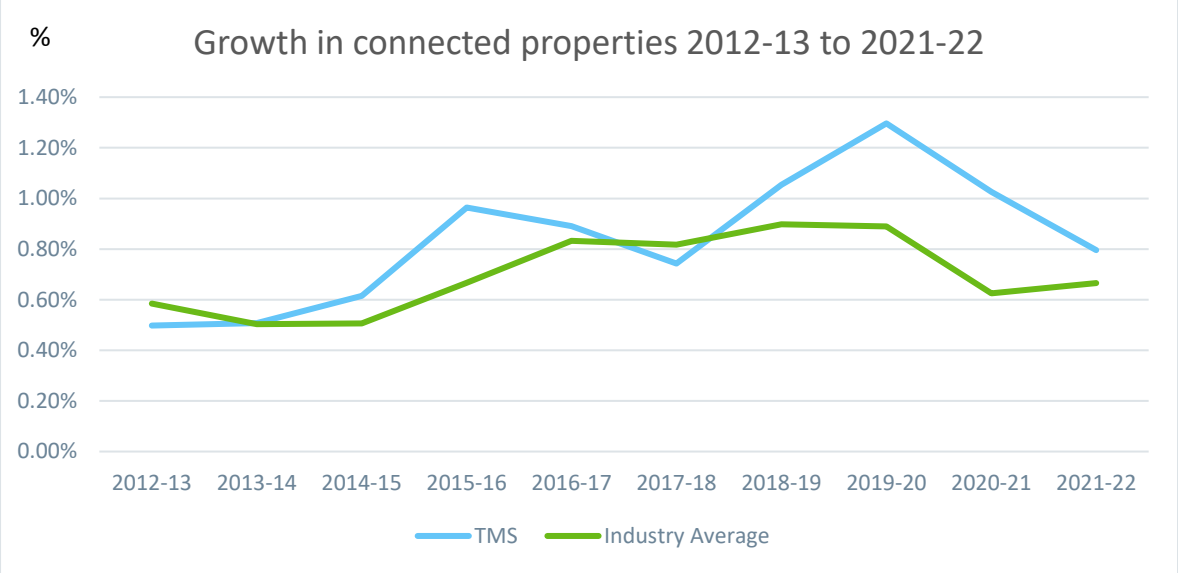
Figure 3.6 below shows the average growth in connected wastewater properties, using cost assessment over the last decade (2011/12 to 2021/22). Thames Water has on average seen the second highest growth in the industry during this period and significantly higher than the industry average.

Figure 3.6: Average growth in connected wastewater properties



The annual growth in properties connecting to wastewater services over the last decade is presented in Figure 3.7 below. Annual growth in Thames Water's supply area has consistently been above the industry average in all but two years over the last decade.

Figure 3.7: Growth in connected wasterwater properties 2012-13 to 2021-22



Whilst growth in the number of properties connecting to wastewater services has been the second highest in the industry, Figure 3.8 below shows that the length of the sewerage network has not kept pace with this. This can be explained by major new development sites connecting to already highly urbanised areas (including London), using up available capacity in the local sewerage network to accommodate new demand.

Figure 3.8: Average growth in sewerage network length

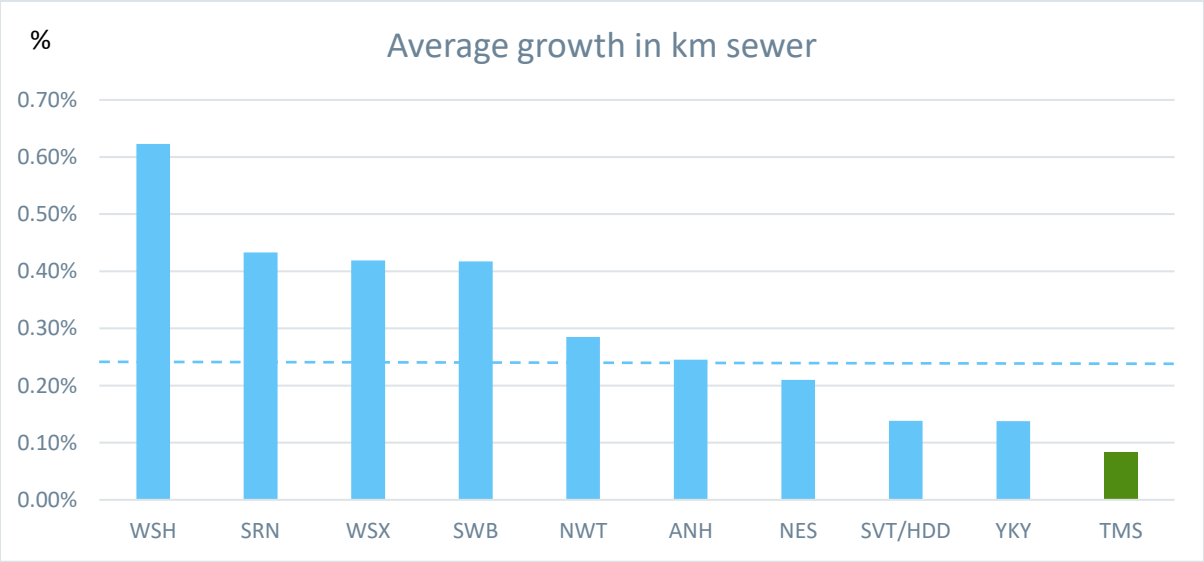
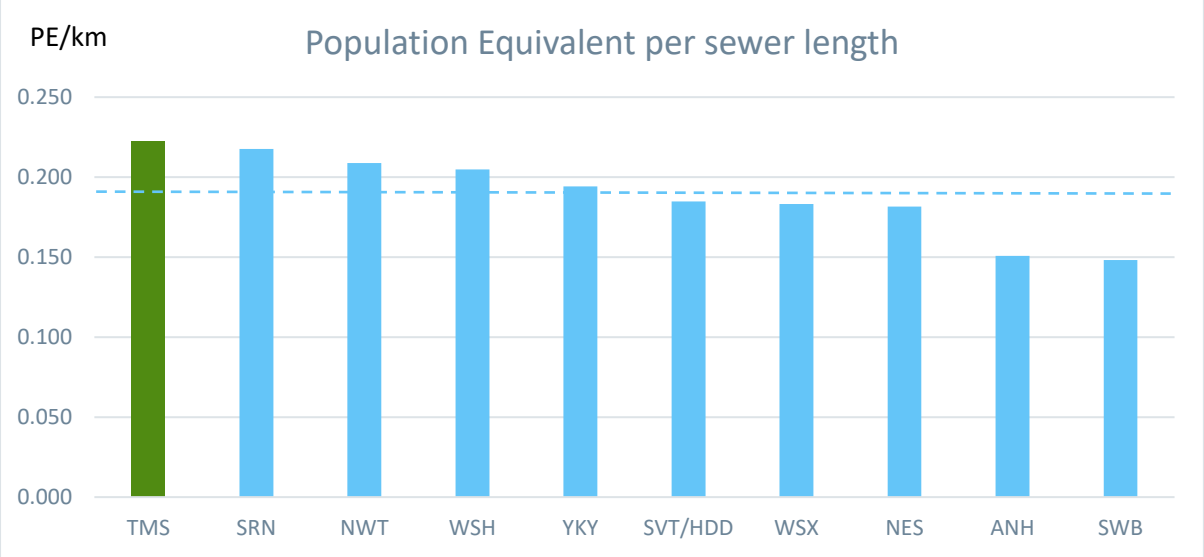


Figure 3.9 shows that the average load carried by the sewerage network in the Thames Water area is higher than any other company when normalised by length.

Figure 3.9: Population equivalent per sewer length



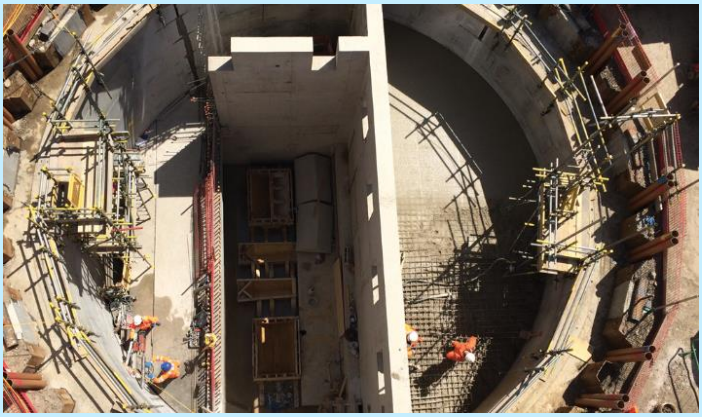
Throughout AMP6 and AMP7, and despite using up headroom in our sewerage networks, we have continued to deliver service to customers by managing surface water more effectively from new development sites. In particular, major new developments in Central London that discharge into combined sewers present a significant opportunity to remove surface water and create headroom. A good example is the Battersea Nine Elms development in South London[4], which at the time was the largest housing construction project in Europe. We worked with developers to implement a scheme to collect all surface water from across the site and pump it into the River Thames. This water would otherwise have been discharged into combined sewers, increasing the risk of storm overflows, pollution and sewer flooding in the area (further details are provided in the case study below).

We've also been increasing the delivery of sustainable drainage solutions across our supply area, working in partnership with Lead Local Flood Authorities and other agencies. Our programme started with a project to deliver 20 hectares in AMP7, rising to a target of 65 hectares in AMP7. Our Drainage and Wastewater Management Plan envisages a much larger programme over the next 25 years to address the impact of population growth and climate change.

Despite all of our efforts to manage surface water, we will need to reinforce our sewerage network to collect foul water from new developments going forward, and our AMP8 plan reflects this.

[4] https://waterprojectsonline.com/custom_case_study/nine-elms-battersea-growth-suds/

3.2.1. Case Study: Battersea Nine Elms



The Nine Elms redevelopment area within Battersea includes 21,000 new dwellings, office, leisure and retail space creating 8000 new jobs including the new US Embassy, a relocated New Covent Garden Market site and the Northern Line extension. An integrated water management study completed by Thames Water in partnership with the Greater London Authority, ARUP and the Nine Elms Partnership (Lambeth and Wandsworth councils) considered the existing and future situation here. Hence further to a detailed hydraulic modelling exercise of the existing sewer system for Thames Water the choice was clear; either build new sewers to cope with the additional demand or pursue surface water run-off removal from the combined sewer network incorporating a SuDS (sustainable urban drainage system) solution to create foul sewer capacity too.

3.3. Historical data in Ofwat's models will not predict future network reinforcement

Our analysis of cost assessment data shows that Thames Water has seen above average growth in properties connecting for both water and sewerage services over the last decade. Conversely, distribution mains and sewerage network lengths have not grown commensurately over the last decade, due to most large development sites occurring in highly urbanised areas including London. For both water and wastewater services, our focus has been optimising our networks, utilising available capacity and not passing on inefficient costs to developers. Going forward, and to meet the demand from new development that is planned for AMP8, we will need to step up network reinforcement and it is right that developers pay for this efficient investment through Infrastructure Charges.

Our conclusion therefore, is that historical data on network reinforcement will not reflect the future cost of meeting demand from properties connecting for both water and sewerage services in AMP8. A step change in network reinforcement will be necessary in AMP8 that will require a cost adjustment. Our plans for network reinforcement in AMP8 are set out in the next section.

