Water Resources Management Plan 2024

Section 8 – Demand Options

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Background and Introduction

Demand options reduce both the leakage and consumption components of water demand.

Demand options for our Water Resources Management Plan 2024 (WRMP24) have been developed in conjunction with the Water Resources South East (WRSE) regional plan.

The purpose of this section of the overall plan is to identify and describe our demand options and to explain the development of our demand reduction programmes.

8.1 Water demand consists of three main components:

- Leakage: water that leaks from our water mains and customer supply pipes
- Household (HH) Consumption: water consumed by household customers
- Non-Household (NHH) Consumption: water consumed by businesses

8.2 Both Household and Non-Household consumption water demand can be further broken down into:

- Behavioural Use: water used by customers in the home or for business purposes. Examples of behavioural use include water used for bathing, clothes washing, drinking, or watering the garden (Figure 8-1)
- Wastage: water wasted in the home through leaking devices. Examples including a leaking toilet, tap or shower head

Figure 8-1: Water Use in the home

8.3 Water that is wasted in homes or businesses (wastage) or that leaks from water mains or customer supply pipes (leakage) is water that could have remained untreated and in the environment.

8.4 Excess behavioural use of water such as running the tap while washing the dishes or running the washing machine for a single item also results in us extracting more water from the environment than is necessary.

8.5 The purpose of demand reduction is to protect our environment and ensure we can meet future demand for water.

8.6 To reduce water demand, we identify demand reduction options and combine these to create demand reduction programmes. In WRMP24, we have done this in five stages:

1. Governance and Strategy – defining our strategy based on the recommendations from our regulators and associated organisations.
2. Demand Options Screening – identifying an unconstrained list of all possible demand options and screen these to a smaller list of feasible demand options.
3. Feasible Demand Options – identifying the costs and benefits of the feasible demand options.
4. Demand Programmes – creation of demand reduction programmes based on feasible options. These demand reduction programmes are used in both our WRMP24 and the WRSE Regional Plan.
5. Demand Reduction – ensure that the outcomes of these programmes lead to leakage, HH consumption, and NHH consumption outcomes which align with the strategy identified in stage one.

Governance

8.7 To develop our Demand Reduction Plan, we have worked closely with our regulators and associated organisations.

- **Department for Environment, Food and Rural Affairs (Defra)** is the UK government department that sets the overall water and sewerage policy framework in England including setting standards and drafting legislation.
- **The Environment Agency (EA)** is a non-departmental public body which is the principal adviser to the government. The EA seeks to maintain and improve the environment in England and Wales and is responsible for issuing water companies with abstraction licences. The EA, together with our other regulators, publishes the Water Resources Planning Guidance (WRPG) which we use to develop our WRMP. The EA tracks our compliance with WRMP19 and the integrity of the information we include in WRMP24.
- **Ofwat** is the economic regulator of the water and sewerage industry in England and Wales. Ofwat sets the limit on how much water companies can charge their customers to protect the interests of consumers and to secure the long-term resilience of water supply and wastewater systems.
- **The National Infrastructure Commission (NIC)** carries out in-depth studies into the UK's major infrastructure needs and makes recommendations to the government.
- **CCW (previously the Consumer Council for Water)** is an independent consumer representative for England and Wales for both the water and wastewater sectors.
- **Market Operator Services Ltd (MOSL)** is the market operator for the non-household retail market in England.

8.8 These organisations have published recommendations for leakage and consumption management. We have utilised these recommendations within the creation of our demand reduction programmes.

Governance Documentation

8.9 The source and publication of these recommendations have been summarised in Table 8-1 to Table 8-4 below.

Organisation	Document	Recommendation
Defra	Government expectations for water resources planning[1]	'The government expects both regional groups and water companies to reduce leakage by a minimum of 50% by 2050 from 2017-18 levels with ambitious milestones to achieve this.'
EA	National Framework[2]	'Regional groups should reduce the water lost from networks by 50% by 2050 from a baseline of 2017-18'.
EA, Ofwat, Natural Resources Wales	Water resources planning guideline (WRPG)[3]	'You should (as a minimum), plan to meet Water UK's commitment, on behalf of the industry, to reduce leakage by 50% by 2050 (from actual 2017 levels). In addition, you should plan to meet any leakage targets set out in Ofwat's price review methodology or by government. You may wish to consider setting more challenging

[1] Defra, 2022, 'Government expectations for water resources planning', page 5 and 6
[2] EA, 16th March 2020, 'Meeting our Future Water Needs: a National Framework for Water Resources – version 1', page 10
[3] EA, Ofwat, Natural Resources Wales, 4th April 2022, 'Water resources planning guideline, version 10', pages 91 - 94

Organisation	Document	Recommendation
		targets for reducing leakage than these, if you can demonstrate you have support from your customers.' 'In the medium to longer-term, it is recognised that reducing leakage by 50% will require innovation and you may not know how you are going to achieve these levels. You should demonstrate that you are actively investigating how to achieve your ambitions. Your leakage forecasts should be consistent with the data you include in the business plan you provide to Ofwat as part of its price review process'.
HM Government	25 Year Environment Plan[4] (2018)	'We also want to see the amount of treated water lost through leakage continue to fall, year-on-year. All water companies will need to match the levels of leakage reduction achieved by the sector's top performers.'
NIC	Preparing for a drier future[5]	'Defra should set an objective for the water industry to halve leakage by 2050, with Ofwat agreeing 5 year commitments for each company (as part of the regulatory cycle) and reporting on progress.'
Defra	Governments strategic priorities for Ofwat[6]	'We expect Ofwat to: • Challenge water companies to halve leakage across the industry by 2050. Water companies have committed to delivering a 50% reduction in leakage from 2018 levels by 2050. We expect Ofwat to monitor progress towards this target • Support and encourage water companies to develop a consistent approach to address leakage on customers' own pipes'
Defra	Consultation on environmental targets[7]	'There are a number of existing commitments and ambitions on water demand that are not statutory. These include commitments made by water companies to reduce leakage by 50% against 2017-18 levels by 2050'.
Defra	Environmental Improvement Plan 2023[8]	'Reduce leakage by 20% by 31 March 2027 and 30% by 31 March 2032'. 'To achieve the statutory water demand target, we plan to … reduce leakage by 37% … by 31 March 2038'. 'This is part of the trajectory to achieving … 50% reduction in leakage … by 2050'.

Table 8-1: Governance documentation on leakage targets

[4] HM Government, 2018, 'A Green Future: Our 25 year Plan to Improve the Environment', page 70.
[5] NIC, April 2018, 'Preparing for a drier future, England's water infrastructure needs', page 6 and 15
[6] Defra, 28th March 2022, 'Policy paper February 2022: The government's strategic priorities for Ofwat'
[7] Defra, 6th May 2022, 'Consultation on environmental targets', page 24
[8] Defra, 31st January 2023, 'Environmental Improvement Plan 2023', page 105

Organisation	Document	Recommendation
Defra	Government expectations for water resources planning[1]	'The government expects both regional groups and water companies to: • Take actions required to reduce PCC to 110 l/h/d by 2050
EA	National Framework[2]	'Regional groups should: • Contribute to a national ambition on average Per Capita Consumption (PCC) of 110 l/p/d by 2050 – this should be reviewed every five years
EA, Ofwat, Natural Resources Wales	WRPG[3]	'Your preferred programme PCC should take into account any relevant future demand reduction planning assumptions set out in the national framework, regional plans and targets set by government or regulators. Your forecasts of PCC should be consistent with the data you include in the business plan (PR24) that you provide to Ofwat as part of its price review process.'
HM Government	25 Year Environment Plan[4]	'We want to see water use in England fall – the average person currently consumes 140 litres per day. With the average bath using around 80 litres and each flush of an old-fashioned toilet using up to 13 litres, there is action we can take to ensure we are using our water supply most efficiently. We will work with the industry to set an ambitious personal consumption target and agree cost-effective measures to meet it'.
NIC	Preparing for a drier future[5]	'Reduce demand from 141 litres per person per day to 118'.
Defra	Government's strategic priorities for Ofwat[6]	'We expect Ofwat to hold companies to account for their contribution towards reducing personal water consumption to 110 litres of water per head per day (l/h/d) by 2050'.
Defra	Consultation on environmental targets[7]	'There are a number of existing commitments and ambitions on water demand that are not statutory. These include planning assumptions based on reducing household water consumption to 110 litres per person per day by 2050'.
Defra	Environmental Improvement Plan 2023[8]	'To achieve the statutory water demand target, we plan to reduce household water use to 122 litres per person per day (l/p/d) … by 31 March 2038', 'This is part of the trajectory to achieving 110 l/p/d household water use … by 2050'.
Defra	WRPG[9]	'Specifically, if you are a water company in England your preferred programme should deliver a PCC of 110 litres per person per day by 2050 under your dry year annual average scenario.'

Table 8-2: Governance documentation on PCC targets

[9] Defra, 14th April 2023, 'Water resources planning guideline', section 9.3.4

Organisation	Document	Recommendation
Defra	Government expectations for water resources planning[1]	'The government expects both regional groups and water companies to: • Work with retailers to implement actions to assist non-household users to sustainably reduce their water use'
EA	National Framework[2]	'Regional groups should: • Pursue ambitious reductions in non-household demand and contribute to the evidence available on the potential savings – as part of this regional groups should work with non-household water retailers and new appointments and variations (NAVs) to align their approaches to planning, reducing demand, forecasting and monitoring non-household water use' [The EA considered three scenarios which reduced non-household reduction ranging from 0% - 4%].
Defra	Consultation on environmental targets – Water targets[7]	'Three overall scenarios were modelled: the medium scenario including 9% reduction in NHH demand' [other scenarios ranged from a 6% - 20% reduction in non-household consumption].
Defra	Environmental Improvement Plan 2023[8]	'To achieve the statutory water demand target, we plan to … reduce non-household (for example, business) water use by 9% by 31 March 2038. This is part of the trajectory to achieving … a 15% reduction in non-household water use by 2050.'
CCW	Smart Thinking – Metering for Business Customers[10]	'Businesses need educating on how smart water meters work and how easy installation is'
MOSL	Interim National Metering Strategy for the Non-Household Market[11]	'To either: Roll out smart metering to all NHH customers (recommended) … OR Ensure all medium and large meters are 'smart' or smart-enabled'

Table 8-3: Governance documentation on business demand targets

Organisation	Document	Recommendation
Defra	Consultation on environmental targets – Water targets	'Proposed target – To reduce Distribution Input (DI) over population by 20% from the 2019-20 reporting year figures by 2037-2038'.
Defra	Environmental Improvement Plan 2023[8]	'Reduce the use of public water supply in England per head of population by 9% by 31 March 2027 and 14% by 31 March 2032.'

Table 8-4: Governance documentation on distribution input (DI) targets

[10] CCW, 12th April 2023, 'Smart Thinking – Metering for Business Customers', page 6
[11] MOSL, 17th April 2023, 'Interim National Metering Strategy for the Non-Household Market', page 9

8.10 In addition to the recommendations regarding leakage and consumption reductions, we have also considered Defra's recommendations for metering[1] and complied with The Water Resource Management Plan (England) Direction 2022 (Appendix Z – Defra Directions Checklist).

8.11 Of particular focus, the government has set out new legally binding targets under the Environment Act 2021 to reduce the use of public water supply in England per head of population by 20% by 2038.

8.12 The leakage reductions outlined in WRMPs aim to deliver the entire leakage reduction target, while demand options within the control or influence of water companies will play a significant part of the PCC and Business Demand reduction glidepaths. Achieving the total PCC and Business Demand target agendas will also rely on a range of new government-led policy initiatives and regulatory changes.

Key Dates

8.13 We have considered this guidance to summarise our key dates for targeting as below.

Metric	Unit	Start Year	2026/27	2031/32	2037/38	2049/50
Leakage	Ml/d (% reduction)	2017/18	20%	30%	37%	50%
Per Capita (HH) Consumption	l/head/d				122	110
NHH Consumption	Ml/d (% reduction)	2019/20*			9%	15%
Distribution Input	Ml/d per head (% reduction)	2019/20	9%	14%	20%	

Table 8-5: Key Dates for Targeting

**No start date was confirmed within the Environmental Improvement Plan[8], for this document we have assumed the start date to be 2019/20 for target comparison.*

Strategy

8.14 From our governance recommendations we have generated eight ambitions, to guide our strategy and demand management programmes. These are:

- Ambition 1 – reduce leakage by 50% (from 2017-18 levels) by 2050
- Ambition 2 – maximise feasible PCC reductions by 2050
- Ambition 3 – smart meter all practicable connections by 2035
- Ambition 4 – minimise unmeterable properties by 2040
- Ambition 5 – wipe out most wastage by 2050
- Ambition 6 – minimise impact on customer bills
- Ambition 7 – minimise carbon cost
- Ambition 8 – create a deliverable, resilient and ambitious programme

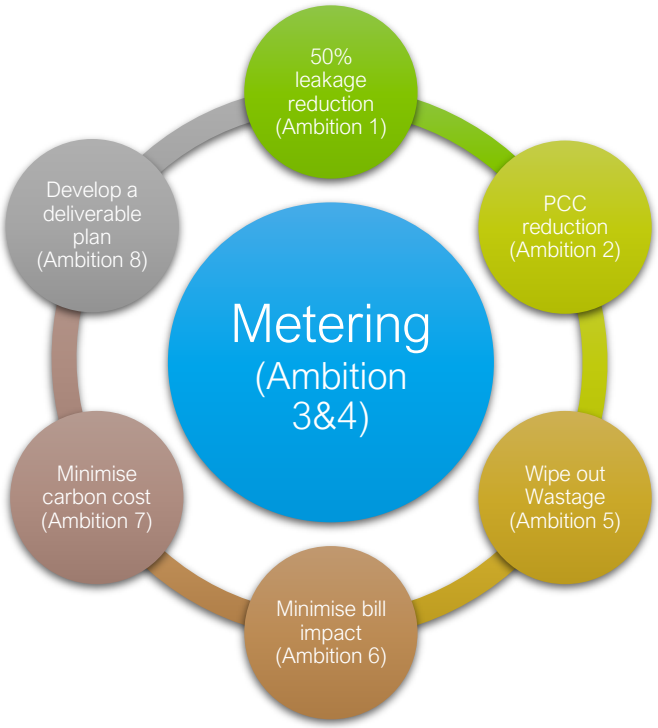

Figure 8-2: Demand Reduction Ambitions

8.15 At the heart of our demand reduction strategy is our smart metering programme, as it contributes to all eight ambitions. See the Metering section below for further details.

Changes since WRMP19

8.16 In WRMP19, we determined the Sustainable Economic Level of Leakage (SELL) and the Sustainable Economic Level of Demand Management (SELDM). This involved the creation of a range of demand reduction programmes to determine the most cost-effective mix of activity to reduce leakage and total demand.

8.17 In WRMP24, we have moved away from this approach and instead developed our programmes based on the government guidance (Governance section) and the eight ambitions in our demand reduction strategy. The change in approach is due to the change outlined in the WRPG: ***'Previously, companies have used the sustainable economic level of leakage method to determine levels of leakage. However, this is no longer acceptable for use in WRMPs and you should consider instead government's, regulators' and customers' views when deciding on your planned level of leakage'.***[12]

[12] EA, Ofwat, Natural Resources Wales, 4th April 2022, 'Water resources planning guideline, version 10', Section 9.3.1

Demand Options Screening

8.18 In stage 2, we have undertaken demand options screening to identify a list of feasible options that we can include in our demand reduction programmes to achieve our strategy for WRMP24.

8.19 The outcome of the demand options screening process is a Feasible Options list of demand options. The options are grouped into three categories: metering, water efficiency or leakage.

8.20 Demand options screening consists of two key stages:

- Stage 1 – Primary Screening of the Unconstrained Options List
- Stage 2 – Secondary Screening to create a Feasible Options List

8.21 The screening process is illustrated in Figure 8-3.

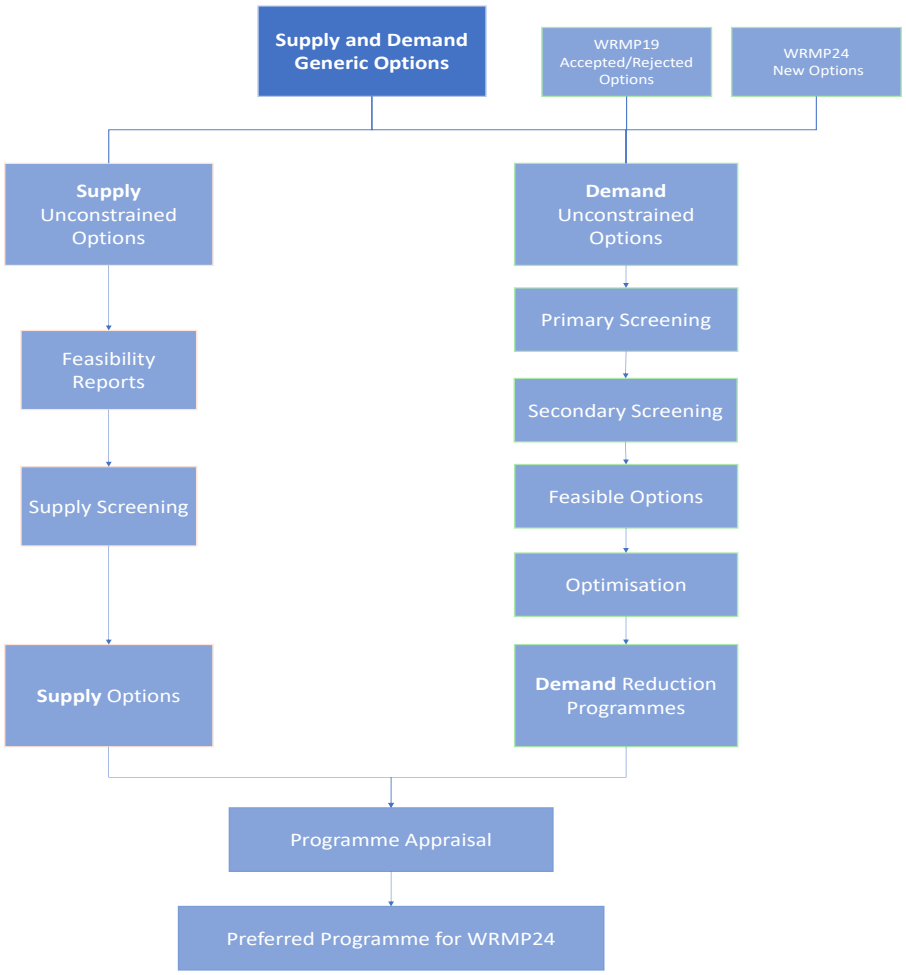

Figure 8-3: Demand Screening Process

8.22 The purpose of Stage 1, Primary Screening, is to review and screen out those options that do not meet the key objectives. The resulting list of options represents a management set of options for further assessment. Primary screening assesses option feasibility at a high level for acceptance or not, having regard to Technological, Financial, Environmental, Risk and Resilience and Legal constraints.

8.23 The purpose of Stage 2, Secondary Screening is to create a list of demand options which are considered to have a reasonable chance of implementation and of achieving a water

demand saving. Secondary screening further refines the options list that has emerged from the primary screening exercise by reference to qualitative criteria.

Screening process changes for WRMP24

8.24 The Demand Options Screening Process is similar to the process undertaken in WRMP19. This approach has been reviewed for WRMP24 to ensure that the criteria and process is aligned with the supply options screening approach and that recommendations from regional planning are considered.

8.25 Our screening process utilised data and insight from delivering large leakage, smart meter installation, and water efficiency programmes from AMP6 and AMP7. This assessment also utilised the UK's largest data source of smart meter consumption reads, covering both variable usage and continuous flow insight. Additional options and screening involved input from external industry and independent groups, including Water Efficiency Network, Smart Meter Advisory Group, UK Water Efficiency Strategy steering group, and Retailer-Wholesaler Group.

8.26 In WRMP19 all discrete water Demand Options and combinations of discrete options underwent Primary Screening and Secondary Screening before being declared a Feasible Demand Option.

8.27 For WRMP24 to achieve consistency with the process outlined in the EA's WRPG, it was deemed more appropriate to first screen out discrete water Demand Options and then, through the modelling phase, develop the Demand Reduction Programmes. This alteration ensured that all feasible discrete options were considered and included in the modelling process used to create demand reduction programmes.

8.28 Additionally, a question was added to the screening process as follows.

- Question 11: Can cost and benefit of the demand option be modelled for comparison with alternative at DMA level or can the option be actively investigated in the 2025-30 period for future consideration within our long-term strategy?

8.29 For the details of the demand options screening process including the full list of unconstrained options and screening questions, please see the report titled, 'Demand Management Options Screening', Thames Water.

Feasible Options

8.30 In stage 3, we have assessed the demand reduction expected to be achieved by each option, along with the options' costs (in 2022/23 price base, no D&PG[13] applied), and any constraints.

8.31 For metering, evidence shows that, on average, the installation of a new smart meter will result in a 13% consumption reduction per property. 10% of this saving is due to changes in behaviour and 3% is due to repair of wastage[14]. Using innovative metering methods to build upon our current PMP (progressive metering programme) and PSUP (progressive smart upgrade programme) metering options, we expect to reduce the number of properties that previously could not have a meter installed from over 1.2 million to 308,000.

8.32 We have introduced several new water efficiency (WEff) workstreams under household innovation and tariffs to reduce household consumption both in the short and long-term. These include innovative solutions and ambitions such as targeting activity to remove wastage from most properties and Digital Engagement with customers to provide advice on reducing their consumption.

8.33 For leakage, we have considered new options, Advanced District Meter Area Innovation (DMAi) and Leakage Innovation, to approach leakage reduction with innovative methods to reduce overall cost and increase efficiency.

8.34 A list of the feasible options is presented in Table 8-6 below. Options are further defined, and their costs and benefits are quantified in the sections below. Further technical detail is available in Appendix N, Metering and Appendix R, Scheme Dossiers.

Option	Option Type	Leakage Reduction	HH Consumption Reduction	NHH Consumption Reduction	WRMP19 or New
HH PMP	Metering		Yes		WRMP19
HH PSUP	Metering	Yes			WRMP19
Bulk Meters	Metering	Yes			WRMP19
Mini-Bulk Meters	Metering	Yes			WRMP19
NHH PSUP	Metering	Yes		Yes	New
Metering Innovation PMP	Metering	Yes	Yes		New
Metering Innovation PSUP	Metering		Yes		New
Digital Engagement	Water Efficiency		Yes		New
HH Innovation & Tariffs	Water Efficiency		Yes		WRMP19
HH High User Targeting	Water Efficiency		Yes		New

[13] D&PG is an overhead which is applied to capital expenditure
[14] Artesia Consulting, May 2022, 'Smart Metering Benefits Template_2022-05-18'

Option	Option Type	Leakage Reduction	HH Consumption Reduction	NHH Consumption Reduction	WRMP19 or New
Smarter Home Visit	Water Efficiency		Yes		WRMP19
Wastage Fix	Water Efficiency		Yes		WRMP19
Green Redeem Incentives	Water Efficiency		Yes		WRMP19
Smarter Business Visits	Water Efficiency			Yes	WRMP19
NHH Continuous Flow Targeting	Water Efficiency			Yes	New
NHH Retailer Activity	Water Efficiency			Yes	New
NHH Tariffs	Water Efficiency			Yes	New
Advanced DMA Intervention	Leakage Reduction	Yes			New
Leakage Innovation	Leakage Reduction	Yes			New
Mains Rehabilitation	Leakage Reduction	Yes			WRMP19

Table 8-6: Feasible Options List

8.35 In WRMP24, we identify options that realise a direct demand reduction. We also quantify the activity required to maintain those savings throughout the planning period.

8.36 Reductions achieved prior to WRMP24 will also merge into the current planning period. To offset this deterioration, we include baseline options in our plan.

8.37 The options that form our baseline water efficiency activity are included in WRMP24 Section 3 – Demand and WRMP24 Appendix O – Water Efficiency.

Metering

Metering Benefits

8.38 Our metering options can reduce customer-side leakage (CSL), wastage, or behavioural usage of customers. This applies to both household and non-household customers. Figure 8-4 illustrates where these savings occur.

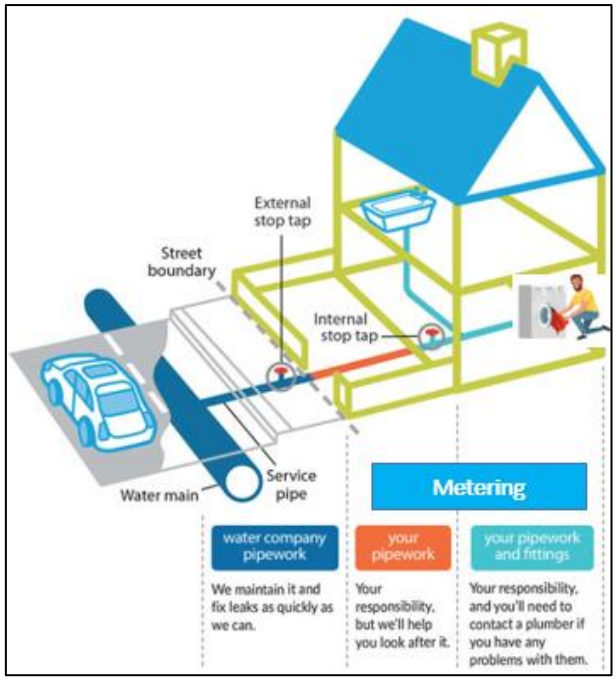

Figure 8-4: Water pipe ownership and metering[15]

8.39 Change in water use behaviour and wastage repairs occur in the home downstream of the internal stop tap. This includes pipework that extends outdoors for customers with a garden. Evidence shows that when metered, customers reduce their consumption through behavioural use changes and wastage repairs. Metering also enables further water efficiency activity to target greater volumes of customer engagement and wastage reduction.