4. Network Reinforcement plans for AMP8

In this section we explain how our Network Reinforcement plan for AMP8 was produced. We explain:

- How we undertake Impact Assessments for Network Reinforcement
- Our optioneering process to develop efficient costs
- The detail of our AMP8 plan:
    - Live Network Reinforcement Projects
    - Network Reinforcement forecast from planned New Development
    - Smaller Development Sites
- Developers are not being asked to funded project from previous price reviews

Our network reinforcement plan for AMP8 for water and wastewater is summarised in the table below:

Table 4.1: Summary of network reinforcement plans for AMP8

	Water £m	Wastewater £m
Live Network Reinforcement Projects	58.9	102.7
Network Reinforcement forecast from planned New Development	103.5	21.2
Smaller Development Sites	23.5	0.0
Total	185.9	123.9

4.1. How we undertake Impact Assessments for Network Reinforcement

We monitor new development and focus specifically on Policy SD1 Opportunity Areas[5], (which influences the location of strategic housing developments within London) and Local Area Plans (which influences the location of strategic housing developments for Thames Valley and Home Counties). We explain our approach to determining whether network reinforcement is needed.

We have a statutory duty under section 45 (1) and section 94 of the Water Industry Act 1991[6]

- to provide and maintain a sewerage system and make provision for the emptying of those systems to ensure that the area where any development is planned is and continues to be effectively drained (section 94)

and

- to make a connection, where the owner or occupier of any premises serves notice on the company requiring it, for the purposes of supplying water for domestic purposes (section 45)

[5] Chapter 2 Spatial Development Patterns | London City Hall accessed 31/07/23

[6] Water Industry Act 1991 (legislation.gov.uk)

The request to connect new developments to our water and waste networks can be managed through the Developer Services section of the Thames Water website for water[7] and waste[8]. Developments are tracked and managed through our Development Tracking System (DTS).

Regardless of the request route, applications for connection are subject to a technical review to determine if an Impact Assessment would be required and whether the connection of new developments to the existing network would lead to a detrimental impact on the service provided to existing customers already connected that network.

4.1.1. Impact Assessment of new development on water networks

Our approach to assessing the impact of new developments on the level of service delivered to existing customers on water networks is to undertake an Impact Assessment using hydraulic models.

Modelling is undertaken using the latest version of the hydraulic model for the flow monitoring zone in which the connection for the new development is most likely to take place. A series of growth scenarios (normally low, medium and high) are created based on the phasing of proposed developments and the status of the current planning application. Status can be divided into the following confidence bands[9];

High confidence (of being built)

- Completed
- Under development
- Full planning permission (FPP)
- Full Planning Permission/Allocation (FPP/Allocation)

Medium confidence (of being built)

- Outline Planning Permission (OPP)
- Outline Planning Permission/Full Planning Permission/Allocation (OPP/FPP/Allocation)
- Prior Approval given (PAGI)

Low Confidence (of being built)

- Strategic Housing land Availability Assessment (SHLAA)
- Allocated as viable as per local plan (Allocations)

4.1.2. Impact Assessment of new development on wastewater networks

Our approach to assessing the impact of new developments on the existing sewerage and surface water network has been accredited as a ISO9001 Quality Management System[10]. Our process

[7] Clean water | Larger scale developments | Developer services | Thames Water

[8] Clean water | Larger scale developments | Developer services | Thames Water

[9] Example growth scenarios and confidence bands used in NM948 Isle of Dogs Multiple studies Atkins (2021) on behalf of Thames Water

[10] Certificate no:24269/3

uses hydraulic sewage network models to determine if any detrimental impact to the existing network occurs due to the connection of additional developments. Detriment is defined as a 'reduction of the levels of service and/or a negative impact on Thames Water Key Performance Indicators'[11] and/or causing a significant negative impact to society[12]

This detriment can occur in a number ways including:

Flooding

- Foul sewers
    - new flooding incident>25m^3
    - increase over baseline flooding volume of ≥25m3 AND ≥5% where there is no historic evidence of flooding
    - increase over baseline flooding volume of ≥1m3 AND ≥5% where there is historic evidence of flooding or
    - manhole is closer than 10m to a watercourse (SFHD)an increased flooding frequency 1 in 5, 1 in 10, 1 in20 (movement to a higher flood category)
    - an increased flooding intensity/severity (movement to more vulnerable receptor)
    - increase in flood depths
        - below or equal 0.1 to higher
        - between 0.1 to 0.5m to higher
- Surcharge[9] (proximity to private drainage)
    - Presence of basement properties (<2.1m freeboard) or properties on a downhill slope (<1.0 freeboard)
- Surface water sewer
    - detriment caused by surface water sewers is dependent on the vulnerability of the receptor which include
        - Statutory designated areas (e.g. conservation areas, monuments) major infrastructure,
        - major community buildings or centres, properties, busy roads. Non vulnerable receptors are: Fields, green areas
        - and low traffic roads; these are spaces which are deemed to be able to accept surface water flooding without causing a significant negative impact to society

Pollution

- Flooding at foul manholes close to open watercourses
- CSO spills
    - Breach of consent through development
    - Increase in spill volume >5% assessed in 10 year timestep TSR
    - New annual spill assessed in 10 year timestep TSR

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[11] Guideline of the representation and assessment of developments in hydraulic models, Asset Modelling and Strategy Team, Thames Water utilities, May 2016, page.13

[12] Guideline of the representation and assessment of developments in hydraulic models, Asset Modelling and Strategy Team, Thames Water utilities, May 2016, page.14

Discharge Permit Compliance (not covered by Infrastructure Charges, but forms part of an Impact Assessment)

- Higher pump rates required at sewage pumping stations
- Increase capacity at sewage treatment works to receive flow

4.2. Our optioneering process to develop efficient costs

4.2.1. Water network reinforcement

Network Reinforcement is described as the activities that need to be carried out to our existing water network to support housing development-related growth.

Our Impact Assessments identify a number of options that should be considered before Network Reinforcement is recommended. These include:

- Further model validation including field testing, which could include the updating of flow and pressure logging, headloss investigations, valve status, mains size validation
- Operational enhancements including Pressure Reducing Valve (PRV) optimisation

If the connection of new developments still exert a negative impact on the level of service delivered to existing customers after the above options have been incorporated into the hydraulic model, Network Reinforcement options are proposed. These options will detail the scope any of intervention including;

- The lengths and internal diameter of any upsized or new mains
- Connection points to the existing network
- Transmission modifications or additional pumping requirement
- Control modification i.e. start and stop times for pumps

Network reinforcement activities could include:

- Upsizing existing pumping stations or building new ones
- Increasing treated water storage capacity in service reservoirs
- Providing additional connections to improve network capacity under differing network conditions
- Enlarging existing pipes or installing larger new pipes to increase capacity

These options ensure that service levels delivered under current base funding arrangements do not deteriorate as a result of the connection of new developments.

4.2.2. Wastewater network reinforcement

The need for network reinforcement is required where modelling studies conclude that detriment is likely to occur. Network reinforcement is described as the options that need to be carried out to our existing wastewater network to support housing development-related growth. These activities are needed to ensure there is enough capacity in the network to ensure the risk of flooding from the existing network does not increase to unacceptable levels.

Network reinforcement may include the following activity:

- Enlarging existing pipes or installing larger new pipes to increase capacity for a specific development, or further expected growth in the future
- Upsizing existing or proposed pumping stations
- Separation of surface water from existing networks to create headroom

- Providing additional connections to improve network capacity under differing network conditions
- Other infrastructure required to provide network capacity for growth resulting from new developments such as Sustainable Drainage Systems (SuDS)

4.3. Live Network Reinforcement Projects

Our Network Reinforcement plan for AMP8 includes live projects held in our capital planning system (SAP) that are forecast to incur expenditure beyond 2024/25. All of these projects have had Impact Assessments completed and have been through our technical governance process to ensure that solutions and costs are efficient. The cost of each project will also be offset by income from developers through Infrastructure Charges over time.

Table 4.2: Live network reinforcement projects and forecast investment in AMP8

	Water £m	Wastewater £m
Live Network Reinforcement Projects	58.9	102.7

A live project indicates that we have entered into a contractual obligation with our supply chain to deliver the Network Reinforcement. In triggering the need for investment, we take a number of factors into account:

- Whether planning approval has been granted for the development site
- Whether the developer has acquired the land
- Whether building work has commenced on site

A full list of our live Network Reinforcement projects and forecast costs in AMP8 can be found in Annex 2.

4.4. Network Reinforcement forecast from planned New Development sites

In this section, we set out large New Development sites that we have been monitoring from Local Plans. We have already conducted Impact Assessments for water and wastewater services for these sites and have determined that reinforcement is necessary to present any detriment. However, we have not yet commenced work on constructing these projects, because either full planning approval has yet to be obtained by the developer, land has not been acquired or building work has not yet started on site.

Table 4.3: Network Reinforcement from planned New Development sites

	Water £m	Wastewater £m
Newbury Network Growth	0	21.2
Riverside (Area 2)	32.0	0
Isle of Dogs (WI Network Growth)	2.9	0
Hagbourne Hill	3.9	0
Bicester	6.4	0
Munstead to Hydon Ball	25.1	0

Banbury	14.6	0
Riverside (Area 2) WI Growth	13.6	0
Brookfield Garden Village	4.9	0
Total	103.5	21.2

In Annex 1 we have provided details of some of the Local Plans we have been monitoring across London and in the Thames Valley. We have also explained some of the findings from our Impact Assessment work and hydraulic modelling.

In the remainder of this section, we provide two case studies for Brookfield Garden Village and Newbury listed in the table above.

4.4.1. Case Study: Brookfield Garden Village

Broxbourne Borough Council has recently approved Outline Planning permission for the development of a 1,250 home garden community and new town center (Planning Application 07/22/1079/0-PPA [13]), located near to the A10 road close to the town of Broxbourne in Hertfordshire.

Broxbourne is located in the south-east of Hertfordshire within the Upper Lee Valley bordered by East Hertfordshire to the north, Epping Forest to the east, Enfield to the south and Welwyn Hatfield to the west. The M25 demarcates the southern boundary of the Borough and the River Lee Navigation demarcates the eastern boundary. Broxbourne lies in the core area of the London Stansted Cambridge Corridor.