8.40 Change in water use behaviour refers to the changes customers make to their discretionary water use in response to the move to a metered bill and proactive engagement about water use volumes. Examples include reducing shower length, running the washing machine on a full load, and using a watering can in the garden.

8.41 Wastage repairs refer to the repair of wastage issues in the home, such as a leaking tap or toilet in response to the move to a metered bill.

8.42 CSL repairs occur on the pipework between the external and internal stop taps. This pipework is the responsibility of the customer, but we currently offer free CSL repairs to household customers to help us meet our commitment to reduce leakage. Metering contributes to our leakage reduction through the detection of CSL and provides greater insight into asset performance.

8.43 Metering minimises bill impact for customers by ensuring they pay for what they use. It is a more cost beneficial demand reduction option compared to more expensive options such as mains rehabilitation.

8.44 Similarly, metering has a lower carbon cost than other more intensive solutions such as mains rehabilitation. It is a proven deliverable and reliable solution to meet our Ambition 8 to develop a deliverable, resilient and ambitious programme.

[15] Sourced from Discover Water UK, www.discoverwater.co.uk/leaking-pipes

8.45 To minimise the billing impact on customers, we currently implement a 'one year journey' from the time a customer has a meter installed and the time they begin paying on a metered tariff. Within this one-year window, customers receive comparative bills which show the cost of water on an unmeasured and measured tariff. This incentivises customers to save water prior to being put on a metered tariff at the end of their one-year journey.

8.46 This information is used to model the savings for short-term (AMP7 baseline) assumptions only, with the full savings expected from household metering coming into effect one year after the meter install. We assume that 10% of the savings occur at the time of meter install and the remaining 90% occur one year after the meter install. For longer-term metering it is assumed this effect is negligible alongside other uncertainties, as such the modelling simplifies this to assume metering savings occur in the same year as installation.

8.47 Smart meters enable significant further demand reductions from our household and non-household water efficiency demand reduction and leakage programmes. In our household programme smart meters enable our: wastage/internal leak alerts and repairs; Smarter Home Visits; digital engagement; tariffs; and customer side leak identification and repairs. In our non-household programme smart meters enable us to deliver: Smarter Business Visits; Continuous flow alert and wastage repairs; identification of discretionary water users who we can work with to promote alternative sources of water. When making an assessment of the value of smart meter installations, it is important to factor in these enabled activities.

Smart Meter Benefits Study – Smart Meter Data Sources

8.48 In WRMP24, our models have been updated to use smart meter data. In contrast, our WRMP19 models were based on basic meter data. The smart meter data used in WRMP24 has given us the opportunity to reforecast the total household consumption savings we expect from metering and to split these savings between customer behavioural changes and wastage. This reforecast has been implemented in our Smart Meter Benefits Study[14].

8.49 The Smart Meter Benefits Study has been undertaken to forecast the average savings from PMP. This study involves looking at smart meter data to determine both our unmeasured property consumption prior to metering and measured property consumption after a customer receives their metered bill.

8.50 In this study, smart meter data is analysed by property type. Property type is broken into six areas; detached, semi-detached, terrace, dwellings in bulks, dwellings in mini-bulks, and unknown.

8.51 The meters included in the study had to meet the following conditions:

- The data from the smart meter covered the whole meter journey. This includes from meter installation, to being activated on the PMP journey, through bill comparisons and then switching to a metered bill account, either voluntarily or compulsorily switched. Each meter in this study was analysed individually.
- The property had not received a water efficiency Smarter Home Visit (SHV) or wastage repair. This was done to ensure we did not double count the benefits from smart metering with the benefits from water efficiency activity.
- The property had completed its one-year journey and moved to a metered bill prior to January 2020. This was done to ensure the impact of Covid-19 was not included in the

results. Further work is required to robustly model the changing impact of Covid-19. At the time of this analysis, we did not have a full year of data during Covid-19 and therefore it could not be reliably included in this study.

8.52 The meters included in this study were all based in London because the roll out of smart metering is under development in our Thames Valley region.

8.53 The split of property type of the smart meters included in the study is summarised in Table 8-7.

Property Type	Sample Size	Proportion
Detached	4,256	4%
Semi-detached	21,716	21%
Terrace	60,622	59%
Dwelling (mBulk)	9,644	9%
Dwelling (bulk)	3,766	4%
Unknown	3,096	3%
Total	103,100	100%

Table 8-7: Smart meter benefits study sample size

8.54 For the purposes of the smart meter benefits study, this mix of property type was deemed robust to draw conclusions about the benefits of smart metering. However, it is noted that this sample does include the following bias:

- Most smart meters are in terraced properties. Larger property types such as semi-detached and detached can make greater savings due to the number of bathrooms and garden size in these properties. A larger sample size of these properties may show average greater savings can be achieved from these property types. There is a risk we have underestimated the final benefits of smart metering as a result.
- All data was collected in London. As such, there may be implicit bias when applying findings to Thames Valley, for example in results of larger property types. Results for Thames Valley metering will be available from AMP8 activities.
- The smart meters installed to date were based on the rollout of our PMP in AMP6. We may have introduced a small bias and targeted easier to access areas and boroughs where external installs are more readily available.

8.55 For each meter, the consumption has been determined and compared before (unmeasured) and after (measured) the customer moves to a measured bill.[16] The difference between the unmeasured and measured consumption is the benefit of smart metering for that property.

8.56 The activation date of PMP is considered to determine the dates assumed to be representative of measured or unmeasured consumption values. The activation date of PMP is when the customer is formally moved onto a metered bill. This is the period where a customer has completed their one-year journey and are billed for their measured water consumption.

[16] Artesia Consulting, 2021, 'Quantifying the savings from PMP – Summary', Artesia Consulting Technical Note

8.57 It is assumed that after the activation date a customer becomes more aware of their water consumption whereas prior to this date they are behaving as they historically have as an unmeasured customer.

8.58 The unmeasured consumption is determined by looking at the first 11 days of data before the activation date of PMP.

8.59 The measured consumption is determined by looking at the first 30 days after a customer is moved to a measured bill.

8.60 We have checked these assumptions by looking at the change in the components of consumption: the customer behavioural usage and wastage at the activation date. This confirmed that the activation date is a key point in time with a change in the measured total flow. This may be related to fixes of known wastage or CSL when the customer becomes aware that they have a meter.

8.61 Unmeasured and measured consumption rates were analysed by looking at the breakdown between customer behavioural usage, wastage and CSL. This was done by first splitting the smart meter flow into continuous and variable flow. The continuous flow was then split into wastage and CSL based on our historical analysis. Continuous flow is where the flow rate does not drop below a minimum threshold consistently for fourteen days. Continuous flow on an external meter indicates the customer either has leakage or wastage within their property. Continuous flow on internally metered properties indicates internal wastage, such as leaking toilet or taps.

8.62 Since our historical analysis and assumptions favour a larger proportion towards CSL, this may introduce some bias into the smart meter study and underestimate the wastage savings we can achieve from smart metering. However, until we can prove this split is different with a larger dataset, we have retained our auditable split of wastage and CSL.

8.63 These results of this analysis are illustrated in Figure 8-5 and Figure 8-6.

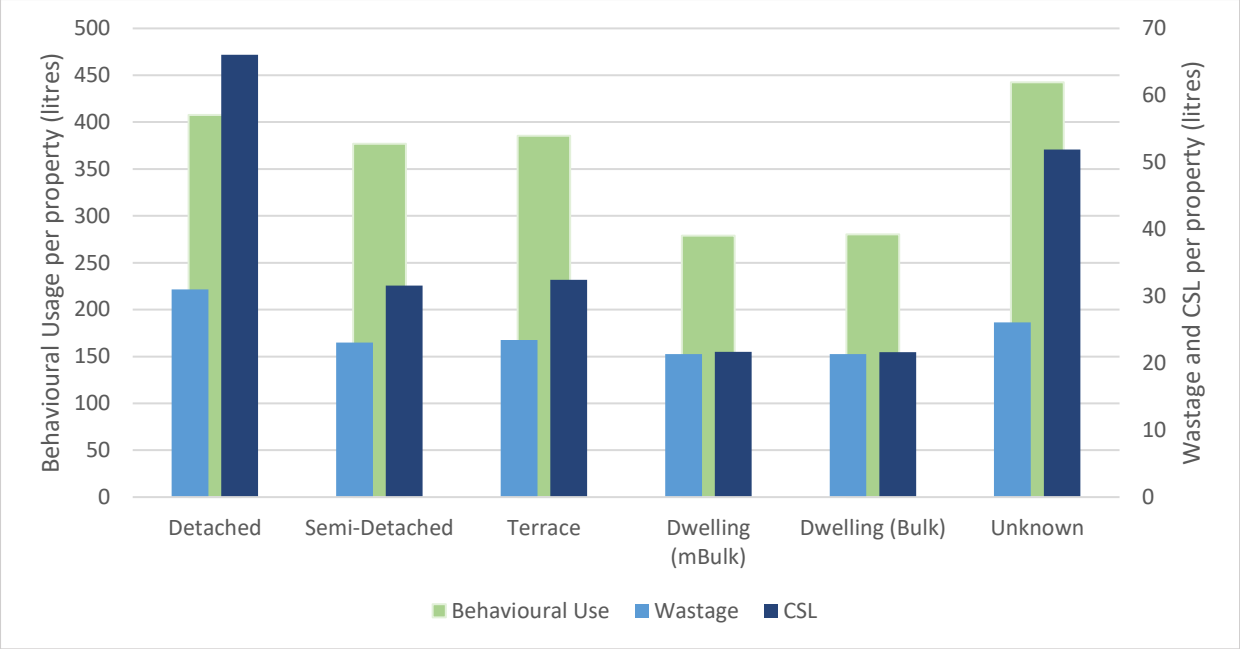

Figure 8-5: Unmeasured consumption breakdown

8.64 On average, 85% of total unmeasured consumption is due to customer behavioural use, 6% is wastage and 9% is CSL[17].

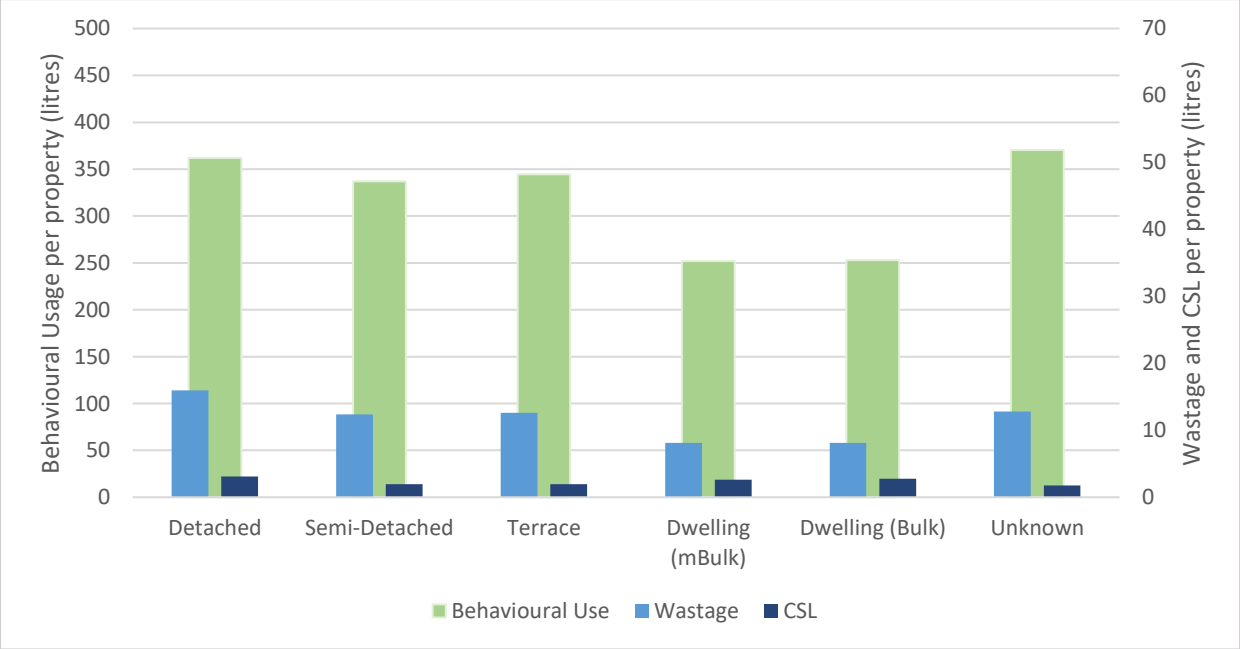

Figure 8-6: Measured consumption breakdown

8.65 In comparison, on moving to a smart meter, customers eliminate almost all their CSL, such that it represents only 1% of total measured consumption. This is due to our free CSL repair programme that we have offered customers throughout AMP6 and 7.

8.66 Both behavioural usage and wastage also decrease such that wastage is only 3% of total consumption once customers move to a metered bill.

[17] CSL associated with Dwellings in bulks and mini bulks is for external meter installations only.

8.67 The water volume reductions through behavioural usage, wastage, and CSL following a meter installation underpin the benefits case for increasing meter penetration, specially through smart meter installations.

8.68 For direct comparison with WRMP19, the remaining analysis focuses on the change in behavioural use and wastage. WRMP19 split the total consumption from metering into activities that customers undertake in response to a metered bill (behavioural use change and wastage repair), thus excluding the repair of CSL.

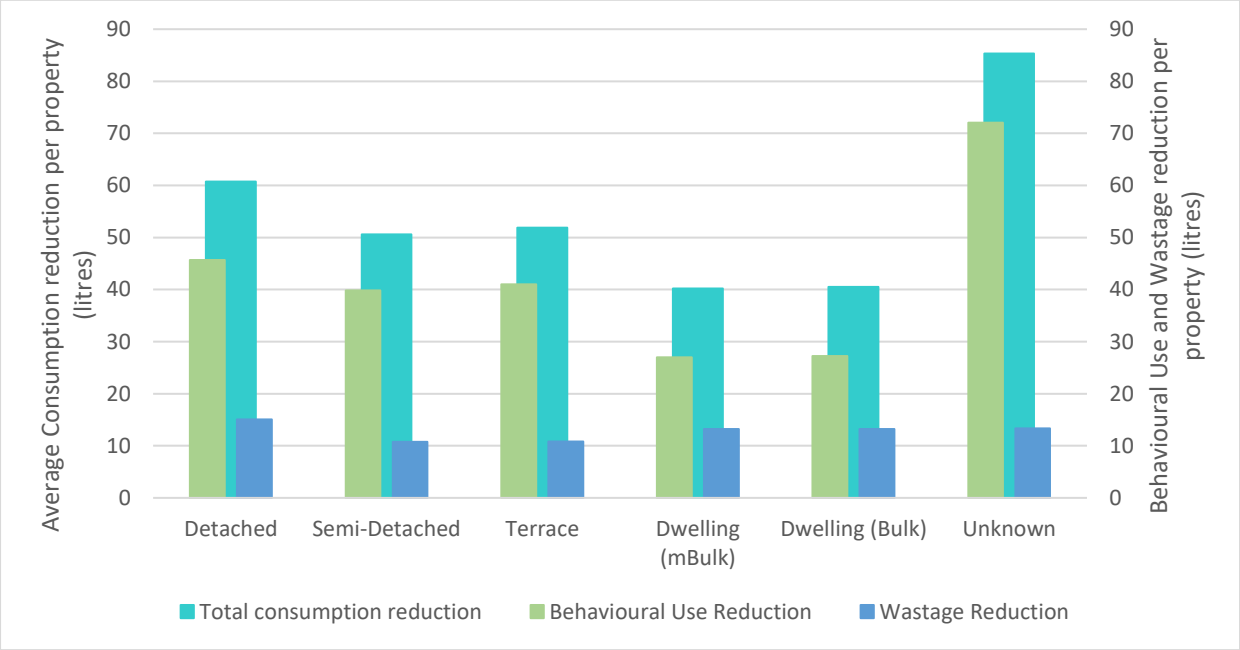

Figure 8-7: Smart metering consumption reduction (Ml/d) by property type

8.69 The total household consumption reduction from smart metering is shown in Figure 8-7. This demonstrates that the greatest daily consumption savings can be achieved from smart metering houses with detached properties saving 61 litres per property, semi-detached saving 51 litres and terraces saving 52 litres per property on average.

8.70 The larger savings associated with detached properties is likely due to the higher number of bathrooms and larger gardens associated with these properties. This is reflected in the both the greater savings from wastage and behavioural use compared to other property types.

8.71 The largest savings in the sample are associated with Unknown property types. The savings from these properties indicate that the average savings from all property types may be higher once we factor in the unknowns. This does highlight that regardless of the property type being metered, there are substantial consumption savings to be made by smart metering all properties.

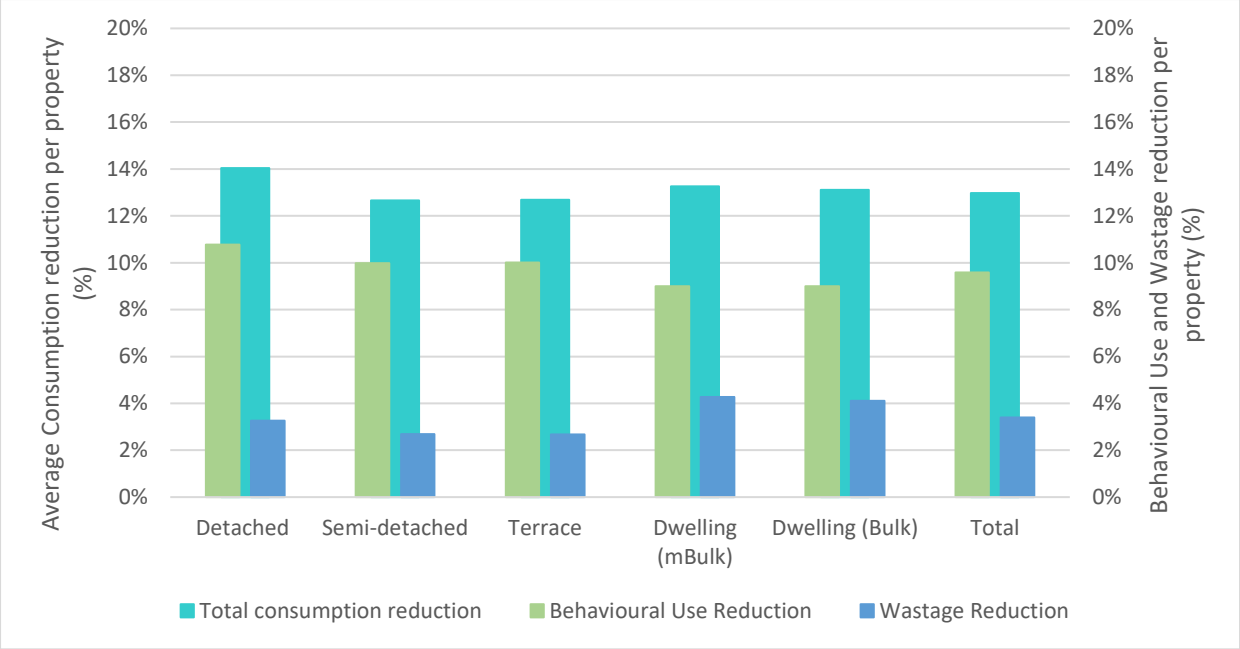

Figure 8-8: Smart metering consumption reduction (%) by property type

8.72 To provide a direct comparison to WRMP19, the figures presented in Figure 8-8 are converted to a percentage reduction from unmeasured to measured consumption.

8.73 This shows that, on average, the installation of a smart meter will result in a 13% consumption reduction per property. 10% of this saving is due to changes in behaviour and 3% is due to customer repair of wastage. Table 8-8 shows this consumption reduction benefit of PMP installations separated by property type.

Progressive Meter Installations	Variable Use + Wastage (litres)			
Property Type	Measured	Unmeasured	Savings	Savings (%)
Detached	378	439	61	13.8%
Semi-detached	349	400	51	12.6%
Terrace	357	409	52	12.7%
Flat Dwelling (SBF)	260	300	40	13.4%
Flat Dwelling (LBF)	261	302	41	13.4%
Unknown	383	469	85	18.2%
Average	**345**	**396**	**51**	**13.0%**

Table 8-8: Smart Metering Consumption Reduction from Artesia study on smart metering benefits

8.74 Although the greatest percentage reduction remains for detached properties (14%), the percentage reduction for dwellings in bulks and mini-bulks (13.3%) is higher than terrace and semi-detached houses (12.7%). This is largely due to the substantial wastage savings

made by dwellings which save over 4% by repairing their wastage compared to houses of 2.7%. We hypothesise that this is because the occupants in these dwellings are aware of the wastage because they are in the smaller property. The smaller property may also indicate a more challenging socio-economic position, so these occupants are more likely to repair the wastage to save money on their metered bill.

Metering Costs

8.75 Ofwat, Defra, the Greater London Authority (GLA) and CCW have all stated support for metering as the fairest way for customers to pay for water.

8.76 Metering also has broad customer support, recognising that it is fair to pay according to how much water is used.

8.77 Additional metering support enhancement costs have been included as below. These costs are expected to be uniform regardless of demand programme and have as such been applied consistently across each programme.

- Field investigations; street-level investigations undertaken prior to scheduling installs.
- Smart Metering Operations Centre (SMOC); enhancements to the SMOC required in order to carry out the metering programmes.
- HH and NHH reactive replacements; the enhancement element of replacement of existing smart meters.

8.78 Our WRMP demand reduction enhancement case gives full details of how the costs of our metering programme have been developed, and why these costs are efficient[18].

Installation

8.79 The cost forecasts for the AMP8 meter installation programme are based on real life experience delivering large scale smart meter installation activities throughout AMP6 and AMP7. They are based on market rates with multiple external framework providers, and efficiency opportunities gained through open tender processes, economy of scale savings, prioritisation of installations based on logistics and demand reduction benefit, and contractor negotiation.

8.80 Meter installation costs consist of:

- The cost to survey (new installations only)
- The cost to contact and engage with the customer
- The cost to install the meter chamber (bulks only)
- The cost to install the meter, including direct and fixed support costs
- The cost of the meter itself
- The cost of the Local Communications Equipment (LCE) to enable smart capability

8.81 The cost to survey and install depends on the size and position of the meter regarding whether it is in the pavement, the soft verge or within the property. The cost to install a meter internally can be more expensive than an external install due to the additional time and resources required for the customer engagement and appointment facilitation. Internal meter installations also incur additional costs due to 'no access' outcomes, when

[18] TMS28 Enhancement Case: WEMP Demand Reduction, October 2023, https://www.thameswater.co.uk/media-library/home/about-us/regulation/our-five-year-plan/pr24-2023/wrmp-demand-reduction.pdf

the customer does not provide access to the property, despite a prior appointment being made. The cost of an external meter installation is broken down to the cost to dig and install a new boundary box with the meter or to screw in a new meter where a boundary box already exists from work conducted in AMP7.

8.82 The cost to replace a basic meter with a smart meter does not require the additional cost to survey and is therefore cheaper than a PMP that requires a dig or internal installation with a survey. Replacing a basic meter with a smart meter does require linking the meter and LCE with fixed network or other communications platforms, involving work and cost over and above traditional basic-to-basic replacements. We also consider the cost to survey and consult the customer in properties that are then proven to not physically allow a meter installation. These properties are termed unmeterable.

8.83 Meter/chamber installation costs used in WRMP24 are based on actual costs from AMP7 with a 6% uplift for inflation.

8.84 Leakage-led activity is where we employ a specialist contractor to identify areas of high leakage and pinpoint BMAs which may have high levels of CSL. A bulk meter is installed, and the contractor finds and fixes the CSL. Leakage-led costs for bulk meters were based on costs for AMP6 and AMP7 activities.

8.85 For PMP and PSUP activities, we assume that 3% of installs will need funding for a CSL repair. We assume that 37% of CSL fixes are repairs to the supply pipe and 63% are replacements of the supply pipe. This is based on field data gathered throughout AMP6 and AMP7 while implementing our PMP and PSUP.

Meter Reads

8.86 The cost to read an AMI (Advanced Metering Infrastructure) meter is based on our Smart Meter Operations Centre (SMOC), Meter Data Management System (MDMS) and Customer Experience costs. The cost to install our fixed network or other smart meter communications network has been covered in AMP7. The cost to read our meters is based on the increasing number of meters installed and operating each AMP.