The proposed development would be located at the currently undeveloped Green Belt area around Cheshunt Park Farm, Cheshunt

The Broxbourne Local Plan, which sets out proposals for how Broxbourne will grow and develop includes provision for around 7,718 homes (at an average of 454 per annum) by 2033[14] . The majority of the housing is included in 3 strategic developments:

- 'Brookfield Garden Village' including 1,250 homes
- 'Cheshunt Lakeside', a new mixed-use urban village including 1,750 homes as well as businesses and a primary school,
- 'Rosedale Park', comprising around 820 homes (plus a 64-bed care home) and a primary school

The remainder of the residential development is proposed at a number of smaller sites within the borough. Evidence gathered to support the Local Plan suggests that the population of the Borough will increase by 18,500 by 2033[15]. The intent, contained within the plan, is to meet their housing needs in full[16]

[13] Broxbourne: New 1,250-home garden community approved - BBC News accessed 11/09/2023

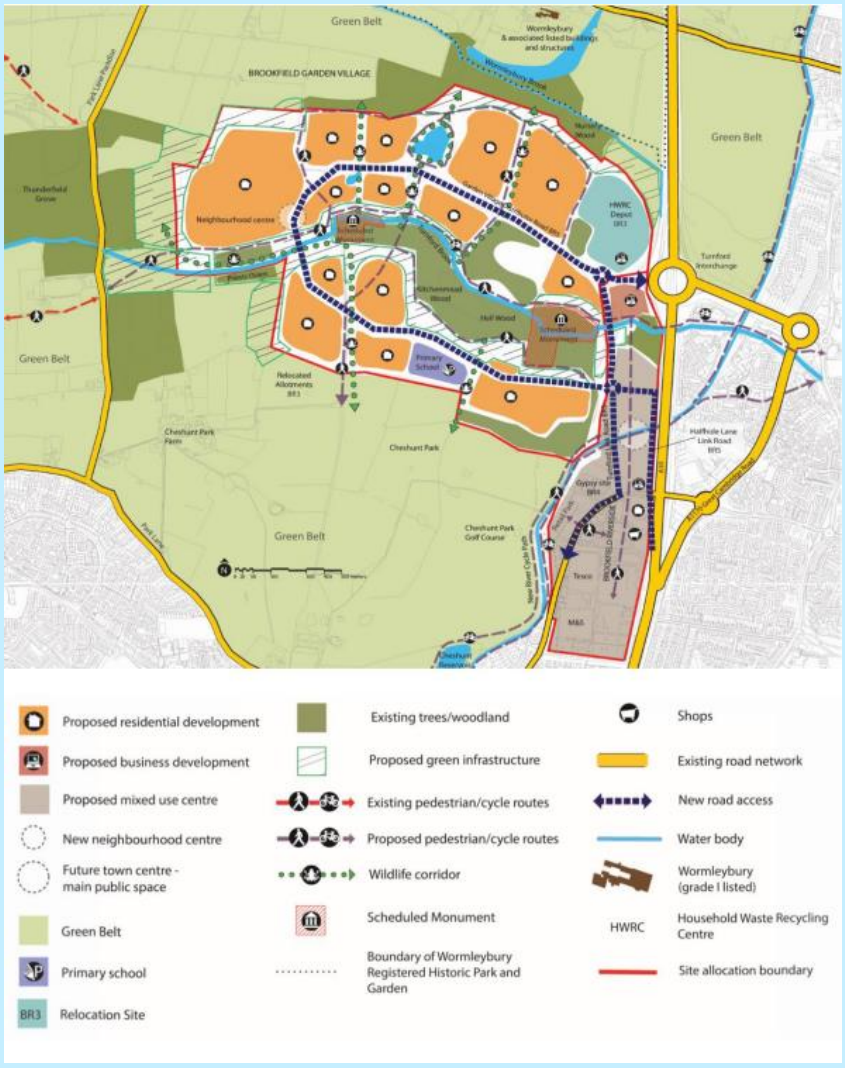
[14] summary and key points (broxbourne.gov.uk) p.5

[15] summary and key points (broxbourne.gov.uk) p.16

[16] summary and key points (broxbourne.gov.uk) p.20

An image detailing the concept for the Brookfield area has been included below

An assessment was undertaken to determine the impact of the proposed developments on existing service levels with the system and the required network reinforcements investment required maintain the existing level of service to existing customers and provide an acceptable level of service to customers in the newly connected properties.



The proposed developments would exert an additional average demand of 7.22l/s and peak demand of 21.97l/s. A number of points of connection (POC) where considered within the impact assessment, as the proposed development could theoretically be supplied from three flow monitoring zones (FMZ's), Sewardstone, Hoddesdon and Darnicle Hill. Under each supply scenario, the impact assessment concluded that the system would experience levels of pressure below the minimum standard when the proposed properties were connected to the system.

The necessary network reinforcements required to supply the new development from each of the three FMZ's was considered and the impact on existing service levels forecast. The Sewardstone supply option would require new infrastructure (Sewardstone) and both (Sewardstone and Hoddesdon) would require new local boosters. Despite the required network reinforcement, there was a risk that asset health related outages at either of the associated water booster stations would lead to level of service below the minimum standard. The chosen network reinforcements at Darnicle Hill was deemed as the simplest long term option with the highest resilience benefit, requiring no additional transmission assets and no pressure detriment to the wider system

Development	Location	Description	Option
Brookfield Village (outline planning permission granted, 07/22/1079/0-PPA)	Cheshunt (EN76PZ)	1050 houses, 200 flats, 93,500 m2 (retail, leisure, office, primary school	4.2km, 225mmID main

4.4.2. Case Study: Newbury Wastewater

The Core Strategy[17] contained within the West Berkshire Local Plan[18] aims to deliver at least 10,500 additional dwellings by 2026, with at least 5,800 homes across the Newbury/London Road catchment spread across 22 development sites.

An Impact Assessment was undertaken to determine the location and extent of any detriment caused by the connection of the proposed new developments to the existing wastewater network. This assessment included development sites with either full planning permission or were likely to receive full planning. The assessment considered the connection of the 3,824 homes and care/nursing homes to the existing network.

The Impact Assessment identified multiple manhole locations where new flood events would occur, historical flood events in other locations would become more severe and flooding would occur to low lying properties. A number of these modelled flood events would occur within 10m of a watercourse, increasing the risk of pollution. In addition, one Sewage Pumping Station (SPS) in the catchment , Dene Way, would fail to deliver the required 4*Dry Weather Flow (DWF) in the 2026 development scenario and the downstream gravity sewer could not convey the required duty rate. Dene Way SPS is located within 12m of the river Lambourne[19], a chalk stream with a General Quality Assessment (GQA) biological class 'b' and chemical class 'A'. The river Lambourne is in the top 10% for England and Wales for the number of macroinvertebrate families and contains five nationally rare species of invertebrates.

The assessment concluded that the existing London Road SPS, and in particular its ability to pass onward flow, and the rising mains connecting the network to the SPS and the SPS to Newbury STW presented a major hydraulic restriction and constrained the capability of the existing system to accommodate additional flow generated by the connection of the proposed new developments.

London Road SPS currently can pass up to 370 l/s. As a result of the proposed developments, the SPS will need to able to pass forward 780l/s, otherwise flooding and pollution events are more likely to occur. This restriction is related to the twin rising mains which connect the SPS to Newbury sewage treatment works and existing pump capabilities.

Table 4.4: Details of Newbury Impact Assessment

Development/Planning Permission Approved)	Proposed properties	Project	Forecast detriment	Solution scope/required date	Forecast AMP8 (£m)
Newbury (multiple), Racecourse (09/00971/OUTMAJ[20], 1500 homes, 02/04/2009), Sandleford (East) (22/03079/NONMAT, 1000 homes31/01/23), Sandleford (west) 23/01585/OUTMAJ, 360 homes, awaiting appeal)	3824	K804	New manhole flood events, more severe flood events at historical locations, flood events <10m from water course flooding of low lying properties, SPS requirement >4*DWF,	New SPS at London Road, New rising main 2.8km 710mm PE100 SDR17	21.24

[17] West Berkshire Core Strategy (2006 - 2026) page 43

[18] Read the current Local Plan - West Berkshire Council

[19] The river Lambourn | Lambourn accessed 08/09/2023

[20] Search Results (westberks.gov.uk) accessed 08/09/2023

4.5. Smaller Development Sites

In addition to tracking large development sites contained in Local Plans, we are frequently contacted by Developers requesting a connection to our water and wastewater network for smaller development sites (typically up to around 20 houses). Depending on the location and local circumstances, our planners may also request and Impact Assessment to be carried out, which can also lead to Network Reinforcement projects being completed to avoid any detriment in service.

Historically, Impact Assessments for smaller development sites have shown detriment in water services (i.e. low pressure) in the local network. We have tended to avoid detriment in wastewater services for smaller sites, by working with developers to manage surface water across the site to create the necessary headroom for new foul water connections.

Our forecasts for AMP8 therefore includes a run rate allowance for Network Reinforcement for smaller development sites for water services, based on our experience in AMP7.

Table 4.5: Summary of network reinforcement plans for smaller developments

	Water £m	Wastewater £m
Smaller Development Sites	23.5	0.0
Total	185.9	123.9

4.6. Developers are not being asked to fund projects from previous price reviews

The timing and location of new development is difficult to predict. At PR19, we were monitoring 4 large development sites in London (Finsbury/Isle of Dogs, Old Oak Common, Ebbsfleet, and Greenwich Peninsula) and Aborfield/Reading Gateway in the Thames Valley. Of these, Old Oak Common and Ebbsfleet have not yet progressed and the others have been slower than forecast. We have nevertheless invested more in Network Reinforcement than assumed in PR19, as new sites have emerged. We confirm that Developers are not being asked to pay for projects previously funded - maintaining clear triggers for investment, monitoring planning application status, land ownership and developer activity is key.

5. Quantifying the adjustment

In this section, we set out our view of the cost adjustment needed to support the incremental network reinforcement activity to allow development sites to connect to our networks without causing any detriment in service to customers. All costs in this section relate to capital expenditure – we have not historically incurred operational expenditure for this activity. We set out our view as follows:

- Firstly, we explain our approach for identifying the implicit allowance within Ofwat's base allowance
- Secondly, we summarise the approach we have taken to estimating the required cost adjustment

5.1. Identifying the implicit allowance rate for network reinforcement

We have undertaken a balanced approach in identifying the implicit allowance. Our approach utilises 4 methods and we have taken the average of these:

- Method 1 uses our best view of the PR24 models (improving on PR19). We removed all network reinforcement capex for all company historical datasets and then compared this with the models with network reinforcement capex included
- Method 2 is an extrapolation of a moving average of our historical expenditure on network reinforcement capex based on the last 5 years
- Method 3 takes the historical percentage of network reinforcement across the industry and we apply this to our econometric base allowance of all Botex
- Method 4 is the unit price using the median, mean scaling by water mains and properties or sewage load

A summary of the implicit capex allowance arising from the 4 methods for water networks is presented in Figure 5.1 below:

Table 5.1: Implicit allowance for water network reinforcement

Water - Network reinforcement implicit allowance	£m
1. Using Econometric Improved Models PR24	13.0
2. Extrapolating Moving average of Actual Expenditure with efficiency Challenge	47.3
3. Industry Historical Expenditure Avg. Proportion to AMP8 Model efficiency allowance	30.5
4. Average (Unit Cost)	25.4
Average all scenarios	29.1

The results from applying the same analysis and 4 methods for wastewater networks is presented in Figure 5.2 below:

Table 5.2: Implicit allowance for wastewater network reinforcement

Wastewater Network reinforcement implicit allowance	£m
1. Using Econometric Improved Models PR24	18.9
2. Extrapolating Moving average of Actual Expenditure with efficiency Challenge	52.9

3. Industry Historical Expenditure Avg. Proportion to AMP8 Model efficiency allowance	46.1
4. Average (Unit Cost)	45.9
Average all scenarios	40.9

5.2. Calculating the cost adjustment

In Figure 5.1 below, we show historical and forecast AMP8 network reinforcement capex all in 22/23 prices alongside the implicit allowance calculated in the previous section.