8.87 Our SMOC monitors the performance data from smart meters. The team has been established to recognise potential leaks at a customer's property, identify disproportionate consumption and identify where a meter has gone missing resulting in a drop in communications. In response, the SMOC team will proactively dispatch technicians to investigate meters that are not performing as expected and refer cases of suspected leakage onto our CSL repair team to facilitate a timely repair.

CSL Fixes

8.88 The life of a CSL repair is assumed to be 20 years, after which the customer supply pipe is re-laid.

8.89 The cost to repair any CSL detected is based on whether the fix involves a repair of the existing pipe or full pipe re-lay. A full pipe re-lay is more expensive than a repair but has a longer asset life.

8.90 CSL repair costs used in WRMP24 are based on actual costs from AMP7 with a 6% uplift for inflation.

Maintenance

8.91 The cost to maintain our meters is based on the asset life of a smart meter. Based on the smart meter battery life, we assume smart meters installed up to 2040 need to be replaced

every 15 years. Installs between 2040 – 2055 are assumed to have a 20-year life and installs after 2055 a 25-year life. We also assume that the cost of meter replacement and support costs decrease by 10% after 2040 and 20% after 2055 due to full smart meter penetration and technological advances.

Water Efficiency

Water Efficiency Benefits

8.92 Water Efficiency options can reduce customer behavioural usage and wastage. This applies to both household and non-household customers. Figure 8-9 illustrates where these savings occur. Water Efficiency savings occur in the home downstream of the internal stop tap. This includes pipework that extends outdoors for customers with a garden.

8.93 Change in water use behaviour refers to the changes customers make to their discretionary water use in response to one of our water efficiency options. Wastage repairs refer to the repair of wastage issues in the home, either by the customer or through one of our free water efficiency wastage repairs for toilets and taps.

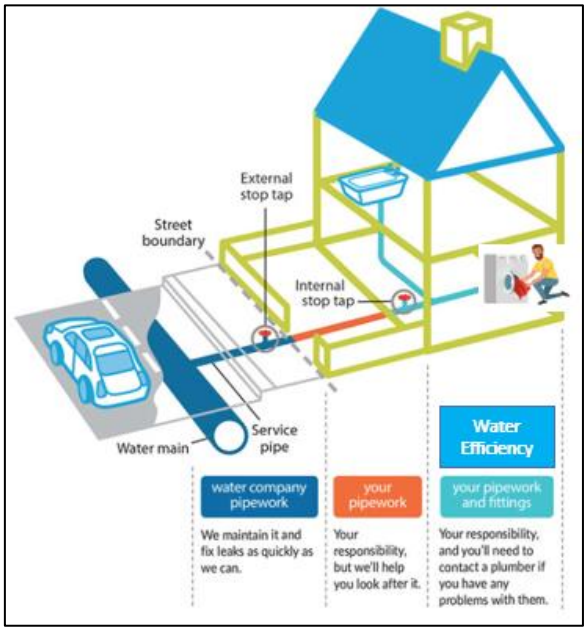

Figure 8-9: Water pipe ownership and water efficiency[15]

Leakage Reduction

Leakage Reduction Benefits

8.94 Leakage reduction is a long-term sustainable option that is achieved through innovative solutions such as advanced District Meter Area intervention (DMAi) and leakage innovation, and traditional solutions such as mains rehabilitation.

8.95 Leakage reduction can only occur when we maintain our existing level of leakage. This means we need to continually maintain our asset base to prevent asset deterioration and leakage recurrence.

8.96 To maintain our existing levels of leakage we undertake activity to reduce bursts, visible and active leaks, and deterioration on our distribution and trunk mains network. This activity is referred to as asset maintenance and will be detailed in our Price Review 2024 plan.

8.97 In WRMP24, we assume in our baseline that our existing levels of leakage are maintained through Asset Maintenance so that our leakage feasible options can achieve a leakage reduction.

8.98 Further savings from "more" active leakage control (ALC, finding and fixing leaks) are considered as part of the innovative solutions (see sections on Advanced DMA Intervention and Leakage Innovation). These solutions use techniques that are not currently in place to better identify leaks, or to perform quicker repairs.

8.99 Leakage reduction occurs in three areas, the water main, the service pipe and the customer supply pipe. In WRMP24, CSL savings are achieved through metering options (see Metering section). Leakage reduction from the distribution water main and service pipe are achieved through advanced DMAi, leakage Innovation, and mains rehabilitation. Figure 8-10 illustrates where these savings occur.

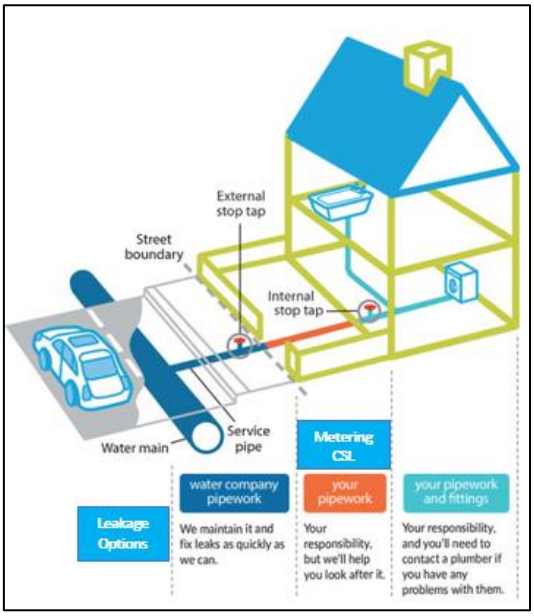

Figure 8-10: Water pipe ownership and leakage[15]

Would more leakage reduction be beneficial?

8.100 Mains rehabilitation continues to be our most expensive leakage reduction option. For this WRMP, we have considered savings from alternative options (Advanced DMA interventions, and Leakage Innovation), however in order to reach the 50% target for leakage reduction, large amounts of mains rehab will still be required.

8.101 For the analysis of mains rehab, we have considered mains which could be replaced at a sub-DMA-level, considering both the cost and the leakage savings from replacement. When constructing the potential options, sub-DMA replacement items were ordered in terms of most to least cost efficient in terms of savings/cost by our demand-side decision support tool, known as IDM. In this way, leakage reduction options required as part of our demand management programmes were given in the most cost-efficient way possible. Final costs were normalised across the company to a value of £1,261/m renewed, in line with current mains rehabilitation costs across Thames Water.

8.102 The total estimated savings possible from mains rehabilitation was around 160Ml/d, of which around 100Ml/d is targeted under either the WRMP reductions, or other capital maintenance activities. The remaining ~60Ml/d of reduction is possible but comes at

significant cost as demonstrated in Figure 8-11, which plots the cost vs benefits of the mains rehabilitation option.

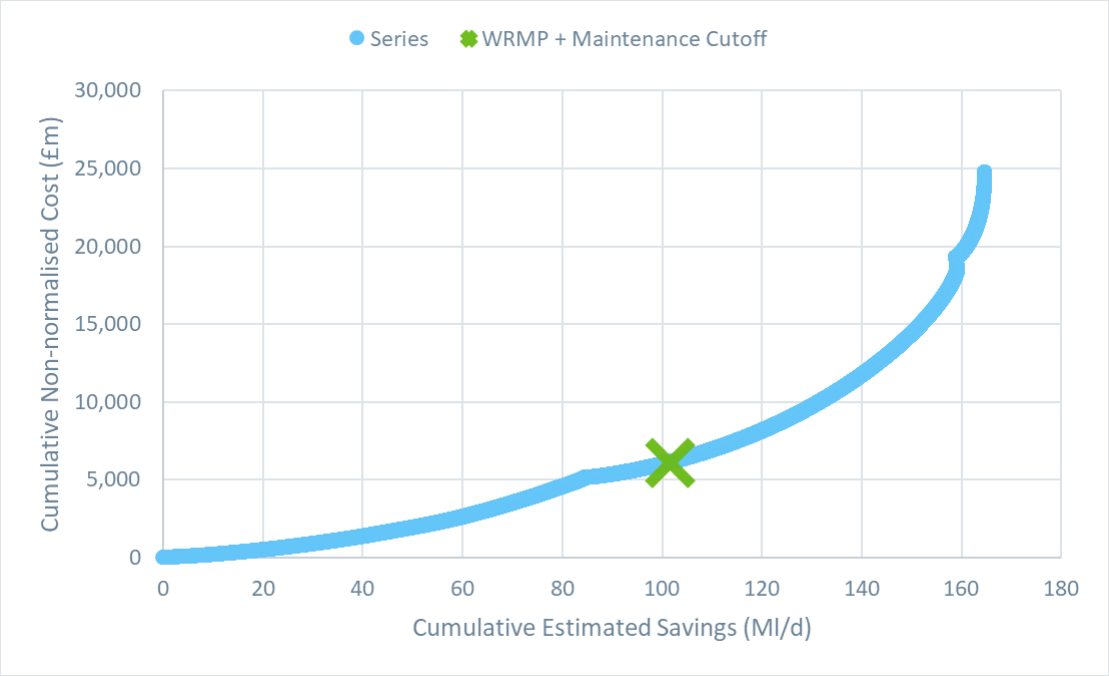

Figure 8-11: Cumulative Mains Rehabilitation Costs and Savings

8.103 When comparing mains rehabilitation activities to supply options to determine if more of the former could potentially replace the latter in the plan there are considerations to be made:

- Is there remaining potential for mains renewal, on top of what has already been planned? For some of the larger supply options (e.g. SESRO, with a total expected 149Ml/d added to DO for the 55% allocated to Thames Water), there is simply not the potential remaining from mains rehabilitation.
- Is the cost of further mains rehabilitation activities less than the cost of the supply option? For most (if not all) supply options, this is unlikely to be the case due to the high cost of mains rehabilitation. For example, the average incremental cost (noted in the data tables, Table 4) of the SESRO option is 101.51p/m3, whereas the equivalent for the entire mains rehab programme is 675.50p/m3, and the latter does not even consider that the cost to replace the supply option will be higher than the average (as per the figure above). Further, in AMP12 (2045-50), the mains rehabilitation option is forecast to deliver reduction at around £137m capex per Ml/d benefit and leakage innovation is forecast to deliver reduction at around £65m capex per Ml/d benefit; this is compared to less than £10m capex per Ml/d benefit from our SRO supply options. This demonstrates that there is such a significant gap between the cost of leakage reduction in the far future and new supply options that efficiency improvements in leakage reduction would not be sufficient to impact the optimum plan for the long term.
- Are there any other considerations that will make mains rehabilitation more valuable above and beyond a pure “cost” measure? Our consideration is that the most important measures of non-monetary value have been considered within the WRSE optimisation process, which includes for alternative metrics to compare between options to provide the best value approach.

8.104 We have considered a “high plus” demand management programme, which includes an increased mains renewal programme as one of its main differences from the high programme. Test runs were conducted for these programmes which concluded that the high-plus programme would not be chosen, for the reasons outlined above (i.e., that selection of the high-plus demand management programme is cost-prohibitive).

Feasible Options – Household Use

8.105 We have used a bottom-up approach to forecast the impact of our interventions on total reduction volumes and PCC, meaning we have used data-led evidence to quantify the maximum savings from each demand option in our programme.

8.106 Our PCC forecast includes both traditional and innovative options, as our plan requires a balance between deliverability and ambition.

8.107 Table 8-9, as with other tables provided for cost and benefit of options within this report (unless otherwise stated), refers to the high programme of demand management options. Programmes are defined and described in the section on Modelling.

Option	AMP8	AMP9	AMP10	AMP11	AMP12
HH PMP	13.4				
Metering Innovation PMP	2.0	14.0	17.4		
Metering Innovation PSUP		0.6	0.5		
Digital Engagement	8.9	13.0			
Household Innovation & Tariffs	5.2	12.7	13.7	14.7	15.0
Smarter Home Visit	3.4	0.8			
Wastage Fix	0.9	0.2			
Green Redeem	0.1	0.02			

Table 8-9: Estimated household use reductions (Ml/d, non-cumulative)

Metering

New Meter Installation

8.108 The Thames Water supply area is designated as an area of serious water stress[19], and since 2012 the Secretary of State has granted us legal powers to compulsorily meter properties. In the Water Resources Management Plans 2014 (WRMP14) and 2019 (WRMP19), we responded with our compulsory meter installation programme called the Progressive Metering Programme (PMP).

8.109 The PMP is a proactive workstream where we compulsorily meter our household unmeasured customers. It enables fairer customer billing because customers only pay for what they use, and facilitates a reduction in customer usage, internal wastage and CSL.

8.110 The PMP applies to all property types; detached, semi-detached and terrace properties and individual dwellings in mini-bulk and bulk properties.

8.111 For WRMP24, our PMP will install a digital meter which is either:

- Advanced Metering Infrastructure (AMI): commonly referred to as a 'smart meter', AMI meters send automatic reads through a secure wireless network to provide real time water consumption data. They can do this when our Local Communication Equipment (LCE)[20] and wide area network (WAN) communication system is available. Electronic readings are remotely passed from the meter to our SMOC which is responsible for the storage and analysis of our smart meter data.

[19] Environment Agency and Natural Resources Wales, 'Water stressed areas – final classification', July 2013
[20] Local Communication Equipment (LCE): Two-way communication hardware also referred to as a communication smart-point. It is wirelessly installed adjacent to the meter and enables transfer of data from the meter to our systems utilising a wide area network infrastructure.

- Automatic Meter Reading (AMR): provide a meter reading during a 'walk by' or 'drive by' reading. These meters are equipped with a short-range radio that communicates with a meter reading device. In contrast to 'Basic meters', AMR meter reads can be taken without physical access to the meter. AMR meters are referred to as 'smart enabled' as they have the capability to be switched into AMI mode when our WAN communication system becomes available in that location.

8.112 To enable complete AMI smart metering by 2025-26, we are currently extending network capacity to cover our whole supply area.

8.113 The current WAN covers 95% of London, and parts of the Thames Valley such as Reading and Guildford (Figure 8-12).

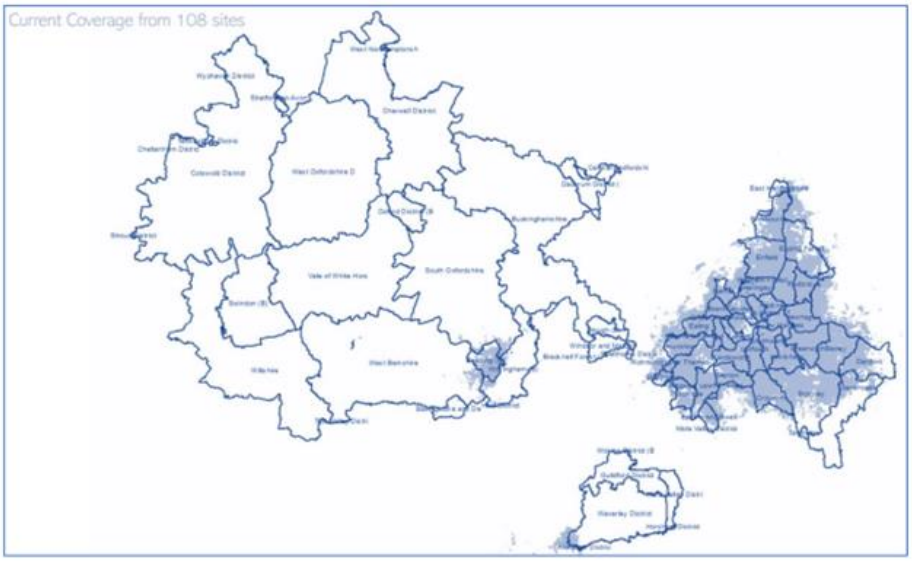

Figure 8-12: Wide Area Network in 2022

8.114 By 2025-26, we will have coverage across Thames Valley. This will enable all PMP meters to be AMI for our WRMP24. AMR meters will be installed by exception such as in the accommodation of religious or personal customer circumstances. For example, some religious communities oppose the installation of smart technology and similarly, some individuals oppose the installation of smart technology in their homes.

Benefits

Option	AMP8	AMP9	AMP10	AMP11	AMP12
HH PMP	13.4				

Table 8-10: HH PMP consumption savings (Ml/d, non-cumulative)

8.115 The sum of customer behaviour changes and wastage repairs is referred to as total household consumption reduction. The total household consumption reduction is the benefit of PMP in WRMP24. This reduction has been estimated per meter installed using the findings of the Smart Meter Benefits Study and supporting data on the property types of PMP.

8.116 For PMP, meter installations and benefits have been modelled over four years of the full five-year AMP cycles to allow commercial negotiations and scale ramp up.

Costs

Option	AMP8	AMP9	AMP10	AMP11	AMP12
HH PMP	£107.5				

Table 8-11: HH PMP costs (£m, non-cumulative)[21]

Constraints

8.117 The number of meters that can practically be installed in each water resource zone (WRZ) is referred to as the maximum deliverable volume.

8.118 The maximum deliverable volume is calculated based on three datasets:

- The number of unmeasured properties at a point in time, split by property type
- The number of these properties that are likely to be internal or external installs
- The likelihood of successfully installing a meter at that property (survey to fit ratio)

8.119 For WRMP24, we have taken the number of unmeasured properties at 2024-25. For details of our AMP7 programme see the WRMP24 Section 3 – Demand.

8.120 To calculate the maximum deliverable volume, we have applied our internal/external split data and survey-to-fit ratios.

8.121 The Internal/External split data identifies the number of unmeasured properties that will be an external installation or internal installation. An external installation is where a meter is fitted in the pavement at the stop tap position. An internal installation is where the meter is fitted at the first stop tap inside the property. In WRMP24, our maximum deliverable volume applied to internal installations only as we had targeted all our potential external installations throughout AMP6 and AMP7.

8.122 For our draft WRMP, survey-to-fit ratios were based on AMP7 data gathered from the targeting of external meters. For our revised draft WRMP however, these ratios have been determined to be unrealistically low for internally metered properties. Adjustments have been applied to AMP8 PMP and optant metering activities such that survey-to-fit ratios are more in line with data trends for surveys targeting internal meters. This represents a new survey-to-fit assumption of 70% for internal PMP installs, and 50% for internal optants. We use this information to predict the likely volume of meter installations we can achieve in the future to ensure we create a deliverable and realistic metering programme.

8.123 Properties which cannot be metered under our PMP, we have included our Metering Innovation considerations.

8.124 London and the Thames Valley regions have large volumes of housing stock that are deemed unmeterable due to a range of physical and historic factors. These include blocks of flats that have multiple inflow pipes, shared supply pipes on terraced and semi-detached homes, converted properties (e.g. past Victorian home converted to multiple flats), and blocks of flats/apartments that have communal hot water supply systems.

[21] Costs included in this section are in a 2022/23 price base without adjustments for D&PG or FSE and therefore will not directly align with our WRMP data tables or PR24 costs

Optants

8.125 Optants are meters that have been installed at the request of the customer. Customers who request a meter are typically lower water users or single occupancy dwellings who wish to minimise their bill.

8.126 The volume of Optant customers is difficult to predict and reliably model. Consequently, Optant meters are not included in the demand reduction programmes but rather included as a fixed number removed from our baseline water demand forecast. WRMP24 Section 3 – Demand details the volume of optant meters included in our WRMP24.

Bulk and Mini-bulk metering

8.127 Bulk Metering refers to the installation of a large smart meter, usually fitted to a block of flats, to detect supply pipe leakage.

8.128 There are two types of bulk metering in WRMP24, bulk metered areas and mini-bulk metered areas:

- Bulk Metered Area (BMA)
  - Feeds 25 or more properties
  - Can supply multiple buildings
  - Can have multiple supplies to the BMA
  - Involves longer and/or more complex pipework (>20m of pipe in London, >50m of pipe in Thames Valley)
  - Can included metered and unmeasured and household and non-household properties within the BMA
- Mini-Bulk Metered Area (mBMA)
  - Feeds up to 25 properties
  - Supplies one building only (with an exception for terrace houses of up to four properties)
  - Single supply to the mBMA only
  - Simple pipe work feeding multiple dwellings in one building (<20m of pipe in London, <50m of pipe in Thames Valley)
  - Can include metered and unmeasured and household and non-household properties (particularly sites with flats over a business premises) within the mBMA

8.129 The meter fitted to a BMA or mBMA for leakage detection is non-revenue. This means it will measure the water supplied but the meter will not be used for billing. Individual premises within a BMA or mBMA may have individual meters on which they are billed.

8.130 A BMA or mBMA cannot be created if supplies into the area are already metered with meters used for billing or if the area is fed from more than one DMA.

8.131 Figure 8-13 shows the decision tree to define a BMA or mBMA.

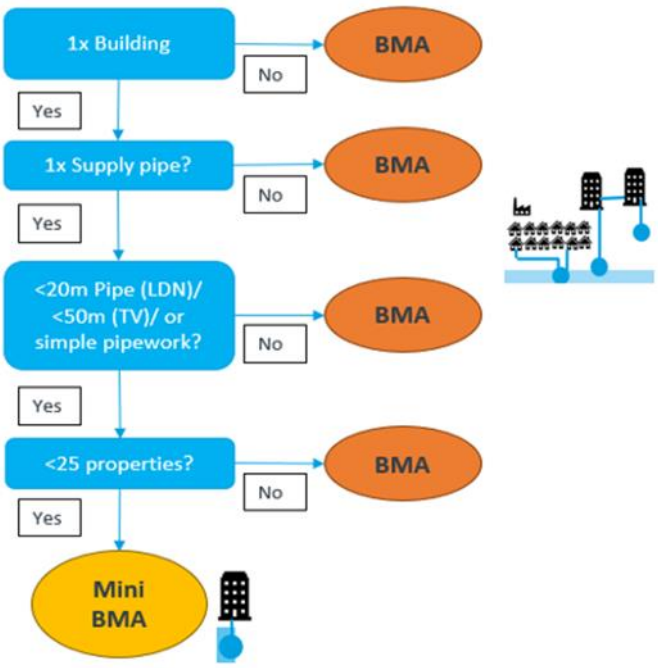

Figure 8-13: Decision tree for bulk metering

8.132 There is a leakage reduction associated with bulk metering due to the increased ability to detect leakage on the shared supply pipe.

8.133 There is not a direct household consumption reduction because non-revenue bulk metered customers are not billed from the bulk meter, and BMAs and mBMAs can include a mix of household and non-household customers. As with other metering options, bulk metering does facilitate customer consumption reduction indirectly through our water efficiency options (see Water Efficiency).

Benefits

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Bulk Meters	20.8	0.7			
Mini-Bulks Meters	1.9	2.1	1.8		

Table 8-12: Bulk and Mini-bulk CSL savings (Ml/d, non-cumulative)

8.134 The volume of CSL that can be found from bulk installations is split into Leakage-led and normal activities.

8.135 Normal activity is where we aim to install a bulk on all practical connections. We do not target leakage in that area first.

8.136 Leakage-led activity achieves a higher CSL reduction per bulk meter install than normal activity. Based on our field data from AMP7, 43% of bulk meters installed due to leakage led activity have a CSL. The CSLs repaired are also substantial with the average size of leak being 36,501 litres/day.

8.137 In comparison, only 2.8% of bulk meters installed under normal activity have a CSL. The CSLs repaired are also much smaller with the average size of leak being 5,599 litres/day.

8.138 Additionally, 2.8% of mini-bulk meters installed will have a CSL and that once that CSL is repaired it will save 1,306 litres/day.

Costs

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Bulk Meters	£15.72	£10.66			
Mini-Bulks Meters	£31.95	£37.29	£40.46		

Table 8-13: Bulk and Mini-bulk costs (£m, non-cumulative)

8.139 There are six types of cost associated with bulk and mini-bulk meters:

- Survey (bulk & mini-bulk)
- Meter chamber install (bulk)
- Meter install (bulk & mini-bulk)
- Leakage-led activities (bulk)
- CSL fixes (bulk & mini-bulk)
- Maintenance (bulk & mini-bulk)

Constraints

8.140 The maximum deliverable volume of bulks and mini bulks is calculated based on two datasets:

- The number of potential bulks and mini bulks. This number is supplied by our field teams
- The likelihood of successfully installing a bulk or mini bulk at that location (survey-to-fit ratio)

8.141 For WRMP24, we have taken the number of potential bulks expected at 2024-25. This assumes we will have undertaken our AMP7 metering programme of bulks and mini bulks. For details of our AMP7 programme see WRMP24 Section 3 – Demand.

8.142 To calculate the maximum deliverable volume, we then apply our survey-to-fit ratios to the possible bulks and mini bulks.

8.143 The survey-to-fit ratio is based on data from AMP7. This represents the number of bulk and mini bulk visits we undertook compared with our successful installations. We use this information to predict the likely total volume of bulks and mini bulks.

8.144 For the Survey to Fit ratio data and details of this calculation, see WRMP24 Appendix N – Metering.

Household Smart Meter Upgrades

8.145 Our Progressive Smart Upgrade Programme for households (HH PSUP) refers to our proactive programme to upgrade ‘basic’ meters with ‘smart’ or AMI technology meters.

8.146 A basic meter is a conventional meter with a register dial. Basic meter reads are taken by a meter reader gaining physical access to the meter and visually recording the reading. Readings are manually entered into an electronic data capture device on site. Some data capture devices have bar code readers to check records and the meter serial number.

8.147 Prior to 2016, all meter installations were ‘basic’ meters. This included our PMP, new property and asset maintenance programmes.