Figure 5.1: Water network reinforcement historical and forecast capex

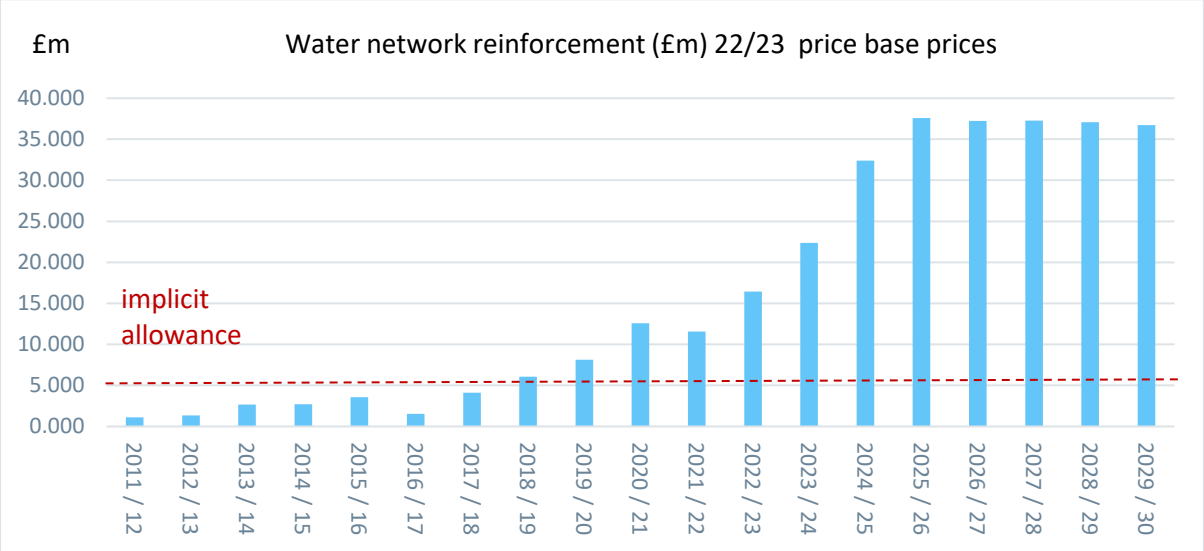
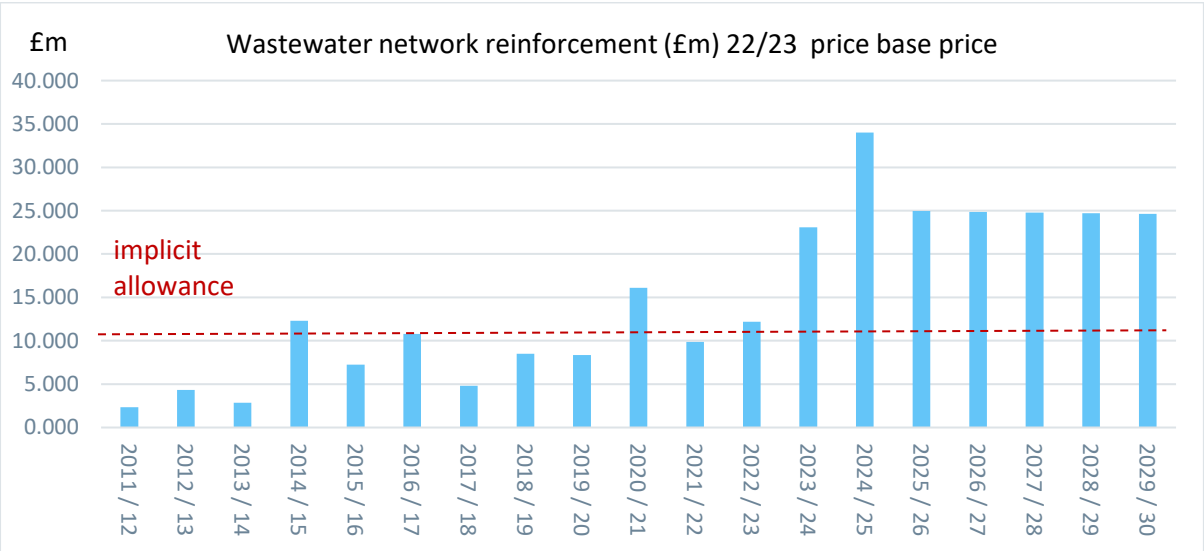


Figure 5.2 below shows the historical wastewater network reinforcement capex, forecast capex and the implicit allowance from the previous section.

Figure 5.2: Wastewater network reinforcement historical and forecast capex



A summary of our valuation of this cost adjustment claim for water and wastewater is presented in the table below. We deduct the AMP8 implicit allowance from AMP8 forecast spend:

Table 5.3: Summary of water and wastewater network reinforcement cost adjustment claims

	Water £m	Wastewater £m	Total £m
AMP8 network reinforcement capex	185.9	123.9	309.8
Implicit allowance (average of scenarios)	29.1	40.9	70.0
Value of Cost Adjustment Claim	156.8	83.0	239.8

5.3. Materiality of our claim

The Ofwat methodology applies a materiality test to cost adjustment claims; a claim must be at least 1% of the water network plus price control and wastewater network plus price control totex in the AMP to pass and be eligible for consideration. We estimate the materiality of the water network reinforcement claim to be 2% and 1% for water and wastewater respectively.

6. Customer protection

We considered what would be appropriate customer protection for this Cost Adjustment Claim and Ofwat's latest guidance on Price Control Deliverables, IN 23/05.

We first reviewed the existing mechanisms:

- Totex cost sharing ensures we return funds for under-delivery and share efficiencies with customers. There remains the incentive for the company not to overspend, as we will bear the bulk of those costs
- Customers do not pay for network reinforcement for water and wastewater, as all costs are offset by Infrastructure Charges paid for by Developers. Provided that we receive this income from Developers as forecast, we consider that customers are protected from this investment
- If we do not invest in any necessary network reinforcement, or if we are slow to meet developers' needs, or delay the connection of new developments, we would expect to receive a lower D-MeX score, a lower ranking and therefore, penalty payments
- The existing network may suffer if we do not bring on the required network reinforcement in time, leading to ODI penalties across a range of Performance Commitments. These could include water supply interruptions (with low pressure also potentially leading to complaints and impacting C-MeX), internal or external sewer flooding and possible pollution incidents or storm overflows

We concluded that the additional totex requested under this claim is already protected by existing mechanisms, as well as additional ODI penalties if we do not invest in network reinforcement as per our forecast. Accordingly, we do not propose any additional protection for our customers, such as a Price Control Deliverable.

7. Annex 1 – Examples of Local Plans and Impact Assessments

This annex explores how planning policy, specifically Policy SD1 Opportunity Areas[21], (which influences the location of strategic housing developments within London) and Local Area Plans (which influences the location of strategic housing developments for Thames Valley and Home Counties) influence the location of new homes within the Thames Water supply area.

Hydraulic modelling undertaken to understand the impact of serving the new developments on the level of service offered to current customers has been undertaken. This modelling concludes that the current level of service cannot be maintained under certain growth scenarios and network reinforcement investment is required to prevent a deterioration in service.

The London Plan 2021 and Opportunity Areas

The London Plan 2021[22] is a statutory obligation dictated under the Greater London Authority Act 1999[23] and represents the Spatial Development Strategy for Greater London providing a framework for how London will grow over the next 25 years.

Chapter 4 of the plan focusses on Housing and in particular Policy H1 which focuses on increasing housing supply. The land identified under the policy is determined by the Strategic Housing Land Availability Assessment (SHLAA)[24], which determines the quantity and suitability of land potentially available for housing.

These assessments are undertaken on sites with an area greater than 0.25 hectares (ha.) The last assessment (undertaken in 2017) covered the period from 2017 to 2041 and has informed the housing targets in the London Plan 2021.

The SHLAA identifies that London has the capacity for an additional 649,350 homes up to 2029. Large sites (which are defined as being larger than 0.25 hectares provide capacity for 400,470 homes, representing 62% of London's overall capacity. Opportunity areas will provide 69% (275,000) of the large site allocation.

Analysis of large site capacity in Opportunity Areas[25] (up to 2041) shows that 6 Opportunity Areas have capacity for more than 20,000 additional homes, (including the Isle of Dogs), 14 opportunity reas have capacity for more than 10,000 additional homes and 22 opportunity areas have capacity for more than 7,000 homes. Further analysis indicates that the majority of development in a number of OA's including Greenwich has already had planning permission approved.

Opportunity Areas are London major source of brownfield land with significant capacity for new housing, commercial and other development opportunities. Opportunity Areas must have a minimum opportunity for at least 2,500 new homes. Making better use of land by supporting higher density developments is a key objective of the London Plan.

Comparison between the densities of developments in Opportunity Areas are shown in the table below and standard density assumptions shows that highest density assumptions are applied to

[21] Chapter 2 Spatial Development Patterns | London City Hall accessed 31/07/23

[22] The London Plan 2021 | London City Hall accessed 31/07/2023

[23] Greater London Authority Act 1999 (legislation.gov.uk)

[24] 2017_london_strategic_housing_land_availability_assessment.pdf

[25] 2017_london_strategic_housing_land_availability_assessment.pdf p.76

housing within Opportunity Areas, reflecting their strategic importance in the delivery of new developments in London.

Table 2.11 - Average density trends in opportunity areas - approved large sites (0.25 hectares and more) between 2004-2016

PTAL	0 - 1	2 - 3	4 - 6
Suburban	83	204	337
Urban	150	226	329
Central	406	363	453

Source: [26]

Table 2.8 - Standard density assumptions

PTAL	0 - 1	2 - 3	4 -6
Suburban	65	80	115
Urban	80	145	225
Central	100	210	355

Source:[27]

The London Plan influences planning decisions throughout London and contains 47 Opportunity Areas which will experience the most significant change. A number of these Opportunity Areas have already experienced development and where possible, the Thames Water network has been able to accommodate these additional demands without impacting current levels of service through utilising residual headroom in the existing network or historic strategic Network Reinforcement investments.

One of the Plan's strategic sustainability objectives is to focus residential housing in Opportunity Areas and town centres[28]. Within the London SHLAA, 98% of land allocated for housing development is delivered on 'brownfield' sites[29] in compliance with Planning Policy Statement 3 (PPS3

Opportunity Areas and Thames Water

The following section explores a number of developments which fall within Opportunity Areas and present modelling evidence to support the impact of additional development on exiting level of service.

[26] 2017_london_strategic_housing_land_availability_assessment.pdf p.26

[27] 2017_london_strategic_housing_land_availability_assessment.pdf p.24

[28] London Plan Sustainability Statement p.8

[29] 2017_london_strategic_housing_land_availability_assessment.pdf p.13

Opportunity Area	Borough	Size (Ha.)	London Plan AMR [30]Status	London Plan Indicative Homes target (2041)[31]	New homes completed since 2019[23]	New homes completed since designation /(year)	OAPF opportunity growth[32] (Number of additional homes)
Greenwich Peninsula	Greenwich	166	Maturing	17000	1480	5,500(2004)	0
Charlton Riverside	Greenwich	121	Ready to grow	8000	n/a	20 (2008)	0
Woolwich	Greenwich	66	Maturing	5000	737	3,862 (2004)	0
Bexley and Riverside	Bexley	1210	Nascent	6000	581	n/a	0
Thamesmead and Abbey Wood	Greenwich and Bexley	877	Nascent	8000	66[24]	446/2008[33]	7500
Isle of Dogs	Tower Hamlets	488	Underway	29000	3836	18000/(2004)	

Details of housing developments to be delivered within Opportunity Areas

Tower Hamlets Local Plan 2031

Tower Hamlets is one of the fastest growing areas in Europe[34] The Local Plan sets out how the borough of Tower Hamlets will grow and develop up to 2031. The plan identifies how many new homes, jobs and services are needed to support the growing population and where they should be provided. The document aligns with the minimum targets for housing set out within the London Plan [35]

Population Growth

Between 1986 and 2017, the population of the borough doubled from 150,000 to 308,000[36]. The borough experienced the fastest population growth of any local authority in England and Wales, making it one of the most densely populated boroughs in the United Kingdom. The borough population is projected to increase from 317,200 to 370,000 by 2028, the equivalent of 15

[30] Annual Monitoring Report – measurement of Key Performance Indicators (KPI's) included within the London Plan 2021

[31] Thamesmead and Abbey Wood Opportunity Area | London City Hall, figure.5, accessed 26/07/23

[32] Opportunity Area Planning Framework – this is the number of additional homes that could be provided if supplementary transport proposals and employment opportunities are delivered

[33] Thamesmead and Abbey Wood Opportunity Area | London City Hall, figure.4, accessed 26/07/23

[34] Tower Hamlets Local Plan 2031 p.10

[35] Tower Hamlets Local Plan 2031 p.10

[36] MYE_2017_Factsheet.pdf (towerhamlets.gov.uk) p.1

additional residents every day for the next 10 years[37]. This represents an increase of 17 per cent population increase compared to 10 per cent for London as a whole[38].

The Isle of Dogs

The Isle of Dogs is the fastest growing part of the London Borough of Tower Hamlets, delivering the largest proportion of Tower Hamlets 3511 new homes per annum. Since 2019, 3,836 of the 29,000 new homes (that are expected to be delivered as part of the Central London Growth corridor by 2041[39]) have been completed within the Isle of Dogs OA [40].

The population is expected to nearly double by 2028 and plans to accommodate this growth is contained within the Isle of Dogs Neighbourhood Plan 2019-31[41].

The plan suggests that the number of households is projected to increase from 132,100 in 2018 to 160,100 in 2028. The projected percentage increase in the population by Middle Super Output Area (MSOA), is shown in the figure below. These dramatic increases in population growth are reflected by the high density housing developments that have been and are being planned for delivery.

[37] Population_Projections_for_Tower_Hamlets.pdf (towerhamlets.gov.uk) p.1, Population projections for Tower Hamlets, (2018), Corporate Research Unit

[38] Population_Projections_for_Tower_Hamlets.pdf (towerhamlets.gov.uk) p. 2, Population projections for Tower Hamlets, (2018), Corporate Research Unit *(if time, update with latest figures)*

[39] Strategic Housing Land Availability Assessment | London City Hall

[40] Isle of Dogs and South Poplar Opportunity Area | London City Hall (accessed 23/07/23)

[41] Isle of Dogs Basic Plan (towerhamlets.gov.uk)

Projected increase in population by MOSA, 2018 to 2028[42]

The scale of the growth is reflected in Tower Hamlets council receiving the largest New Homes Bonus receipts in the country (£189.4million between 2011/12-2020/21). This trend has continued into 2023, as the borough has retained its number one position in the New Homes Bonus receipt table receiving £16, 26m [43], compared to the city of Manchester in second place with £9.85 m and more than triple the level of receipts when compared to the next London Borough of Southwark with £5.11m.

Impact of proposed developments on existing Thames Water customers

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[42] Population Projections for Tower Hamlets.pdf (towerhamlets.gov.uk) p. 3, Population projections for Tower Hamlets, (2018), Corporate Research Unit

[43] https://www.towerhamlets.gov.uk/Documents/Planning-and-building-control/Neighbourhood-Planning-Documents-March-2021/IoD-Basic-Plan-ADOPTED.pdf accessed 23/07/23

The proposed developments within the Isle of Dogs opportunity Area are contained within the Finsbury Park Flow monitoring Zone (FMZ). This zone covers an area of north east London bounded by Hackney Marsh in the north, the Isle of Dogs and the River Thames in the south, Shoreditch in the west and Strafford in the east.

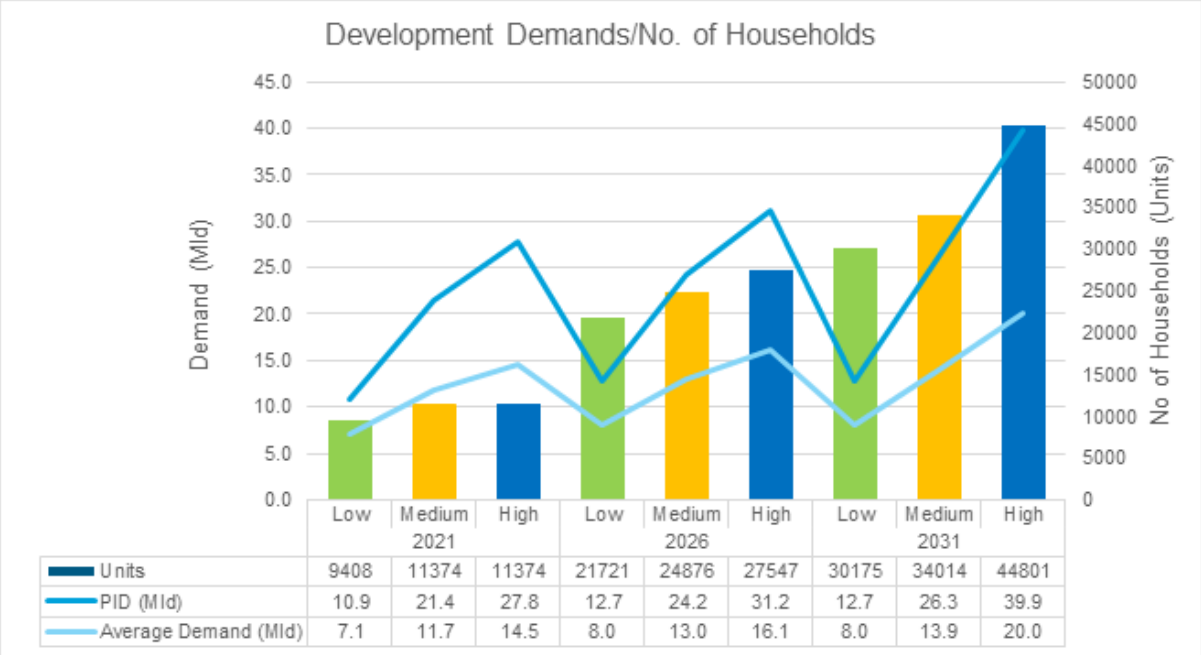
This zone is predominately supplied by Coppermills Advanced Water Treatment Works (AWTW) and Stoke Newington Thames Water Ring Main (TWRM) pump out shaft. Although there is no treated water storage in the zone, additional treated water can be supplied from the Crouch Hill FMZ (via the Leonard Street infusion).

An impact assessment was conducted in 2021 to determine the impact on the minimum level of acceptable pressure service offered to customers in the Finsbury Park Flow Monitoring Zone due to the connection of 125 proposed development locations to the existing network up to 2031. The assessment focussed on the Isle of Dogs Opportunity Area which sits within the southernmost part of the zone.

To account for the uncertainty associated with development activity, the three scenarios representing low (9,162 additional properties), medium (22,812 additional properties), and high growth (34,467 additional properties), (in 2021, 2026 and 2031) were considered.

The peak day average and peak instantaneous demand used in the baseline modelling were based on demand in July 2019 and was 117.5 and 180.6 Ml/d respectively. The assessment concluded that average and peak instantaneous demands would increase between 7.1 and 10.9 Ml/d (in the 2021 low development scenario) and 20.0 and 39.9 Ml/d (in the 2031 high development scenario).

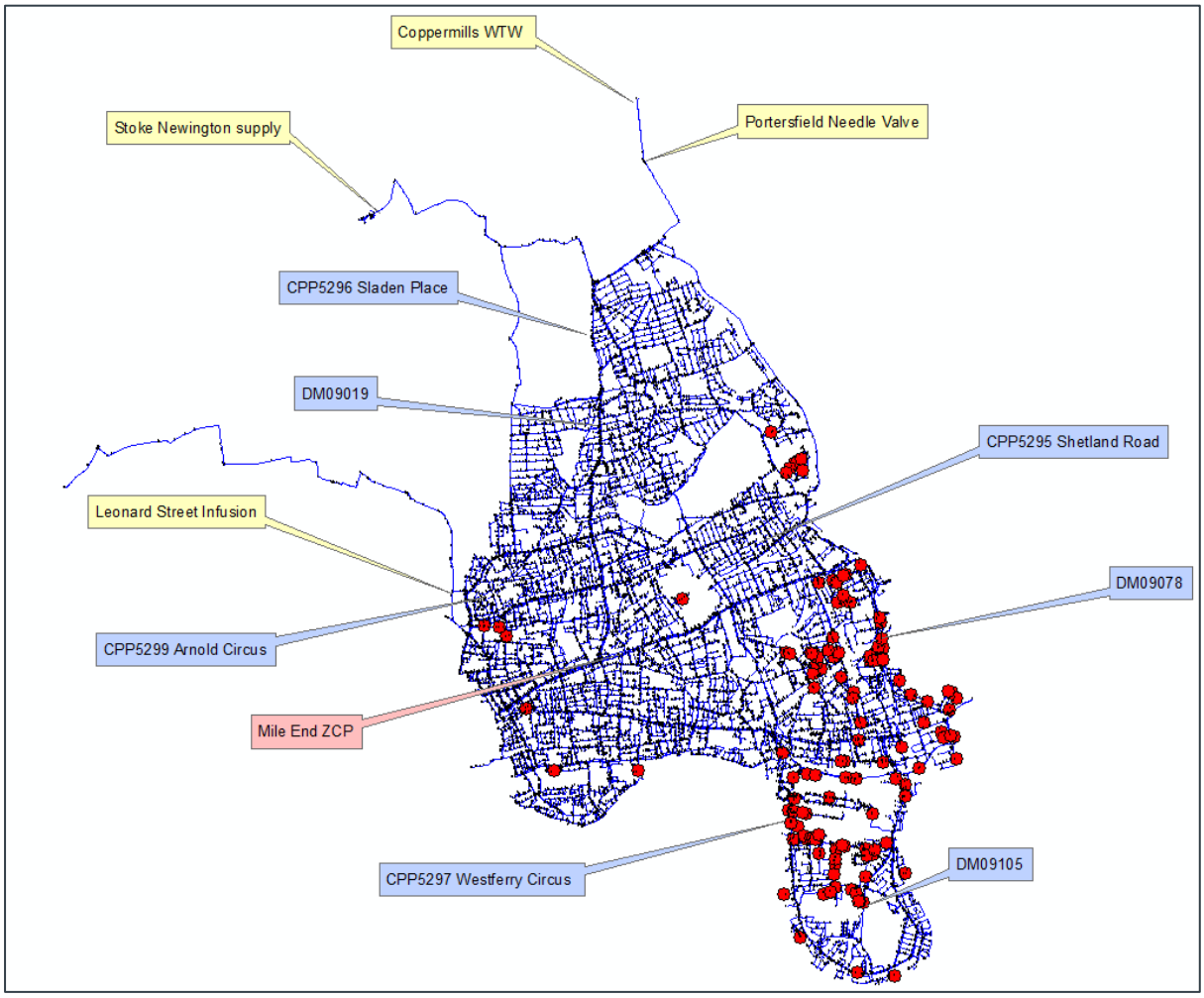
The supply demands created by the developments are illustrated in the figure below.