8.148 Between 2016 and 2020 (WRMP14), we made the decision to phase out basic meters and install ‘smart’ meters on all new properties. Our asset maintenance programme continued to replace ‘end of life’ and faulty basic meters with new basic meters due to the minimal coverage of our WAN at the time, restricting smart meter roll out.

8.149 From 2021 (WRMP19), we have used 'smart' meters on all PMP, new property and asset maintenance installs. We also commenced our HH PSUP (previously called our proactive replacement programme) to proactively reduce the total volume of basic meters in our area.

Benefits

Option	AMP8	AMP9	AMP10	AMP11	AMP12
HH PSUP	12.2	3.7			

Table 8-14: HH PSUP CSL savings (Ml/d, non-cumulative)

8.150 Household PSUP results in CSL and wastage savings driven by smart meters providing real time information on water demand at each property. It also facilitates reductions in customer consumption through our Water Efficiency options (see section on Water Efficiency).

8.151 When a meter is fitted through our PSUP, it will identify whether there is continuous flow of water on the property. For external properties, our leakage teams will visit properties with continuous flow over 5 l/hr to confirm whether it is leakage or wastage. If confirmed as a leak, our repair team will either repair or re-lay the customer supply pipe. Continuous flow on an internal meter indicates the customer has wastage within their property. We have included internal installations as part of our PSUP, this enables further savings through Digital Engagement.

8.152 To calculate the CSL benefits of PSUP, we assume on average, that each install reduces CSL by 20 litres per day. This is based on the output of our Smart Meter Benefits Study[22]. This is a reduction on the volume of CSL we assumed in WRMP19 because we are finding in practice that our average savings from CSL are lower than we predicted in the previous plan. Since WRMP19 we have upgraded our understanding of the split between CSL and Wastage, and we have found wastage makes up a higher proportion of continuous flow that we had assumed in WRMP19. This change in assumption is reflected in our lower assumptions about CSL and new ambition to wipe out wastage by 2050. Table 8-15 shows the CSL benefits of PSUP installations from Artesia's study on smart metering benefits separated by property type.

Smart Upgrades	Customer Supply Pipe Leakage (litres)			
Property Type	Smart	Dumb	Savings	Savings (%)
Detached	12	24	12	49.7%
Semi-detached	18	34	16	47.4%
Terrace	19	35	17	47.0%
Flat Dwelling (SBF)	21	49	28	57.1%
Flat Dwelling (LBF)	24	51	27	52.5%
Unknown	17	17	0	-0.3%
Average	**19**	**39**	**20**	**50.5%**

[22] Artesia Consulting, May 2022, 'Smart Metering Benefits Template_2022-05-18'

Table 8-15: Smart Metering CSL Reduction from Artesia study on smart metering benefits

8.153 There is no direct additional household consumption (behaviour change and wastage) benefit associated with PSUP. This is because we assume basic meter customers have already reduced their consumption in response to being moved to a measured bill based on basic meter reads. A greater level of understanding of PSUP demand reduction benefits will be developed through the remainder of AMP7 and throughout AMP8, through increased PSUP penetration and improved understanding of consumption trends over several years and seasons.

8.154 However, as they have previously only received basic meter reads at 6-to-12-month intervals, some customers may have outstanding wastage issues or changes in their behaviour that they could make to further reduce their consumption. Consequently, after a customer has gone through PSUP, we follow up with our Digital Engagement Programme. This programme is designed to assist customers to make further reductions in their household consumption by using their new smart meter data (see Digital Engagement).

Costs

Option	AMP8	AMP9	AMP10	AMP11	AMP12
HH PSUP	£124.79	£55.56			

Table 8-16: HH PSUP costs (£m, non-cumulative)

8.155 There are four types of cost associated with HH PSUP:

- Meter install
- Meter read
- CSL fixes
- Maintenance

Constraints

8.156 The maximum deliverable volume of PSUP is calculated based on two datasets:

- The number of basic measured properties at a point in time split by property type, and whether the meter has been installed internally or externally
- The likelihood of successfully upgrading the basic meter to a smart meter at that property

8.157 For WRMP24, we have taken the number of measured properties at 2024-25. This assumes we will have undertaken our AMP7 metering programme of PSUP. For details of our AMP7 programme see WRMP24 Section 3 – Demand.

8.158 To calculate the maximum deliverable volume, we then apply our survey-to-fit ratios to the basic meter properties at 2024-25.

8.159 The survey-to-fit ratio is based on data from AMP7. This represents the number of PSUP visits we undertook compared with our successful meter upgrades for each property type. We use this information to predict the likely total volume of PSUP. If the maximum deliverable volume is greater than one million meters, we will consult with our delivery teams and contractors to determine a deliverable and an ambitious level of metering that can be achieved each AMP. This ensures we create a deliverable and realistic metering upgrade programme.

8.160 Properties which cannot be upgraded under our PSUP, we have included our Metering Innovation considerations.

Metering Innovation

8.161 The sections on New Meter Installation and Household Smart Meter Upgrades demonstrated our maximum deliverable volume of household metering given the current deliverability and technological constraints.

8.162 However, to meet our demand reduction ambitions, driven by Defra water targets and AMP8 performance commitments, we need to go beyond what we currently see as the maximum deliverable volume of metering.

8.163 Metering Innovation has been introduced as a new option in WRMP24 to quantify our path to achieve this long-term metering ambition.

8.164 Metering Innovation has two workstreams; Metering Innovation (PMP), properties that haven't been metered following PMP and Metering Innovation (PSUP), properties that haven't been metered following PSUP.

8.165 The number of meter installations possible is currently constrained in two areas:

- No Access: properties where the customer is not available or will not provide permission for us to access their property and install a meter (either internally or externally)
- Unmeterable: properties where it is impractical or a health and safety risk to provide an installation. Examples of an unmeterable property include where:
  - More than two water meters per supply are required to calculate the consumption
  - There is a communal hot water supply
  - Substantial alterations to the pipework would be needed
  - It is unreasonably expensive to do so, defined as where the total cost exceeds a 50% uplift on the standard cost
  - The meter cannot be accessed or maintained after fitting
  - The installation would create an unacceptable health and safety risk for the technicians installing the meter or for the customer

8.166 Metering Innovation will reduce the number of No Access and Unmeterable properties in our area. We plan to do this by:

- No Access Innovation
  - Compulsorily metering properties when customers vacate or move into a property
  - Extending our access to customer support to arrange a metering install appointment. This will include improving our call centre availability and reduction in waiting time to speak to a customer centre representative
  - Extending our operating hours to offer customer metering installation appointments outside of normal working hours on weekdays and during weekends without additional charges
  - Covering a portion of the cost of reinstatement works where an external meter installation impacts a customers' driveway or garden
  - Investigating the introduction of a higher tariff for 'no access' customers
- Unmeterable Innovation

  - Employing innovative and emerging technological solutions to meter customers who are considered unmeterable. This may include the installation of new smaller meters for properties where there is limited space. Or, to employ new innovative ways to meter areas with shared hot water supplies or those which require multiple meters
  - Seeking funding approval from our regulators to increase the limit of an unreasonably expensive install from the total cost exceeding a 50% uplift on the standard cost, to the total cost exceeding an 80% uplift on the standard cost. This will substantially increase the average unit cost of metering for these installations but will enable a greater portion of unmeterable customers to become metered

- AMP8 Investment in Innovation Trials

  - The technology and approach to achieve our ambition for Metering Innovation is either emerging or is yet to be developed
  - It is critical to understand the emerging technology and approaches to metering to ensure the deliverability of Metering innovation in our plan
  - In AMP8, we will invest in trials of innovative technology and metering approaches. This will test and demonstrate the most cost-effective innovative solutions available prior to their full implementation in later AMPs

8.167 At the conclusion of our metering innovation, we expect to achieve installation of 740,000 new meters (PMP), and an additional 170,000 meter upgrades (PSUP). This will support fairness in billing across our customer base.

Benefits – PMP Innovation

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Metering Innovation PMP Consumption	2.0	14.0	17.4		
Metering Innovation PMP CSL			0.4		

Table 8-17: Metering Innovation PMP savings (Ml/d, non-cumulative)

8.168 The benefits of PMP Innovation are broken down into No Access properties and Unmeterable properties.

8.169 No Access properties achieve a household consumption reduction only as they are all internal meter installs.

8.170 Unmeterable properties achieve a household consumption reduction and CSL benefit as they include internal and external installs.

8.171 The benefits applied for household consumption are those from our Smart Meter Benefits Study where the average saving from a new smart meter install is a 13% reduction in consumption (Progressive Metering Programme).

8.172 The benefit applied for a CSL saving is also sourced from our Smart Meter Benefits Study and assumes the same saving as PSUP, that on average each meter saves 20 litres per day in CSL.

8.173 As with PMP, innovation PMP meter installations and benefits have been modelled over four years of the full five-year AMP cycles.

Benefits – PSUP Innovation

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Metering Innovation PSUP		0.6	0.5		

Table 8-18: Metering Innovation PSUP consumption savings (Ml/d, non-cumulative)

8.174 The benefits of PSUP Innovation are also broken down into No Access properties and Unmeterable properties.

8.175 However, these are all internal installs and therefore include a benefit for household consumption reduction only. This benefit will not be realised until these customers go through Digital Engagement. The cost of Digital Engagement to realise these savings in addition to Metering Innovation PSUP installation costs has been included for this option.

Costs – PMP Innovation

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Metering Innovation PMP	£5.0	£335.4	£543.9		

Table 8-19: Metering Innovation PMP costs (£m, non-cumulative)

8.176 The cost of PMP Innovation is based on the costs of PMP with an uplift of 1.5. This reflects the out of hours working and additional communication required to secure and appointment with the customer to gain access for a meter installation.

Costs – PSUP Innovation

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Metering Innovation PSUP		£88.2	£124.8		

Table 8-20: Metering Innovation PSUP costs (£m, non-cumulative)

8.177 The cost of PSUP Innovation is based on the costs of PSUP with an uplift of 2. This higher uplift is due to the internal installation programme. These are high level assumptions which pose a conservative position for our plan. They do not include potential cost efficiencies from technological advances in the future which may reduce this cost.

8.178 As has been noted in representations made on our dWRMP24, the 'metering innovation' options (both PMP and PSUP) are relatively expensive compared to the direct benefit which is anticipated. The cost of metering innovation options is of the order of £30m per Ml/d benefit, compared to £10-15m for PMP and PSUP. As discussed in relation to PMP and PSUP options, however, metering options enable other interventions, such as water efficiency interventions and tariffs, to be introduced. Maximising meter penetration is, therefore, a core part of our programme and requirement under a compulsory meter rollout, despite the higher expense of metering some unique and difficult to access properties.

Constraints – PMP Innovation

8.179 The maximum deliverable volume for PMP Innovation is calculated based on the number of unmeterable properties remaining at the conclusion of the PMP and the likelihood of successfully installing a meter at a property. These unmeterable properties are broken down into 'No Access' and 'Unmeterable' (meaning physically unmeterable) and the split of internal and external installations.

8.180 For WRMP24, we have calculated the maximum deliverable volume using the following assumptions. These have been sourced from expert judgement from technical management and our delivery teams from their experience delivering PMP and PSUP in AMP6 and 7:

- Assume we can resolve 95% of No Access properties using innovative approaches to engage with customers and facilitate access for a PMP installation
- Assume we can install meters on 90% of PMP Unmeterable External properties and 58% of PMP Unmeterable Internal properties using innovative technology

8.181 For the Internal/External Split, Fit to Install ratio data and details of this calculation, see Appendix N – Metering.

Constraints – PSUP Innovation

8.182 The maximum deliverable volume for PSUP Innovation is calculated based on the number of unmeterable properties remaining at the conclusion of the PSUP and the likelihood of successfully installing a meter at a property. These unmeterable properties are broken down into 'No Access' and 'Unmeterable' (meaning physically unmeterable). These are all internal installs.

8.183 For WRMP24, we have calculated the maximum deliverable volume using the following assumptions. These have been sourced from expert judgement from technical management and our delivery teams from their experience delivering PMP and PSUP in AMP6 and 7:

- Assume we can resolve 95% of No Access properties using innovative approaches to engage with customers and facilitate access for a PSUP installation
- Assume we can install meters on 95% of PSUP Unmeterable Internal properties using innovative technology

8.184 For the fit-to-install ratio and details of this calculation, see Appendix N – Metering.

Water Efficiency

Digital Engagement

8.185 Digital Engagement is a new feasible option for WRMP24. It will provide smart metered customers with continuous access to their own water consumption data. It will also enable new proactive and regular digital engagement to 'nudge' behavioural change improvements.