Finsbury FMZ Development Demand/Households per year[44]

[44] 'NM948 Isle of Dogs Multiple studies', 2021 Thames Water Utilities Ltd, Asset management – Water Modelling Group, p. 14

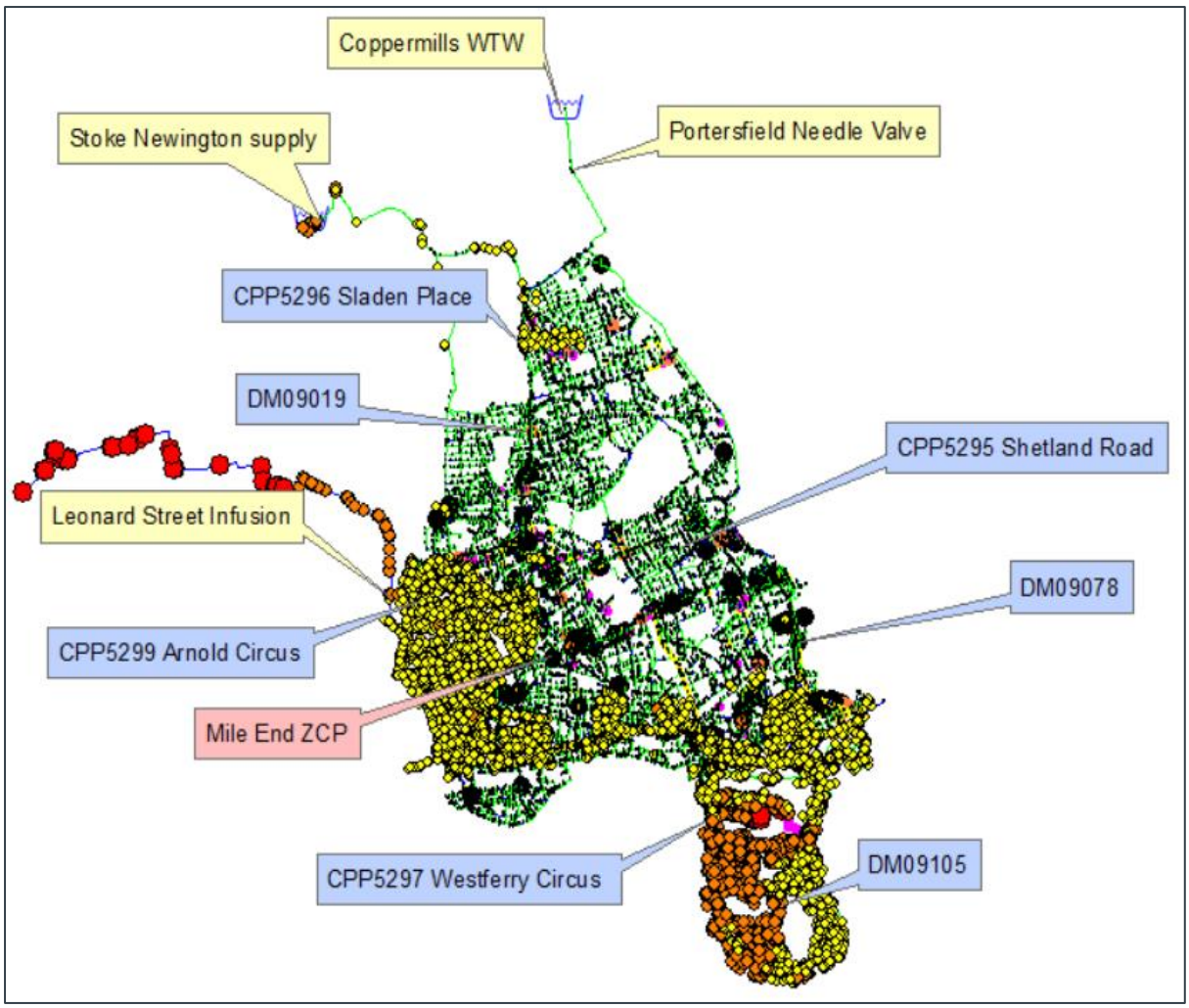
The number of proposed connection points are detailed in the figure below.



New development Points of Connection[45]

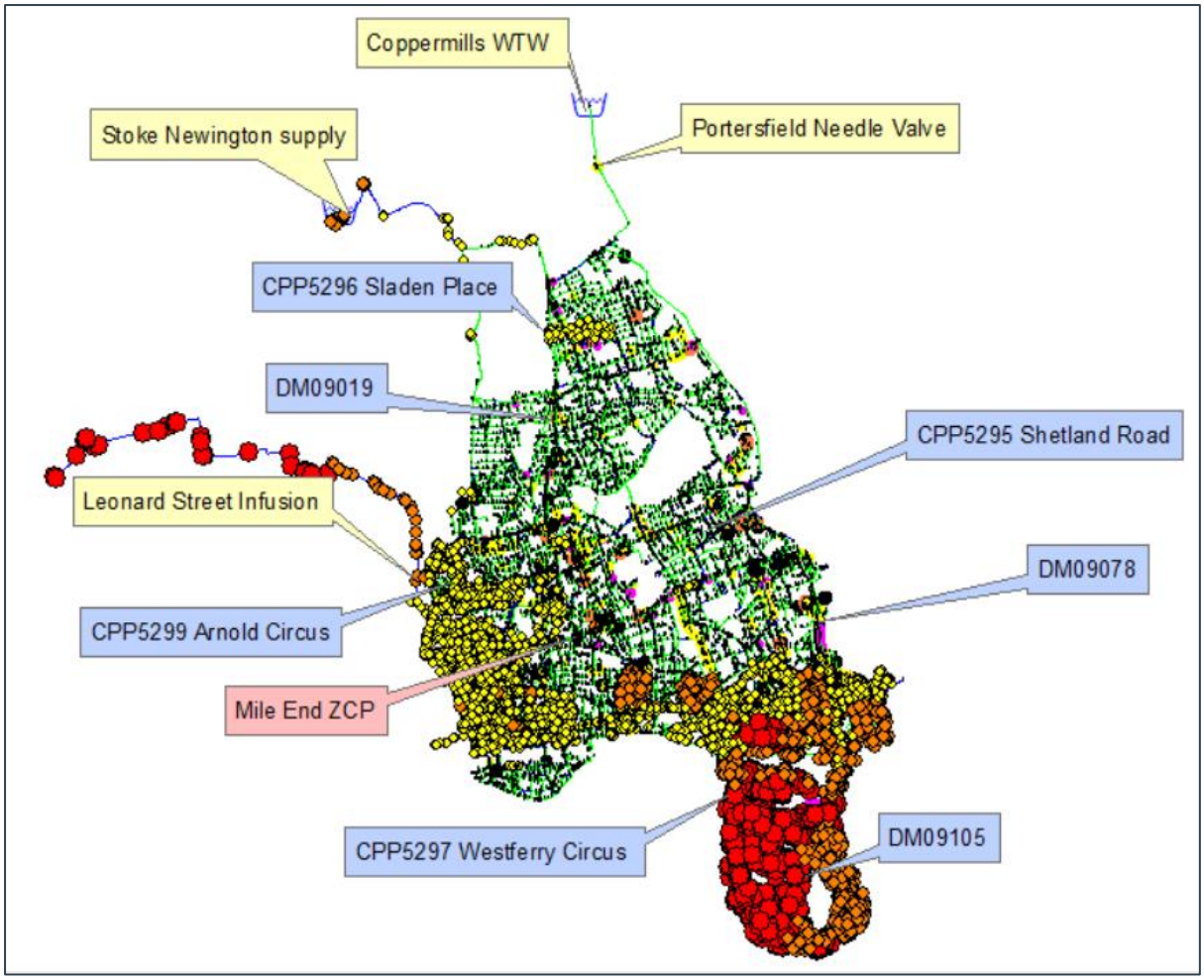
The assessment concluded that the average and peak customer service expectations in all 2021 growth scenarios could still be met with the existing infrastructure and no network reinforcement would be required. In the 2025 high growth scenario, peak customer service expectations could not be met by the existing infrastructure and some local network reinforcement would be required. In all scenarios in 2031, the existing infrastructure would not be able to meet customer service expectations and pressures below 10m would be experienced by a large number or customers. Strategic Network Reinforcement of 2.5km new main (ranging from 200mm to 900mm) would be required. The impact on customers pressure service under the 2031 scenario is represented in the figure below.

[45] NM948 Isle of Dogs Multiple studies', 2021 Thames Water Utilities Ltd, Asset management – Water Modelling Group, p. 15



2031 scenario low growth impact[46]

[46] NM948 Isle of Dogs Multiple studies', 2021 Thames Water Utilities Ltd, Asset management – Water Modelling Group, p. 22

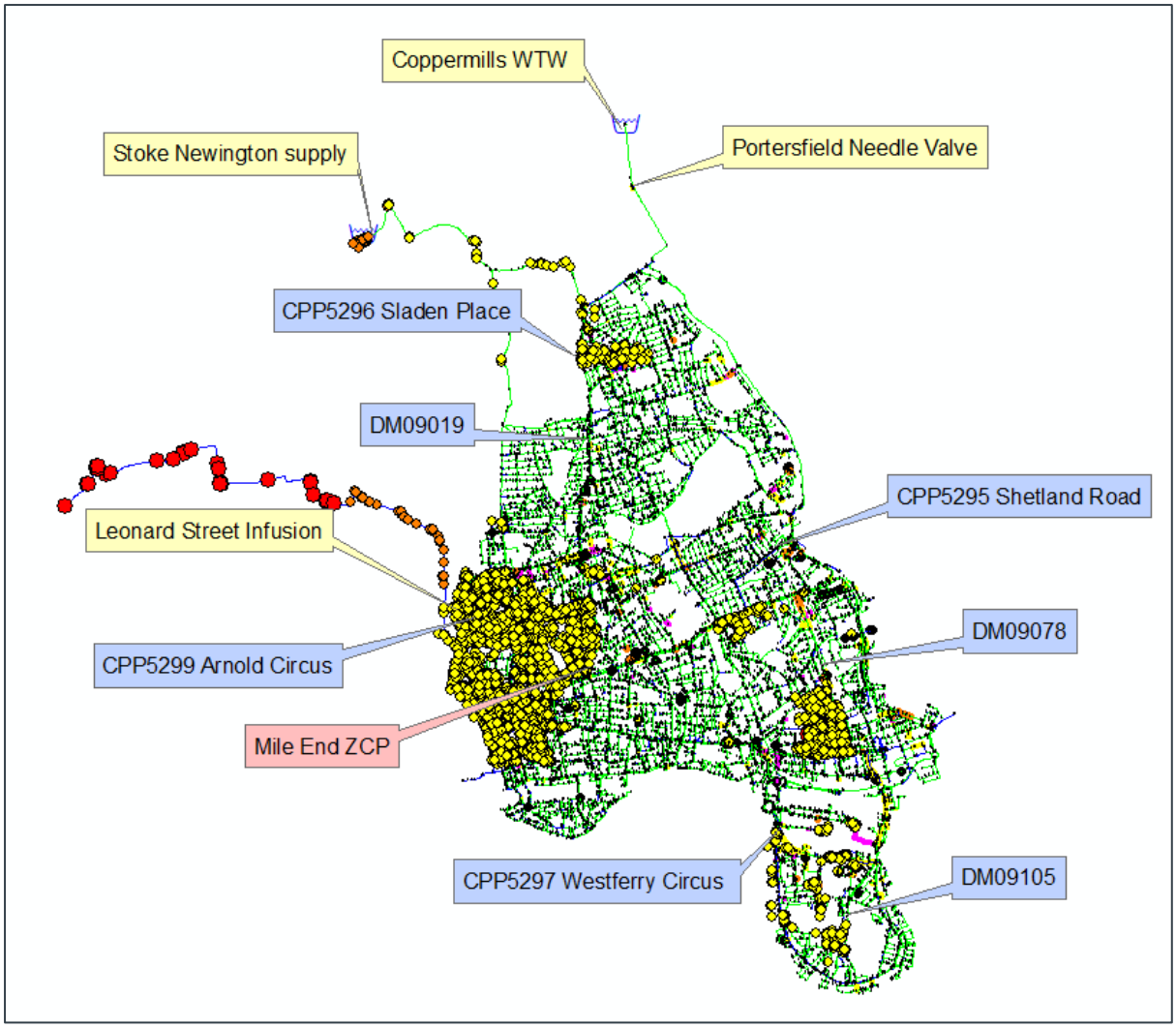


2031 scenario high growth impact [47]

In the scenario represented above, pressure drops of between 13.8 and 16.4m (compared to the baseline scenario) are experienced as a result of connecting the proposed developments to the existing network.

The implementation of local and strategic reinforcement restores customer pressure service to a minimum of 17.7m during peak demands across all of the Finsbury Park zone. This is represented below:

[47] NM948 Isle of Dogs Multiple studies', 2021 Thames Water Utilities Ltd, Asset management – Water Modelling Group, p. 32



2031 high growth scenario impact after local and strategic reinforcement has been applied[48]

Riverside Growth (Phase 2)

Impact of proposed developments on existing Thames Water customers

The Riverside zone is located in South East London and stretches from Greenwich to Erith and contained 81,150 properties at the time of the impact study. The zone covers five London Opportunity Areas including, Greenwich peninsula, Charlton Riverside, Woolwich, Thames Mead and Abbey Wood and Bexley Riverside.

The zone is split into two hydraulic areas, with Area 1 (in the west) supplied by treated water storage at Nunhead Upper Service Reservoir (SRE) and pumped treated water supplies from Honor Oak and Deptford Water Pumping Stations (WPS). Area 2 (in the east) is supplied by Nunhead Upper Service Reservoir (SRE) and pumped treated water supplies from Honor Oak WPS and infusions from Oxleas Wood and Eltham FMZ's.

[48] NM948 Isle of Dogs Multiple studies', 2021 Thames Water Utilities Ltd, Asset management – Water Modelling Group, p. 44

An impact assessment was conducted in 2018 to determine the impact on the minimum level of acceptable pressure service offered to customers in the zone due to the connection of 41 proposed development locations containing up to 67,088 residential units to the existing network up to 2045.

The assessment concluded that average daily demand in the zone would increase from a 58.9 [49] to 82.6 million litres a day(ML/d) by 2045 and instantaneous peak demands would increase from 76 to 140 Ml/d by 2045.

This increase in demand cannot be accommodated by the existing network and will lead to extensive pressure losses resulting in a delivered water service far below customer expectations in a number of locations. Minimum pressure standards can only be maintained by targeted network reinforcement. The impact assessment concluded that for 7.9km of new infrastructure (ranging from 300 to 1000mm) at 13 separate locations would be required for Area 1 (up to 2035) and a combination of 14.7km of new infrastructure (ranging from 350 to 700mm) at 10 separate locations and a booster station would be required for Area 2 (up to 2037). The addition of the booster station would reduce the length of required new mains to 10.8km. Pressure relief valve (PRV) adjustments in Area 1 would reduce required the length of new mains by 3.5km.

The Broxbourne Local Plan

The Broxbourne Local Plan, which sets out proposals for how Broxbourne will grow and develop includes provision for around 7,718 (at an average of 454 per annum) homes by 2033[50]. The majority of the housing is included in 3 strategic developments:

- 'Brookfield Garden Village' including 1,250 homes
- 'Cheshunt Lakeside', a new mixed-use urban village including 1,750 homes as well as businesses and a primary school,
- 'Rosedale Park', comprising around 820 homes (plus a 64-bed care home) and a primary school

The remainder of the residential development is proposed at a number of smaller sites within the borough. Evidence gathered to support the Local Plan suggests that the population of the Borough will increase by 18,500 by 2033[51].

Background

Broxbourne is located in the south-east of Hertfordshire within the Upper Lee Valley bordered by East Hertfordshire to the north, Epping Forest to the east, Enfield to the south and Welwyn Hatfield to the west. The M25 demarcates the southern boundary of the Borough and the River Lee Navigation demarcates the eastern boundary. Broxbourne lies in the core area of the London Stansted Cambridge Corridor.

Brookfield Garden Village

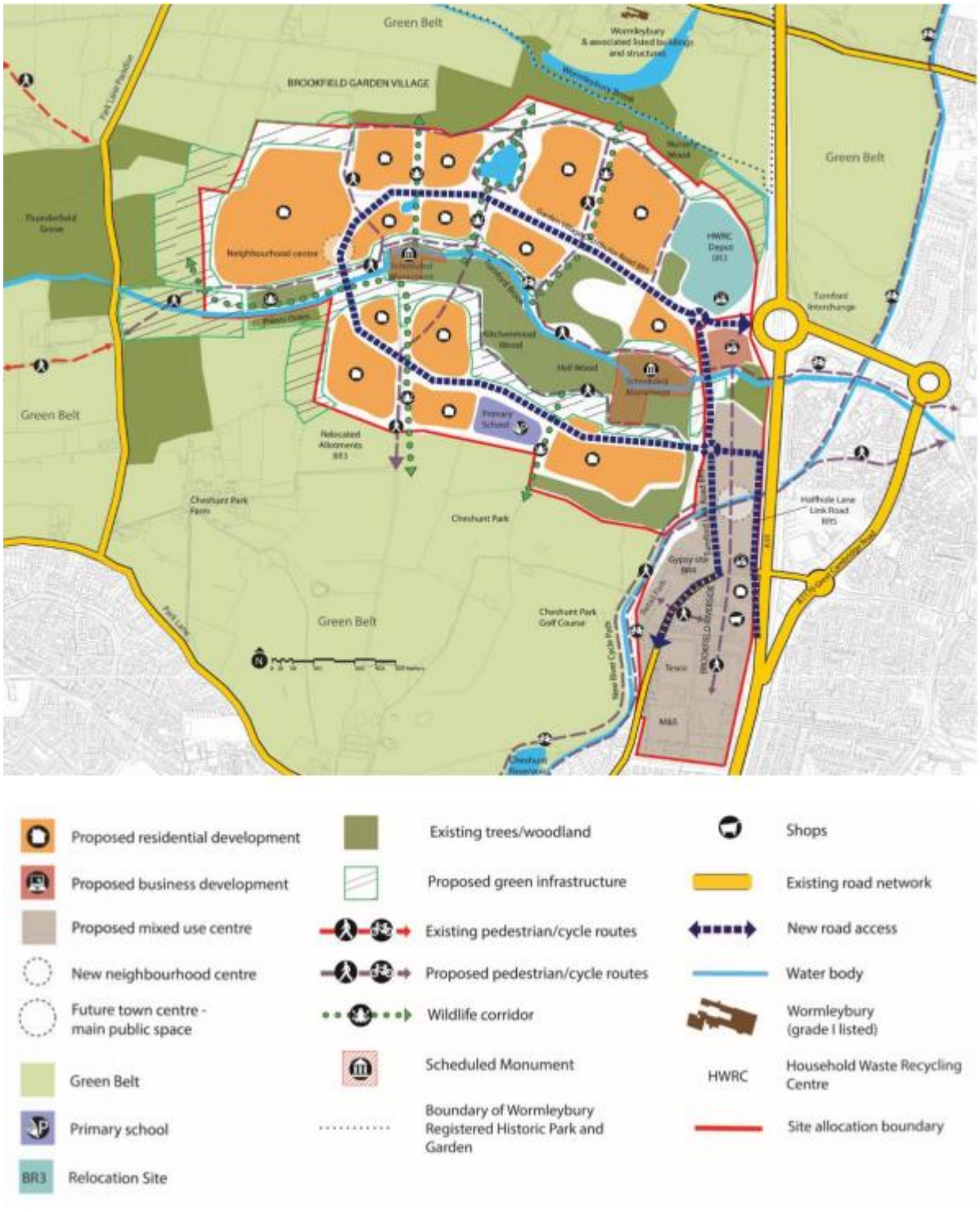
[49] Eight20 D182 Riverside Growth Modelling Study, 2018, p.14

[50] summary and key points (broxbourne.gov.uk) p.5

[51] summary and key points (broxbourne.gov.uk) p.16

The council has identified locations within existing urban areas that can accommodate up to 4,075 new homes, but at least 3,733 new homes and developments which will create in excess of 5,000 new jobs will have to occur within the green belt. One of these locations is Brookfield Garden Village, which will provide new homes for up to 5,000 people. The Council plans to develop the Brookfield area as a comprehensively planned garden suburb that will encompass a retail, civic business and leisure center.

An image detailing the concept for the Brookfield area has been included below.



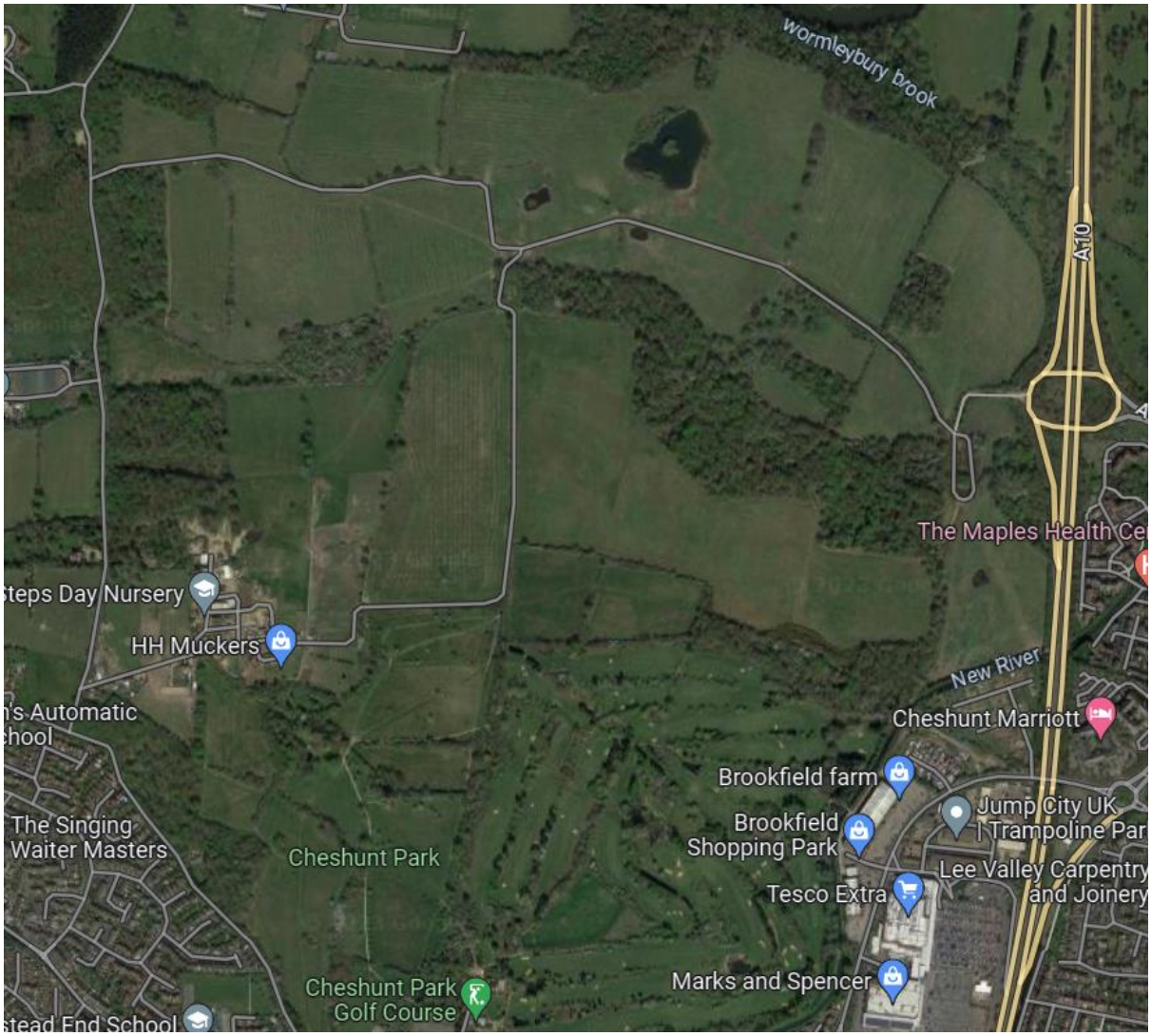
Source: The Broxbourne Local Area Plan, Fig.3 Brookfield Riverside and Garden Village Indicative Concept Plan, p.33 June 2020

An image detailing the concept for the Brookfield Riverside Area which neighbours the Garden Village development area has been included below.

Source: The Broxbourne Local Area Plan, Artist impression of Brookfield Riverside retail and residential , p.34 June 2020

Source: The Broxbourne Local Area Plan, Artist impression of Brookfield Garden Village , p.37 June 2020

A Google maps image of the same area (as it currently exists) has been copied below:



Source: Google 2023 scale Google Maps (online) (accessed 21/07/23)[52]

Impact of proposed developments on existing Thames Water customers

In the absence of the proposed reinforcement the impact of the connection would result in an adverse pressure impact of 4.5m within the existing supply system. Implementation of the recommended option would reduce the pressure impact to 0.1m

The Cherwell local Plan 2011-13[53]

The proposed developments lie with the Ardley FMZ, which covers the area around Bicester in North Oxfordshire. At the time of the study, the zone contained 17,574 domestic properties. The

[52] Google Maps

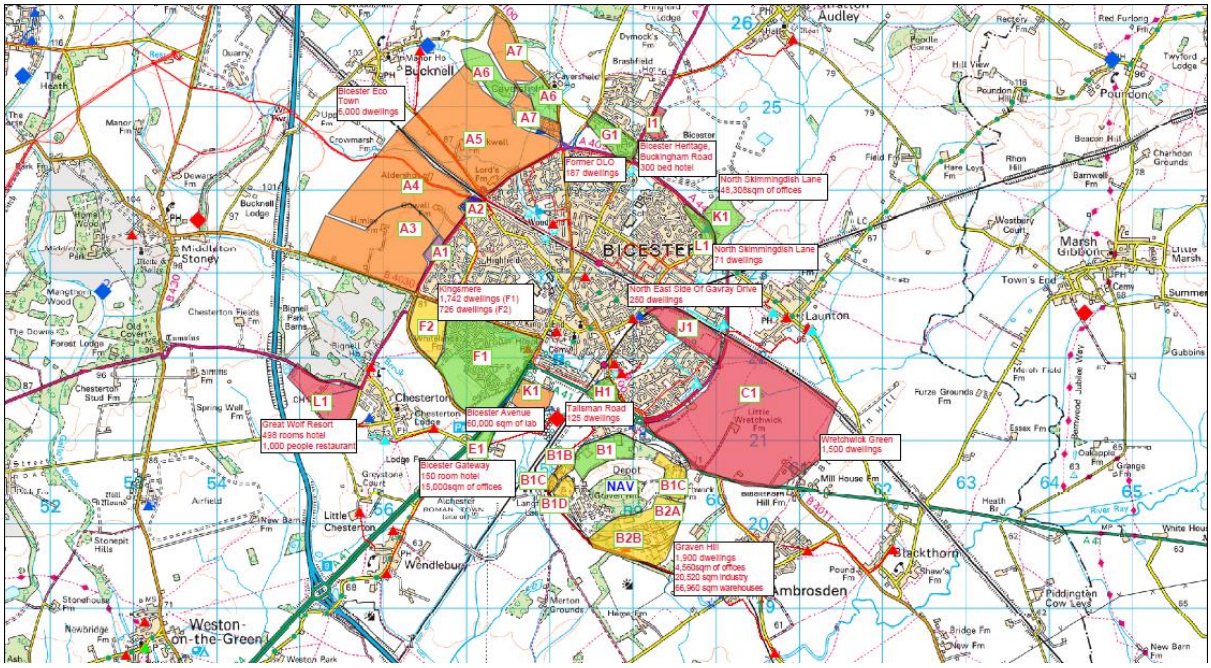
[53] Adopted Cherwell Local Plan 2011-2031 Part 1 (incorporating Policy Bicester 13 re-adopted on 19 December 2016) | Cherwell District Council accessed 28/07/23

Cherwell Local Plan 2011-2031 [54], which sets out the future proposals of Cherwell District Council for the district identifies four potential locations for strategic housing developments around Bicester town. These include the North West Bicester Eco Town (6,000 new homes, 390 hectares), Graven Hill (south of Bicester, 2,100 new homes, 241 hectares), South west Bicester Phase 2 (726 new homes, 29 hectares) and Bicester business park (29.5 hectares)

This zone is predominately supplied by Angelinos WBS, which supplies treated water to Ardley SRE which gravity feeds the zone. Additional treated water can be supplied into the zone via infusion from the Chesterton zone.

An impact assessment was conducted in 2020 to determine the impact on the minimum level of acceptable pressure service offered to customers in the Ardley zone due to the connection of 12, 561[55] new housing units to the existing network up to 2045.

The location of the new properties is represented below.



Proposed growth in Ardley zone [56]

The assessment concluded that dry year peak day demand (DYPD) in the zone would increase from 14.7 [57] to 18.2 (ML/d) and instantaneous peak demands would increase from 259.3 to 364.3 litres per second (l/s) by 2045.

This increase in demand cannot be accommodated by the existing network and will lead to extensive pressure losses resulting in a delivered water service far below customer expectations

[54] Adopted Cherwell Local Plan 2011-2031 Part 1 (incorporating Policy Bicester 13 re-adopted on 19 December 2016) | Cherwell District Council accessed 28/07/23

[55] Ardley growth study reassessment, Stantec, 2020 p. 28

[56] Bicester Growth Plan 20211220 DSLR, Thames Water

[57] Ardley growth study reassessment, Stantec, 2020 p. 30

in 9 of the 13 Districted Metered Areas (DMA's) in the Ardley zone. Minimum pressure standards could only be maintained in 4 of the 13 Ardley (DMA's).

Network reinforcement (in the form of a strategic pumping station) would provide all customers in the Ardley zone with pressures above the minimum delivering an average of 22.5m, with only 1 DMA experiencing a pressure below 20m at 18.7m.

8. Annex 2 – List of Live Network Reinforcement Projects

Developer Services Projects		Service	£m
J540	Wat/Net Reinf Valley Park, Didcot	Water	[redacted]
H615	Sewer Req @ Peel Centre (Growth)	Waste	[redacted]
J531	Brent Cross South Phase 1	Waste	[redacted]
J670	Sew/Net Reinf Land East of A419 (Growth)	Waste	[redacted]
J241	Waste Wembley Growth, Brent, HA9 0FJ	Waste	[redacted]
Growth-18	Silvertown Quays, Land off North Woolwich Road, Newham, London, E16 2BE	Waste	[redacted]
H950	Waste/ Faringdon (Growth)	Waste	[redacted]
H744	Woking Strategic (White Rose Lane)	Waste	[redacted]
J326	Reinf Waste Hornsey Park Village N22 6TZ	Waste	[redacted]
J847	GROWTH_SEW_REIN_ Blunsdon SN26 8AA	Waste	[redacted]
J061	Waverly Gardens (Growth) - Barking	Waste	[redacted]
J025	Waste/Req Alfold (Growth)	Waste	[redacted]
Growth-14	Theale Growth	Waste	[redacted]
Growth-16	Margarine Works, Quayside Quarter Former Honey Monster Factory Bridge Road, Southall	Waste	[redacted]
X5901-021	Haddenham Growth	Waste	[redacted]
Growth-19	Stonepit, Off London Road, Dartford, DA2 6BT	Waste	[redacted]
J927	GROWTH SEW REIN Blakes Lock Growth RG1 3DH	Waste	[redacted]
J843	GROWTH_SEW_REIN_ Highworth_SN6 7BZ	Waste	[redacted]
X5901-032	Land north east of Ware	Waste	[redacted]
K938	Ripley Growth - Wisley Airfield, Ockham Lane, Surrey, GU23 6NT	Waste	[redacted]
Growth-6	Oxford Growth (Formerly Gibbs Crescent, Mill Street, Oxford, OX2 0NX)	Waste	[redacted]
X5901-041	Bicester Growth	Waste	[redacted]
X5901-019	Land to the North East of King George V Playing Fields, Northaw Road East	Waste	[redacted]
K305-0005	Takeley Growth CM22 6QL	Waste	[redacted]
J100	Sewer/Req Grenwich Peninsula (Growth)	Waste	[redacted]
Growth-12	Tesco Superstore at Oysterley Park, Syon Lane, Isleworth, TW7 5NZ	Waste	[redacted]
J309	Sew/Reinf Cutbush Lane Shinfield RG2 9FU	Waste	[redacted]
H958	Bloxham Road, Banbury (Growth)	Waste	[redacted]
L268	Bicester Growth Waste	Waste	[redacted]
	Gatwick and Luton	Waste	[redacted]
	Dunsfold	Waste	[redacted]
	Dunsford	Water	[redacted]
	DS AMP7 timing overlay	Water	[redacted]

	DS AMP7 timing overlay	Waste	[redacted]
Capital Delivery Projects			
J528	Chesterton Farm - Clean Water	Water	[redacted]
J581	Wat/Reinf Arborfield CW Reinf (Growth)	Water	[redacted]
K633	Swindon NEV CW Network Reinforcement SN3 4EW	Water	[redacted]
J508	Wat/Req Wantage Clean Water Growth	Water	[redacted]
K195	Arborfield CW Strategic Water Boosting Station RG2 9ND	Water	[redacted]
	CD Water profile adjustment in SAP Q3RF - slippage in above CD schemes from AMP7	Water	[redacted]
J667	Sew/Net Reinf Cranleigh Growth GU6	Waste	[redacted]
J070	West Basingstoke (Growth) - Scheme 2 Manydown Development (J070)_RG24 9WB	Waste	[redacted]
J400	Net/Re Longcross Garden Village develop	Waste	[redacted]
K595	Dollis Valley Estate (formerly GROWTH - 2)	Waste	[redacted]
J310	Sew/Reinf Milton Park Milton Didcot OX14 (A and B)	Waste	[redacted]
J361	Sew N/Reinf Bordon Growth	Waste	[redacted]
J503	Sew/NetReinf South Wokingham SDL	Waste	[redacted]
K136	South Basingstoke (Growth) - Scheme 3 South Basingstoke (K136 J070-C) RG23 7LL	Waste	
	CD Waste profile adjustment in SAP Q3RF - slippage in above CD schemes from AMP7	Waste	[redacted]
	Total		[redacted]


Thames
Water