8.186 Presently, all smart metered customers can see their consumption information through their online account (Online Account Management – OAM) on the Thames Water website. Customers can view their consumption information in different time periods e.g. hourly, daily, weekly, or monthly. The online graphics also highlight any continuous flows being recorded through the meter (e.g. leaky toilets, taps, and showers). This online resource quantifies consumption and continuous flow in litres and projected bill impacts, which aims to assist the customer make simple water saving behavioural changes or wastage self-fixes.

8.187 Presently, it is our policy to provide household consumption data to customers where available on request. Smart meter customers can request their historic and/or ongoing consumption data through our Providing Digital Media Data service. Basic meter customers can request to see their historic meter reads.

8.188 We will create a digital engagement portal to enable automated and proactive customer engagement to drive more customer self-fixing of wastage and CSL, plus enhance the demand reductions made through behavioural changes across a larger proportion of the smart metered customer base. This enhanced digital portal will provide more bespoke

functionality linking water use to forecasted bills and bill savings, plus potential innovative tariffs.

8.189 We envisage the digital portal will evolve into digital portal systems being used within the gas and electricity industry to drive greater behavioural change and energy demand reductions. Where, together with a smart meter, customers can use an online web-app portal that quickly, easily and proactively communicates consumption information and water efficiency advice.

8.190 To assist customers with the interpretation of their smart meter data, Digital Engagement will also provide data assessment and advice. This will be an option which can be selected as part of the portal.

8.191 Digital engagement advice on the portal will:

- Identify which proportion of consumption may be a leak or internal wastage issue
- Identify peak periods of behavioural usage and recommend water saving tips
- Provide context of a customers' consumption impact on the environment and provide context for the environmental benefits for water saved
- Provide advice to find and fix leakage or wastage issues within the home
- Encourage customers to maintain their previous water savings by highlighting any subsequent increase
- Alert customers when they are entering the 'high use' category of consumption
- Provide consumption information, forecasted bill impacts and water savings advice, linked to potential innovative future tariff structures

8.192 Digital Engagement is critical to engage a wider proportion of our customers in the long term in a cost efficient and effective manner.

Benefits

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Digital Engagement	8.9	13.0			

Table 8-21: Digital Engagement consumption savings (Ml/d, non-cumulative)

8.193 We have assumed that with Digital Engagement, customers will reduce their behavioural use and therefore their overall consumption following PSUP. We have based these savings on Anglian Water's smart meter study which showed PSUP resulting in 3% reduction in measured consumption. Without access to the detail of this study, we have been conservative and applied two thirds of this value, or 2% reduction to basic meter measured consumption. This assumes customers will still make the wastage savings but also greatly reduce their behaviour driven use in response to Digital Engagement.

8.194 Digital Engagement is critical to engage a wider proportion of our customers in the long-term in a cost efficient and effective manner. It is a key option for meeting ambitions for PCC reduction and wastage reduction.

Costs

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Digital Engagement	£0.66	£1.73			

Table 8-22: Digital Engagement costs (£m, non-cumulative)

8.195 The cost of Digital Engagement is based on three costs:

- The original set up cost. This is a one-off cost incurred in AMP8
- The annual IT contingency cost. This is a reoccurring cost
- Ongoing annual fee costs. These are calculated based on the number of expected participants engaged in Digital Engagement

Household Innovation and Tariffs

8.196 Household Innovation and Tariffs encompasses our innovative household activity and future tariffs implementation.

8.197 We have six potential solutions within this demand option, half of which are new for WRMP24. The critical solution is the first one, AMP8 water efficiency innovation trials, as the viability and practicality of the other innovation solutions relies on AMP8 investment in these trials.

AMP8 Water Efficiency Innovation Trials

8.198 The technology and approach to reduce household consumption through innovation is either emerging or yet to be developed.

8.199 In AMP8, we will invest in trials and work with providers of emerging approaches and technology, such as flow regulators and controllers, to test and demonstrate the most cost efficient and viable innovative solutions available to achieve long-term, sustainable reductions in household consumption.

8.200 Due to our commitment to continue to promote and achieve efficient use of water, we will look to further investigate non-potable solutions in AMP8 as a key milestone to achieve our 2050 vision.

Wipe out most Wastage

8.201 Our smart meter data (PMP) has shown that a greater proportion of consumption is wastage compared with the volume assumed in WRMP19. Using smart meter data to improve wastage identification, our on-ground water efficiency initiatives and enhanced digital engagement activities will have an increased focus on targeting continuous flow.

8.202 The combined volume of water lost through continuous flow, needs to form a significant part of the overall demand reduction targets. Maximising the amount of continuous flow that is eliminated from the total DI is a critical priority for Thames Water from AMP8 onwards.

8.203 This means that, even after we have completed our PMP, SHVs, Wastage Fixes and conducted Digital Engagement, some customers will still have internal wastage issues. This solution is to find innovative ways to understand and approach these customers to repair their wastage issues (Figure 8-14).

8.204 During AMP7 we have been delivering our ‘Smart CSL’ project which involves using customers smart meters to identify continuous flow, alerting the customer to the potential wastage or leakage with a letter and tracking change in the continuous flow. This has seen a significant proportion of customers ‘self repair’ their internal continuous flow (wastage) and deliver a demand reduction. We intend to continue and develop this work in AMP8 and onwards.

Figure 8-14: Customer wastage fix campaign

Non-Potable Water Supplies

8.205 Non-potable water is water that is not of drinking water quality, but that can be used for other purposes such as toilet flushing, laundry, and garden watering to reduce the total demand on potable supply.

8.206 In WRMP24, we have considered schemes which are a combination of rainwater harvesting, stormwater harvesting and greywater recycling.

8.207 We are engaging with Government on consultations relating to future changes to Building Regulations, standards, and planning requirements, which have the potential to increase the requirement and volume of non-potable water provision for new development.

8.208 We have recently launched an industry first Environmental Incentive for developers which offers a financial driver to improving the performance of basic water fittings and appliances, plus introduce either rainwater capture of greywater reuse technologies within the design and development. This incentive scheme is available to all residential development in the Thames Water supply area, has informed Ofwat's recent *Environmental incentives to support sustainable new homes* consultation[23].

Water Efficiency on Bulk Metered Areas (BMAs) and mini-Bulk Metered Areas (mBMAs, new)

8.209 BMAs and mBMAs may be revenue or non-revenue.

8.210 Revenue BMAs meter the supply to a multi occupancy building for the purposes of billing the building landlord or managing agent. We do not have meters installed on individual premises within that building.

8.211 Non-revenue BMAs are smart metered for leakage detection and may include individually metered dwellings within the BMA.

8.212 Water efficiency within revenue and non-revenue BMAs involves conducting an SHV and, where required, a wastage repair on dwellings. This solution will specifically focus on those dwellings without a meter. This is a new option for WRMP24 regarding revenue BMAs.

Water Efficiency Media campaigns

8.213 We conduct both 'always-on' customer engagement and time or geographic marketing/media campaigns. These initiatives aim to increase customer awareness about

[23] https://www.ofwat.gov.uk/consultation/consultation-on-environmental-incentives-to-support-sustainable-new-homes/

water resource situations and increase demand reduction activity through changes to household and business water use practices.

8.214 Intensive area-based marketing/media campaigns are designed to raise awareness about water resources and water efficiency solutions in specific locations throughout our supply area. These campaigns can be proactive to reduce a forecasted water resource risk, or reactive in response to local incident (e.g. supply-demand challenge within a specific WRZ) or large-scale climate event (e.g. official drought, Temporary Hosepipe Ban).

8.215 In WRMP19 these were designed with overarching messages that congratulated specific areas for saving water.

8.216 In WRMP24, we revisit these campaigns to provide more focus to link water savings with environmental value and protection in the local area and include the promotion of local activities to help save water.

8.217 Marketing and media campaigns in the shorter-term will raise awareness of all Water Efficiency activity and assist to increase the take up of our specific water saving initiatives.

8.218 Marketing campaigns and media outreach aims to reduce consumption, however it can be difficult to accurately measure specific volumetric changes in total demand from these engagement activities, due to other external factors also contributing to water use/savings over the same period of time or geography e.g. changes to temperature, rainfall, holiday periods, population and commuter movements. These external factors create 'noise' within the analysis of water demand results, which impacts the ability to accurately measure the cost-benefit of customer engagement and marketing/media activities.

8.219 In AMP8 we will identify how we should communicate the introduction of water labelling and factor this into in our Water Efficiency Media campaigns.

New Water Efficiency Innovation

8.220 Although we have an indication of the types of future household innovation, there are solutions that are yet to be conceptualised, tested and made available to market.

8.221 Our new water efficiency innovation category includes these potential options and makes an allowance in our plan for solutions that will be discovered and developed in the future.

8.222 These innovation categories could include new water device technologies, new approaches to customer engagement and IT platforms, working with developers and housing providers to improve the performance of building stock, plus working with policy makers to drive demand reduction change across a wider audience.

8.223 We will look to work with third parties, such as companies promoting innovative water efficiency solutions and NGOs such as Waterwise to drive forward the innovation and policy agenda on water efficiency.

Household Tariffs

8.224 Tariff or pricing controls have potential to be an effective tool for demand reduction if the water rate structures contain strong incentives to conserve water. This view is supported by behavioural economic theory which indicates consumers may respond to economic incentives by changing their behaviour to maximise their economic self-interest.

8.225 Tariff charging to encourage water conservation can be implemented by reforming water rates, introducing surcharges, or establishing penalties to deter high water or wasteful water practices.

8.226 In WRMP24, we plan to undertake a trial of an innovative tariff structure on smart metered households. Our aim will be to test a rising-block tariff against affordability and demand reduction performance objectives. Hourly consumption data from smart meters will enable more accurate monitoring of daily usage against different volume and tariff thresholds and enable more regular customer engagement to facilitate greater behavioural change and water savings outcomes.

8.227 The objective will be to reward efficient consumption levels with lower bills, whilst incentivising households that are high users, due to high variable consumption and/or continuous flows, to reduce their water demand through high tariff rates linked to high consumption thresholds.

8.228 The specific price and consumption thresholds of the pilot tariff have yet to be determined. An independent advisory group will be established to assist the development and testing of the innovative tariff pilot with customers.

8.229 We will use the insight gained from our innovative tariff trial to inform future household tariffs for all customers, with a view to implement tariff structure changes to our increasing smart meter customer base inside of AMP8.

High Use Targeting

8.230 A key output of our smart metering programme is the identification of large water consumers. High usage is found to be a mix of excessive variable or discretionary water use (i.e. behaviours, fixtures, appliances) and continuous flow (internal wastage and CSL). Reducing the number of high users and reducing the average usage across the entire customer base, are essential actions against PCC and national water target agendas.

8.231 High user targeting of household properties has been considered as part of our Household Innovation and Tariffs policy for WRMP24. Savings to be made from targeting measures have been investigated through a study carried out by Artesia[24].

8.232 This study details a number of recommendations for the identification and targeting of high water users using metering data and estimates high-level savings that could potentially be saved from targeting.

8.233 Estimates for variable and continuous flow on measured household properties have been made using hourly flow meter data. Properties have been grouped into one of four groups based on the magnitude of the continuous flow element, and summary statistics of both variable and continuous flow have been determined for these groups.

8.234 From this, Artesia have inferred a high-level estimate of how much could be saved from moving a customer from one high-use group to a lower use group.

> *"The estimations show that there is a potential to reduce household consumption by between 40 and 65 Ml/d through targeting the top 10% of high users to eliminate continuous flows and reduce variable use."*

8.235 A number of our other activities, especially those contained within the Household Innovation and Tariffs option are also expected to make savings into continuous flow and variable use. Household water savings that can be made are expected to disproportionately affect high use properties due to the higher reductions available. As

[24] Artesia, 2023, 'Thames Water High users study part II: Executive Summary'

such, we need to be careful with double-counting expectations around the 40 to 65 Ml/d value.

8.236 Customers in this study who voluntarily moved to a metered bill reduced their PCC below customers who were automatically moved to a metered bill. This supports our Digital Engagement and Household Innovation demand options to ensure greater reductions in PCC.

8.237 Our SHV programme has already shifted to focus on high users. This change has resulted in a doubling of measured water savings per household visit. Both water efficiency on-ground programmes and proactive digital engagement activities, will continue to utilise smart meter data to help target future demand reduction interventions.

Benefits

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Household Innovation & Tariffs	5.2	12.7	13.7	14.7	15.0

Table 8-23: Household innovation & tariffs consumption savings (Ml/d, non-cumulative)

8.238 The benefit of household innovation and tariffs has been estimated based on technical expert assumption and the results of our smart meter benefits study.

8.239 Our smart meter benefits study showed that customers measured by a smart meter still consume a significant volume of water from their behavioural use. They also still have a volume of wastage in the home (Figure 8-15).

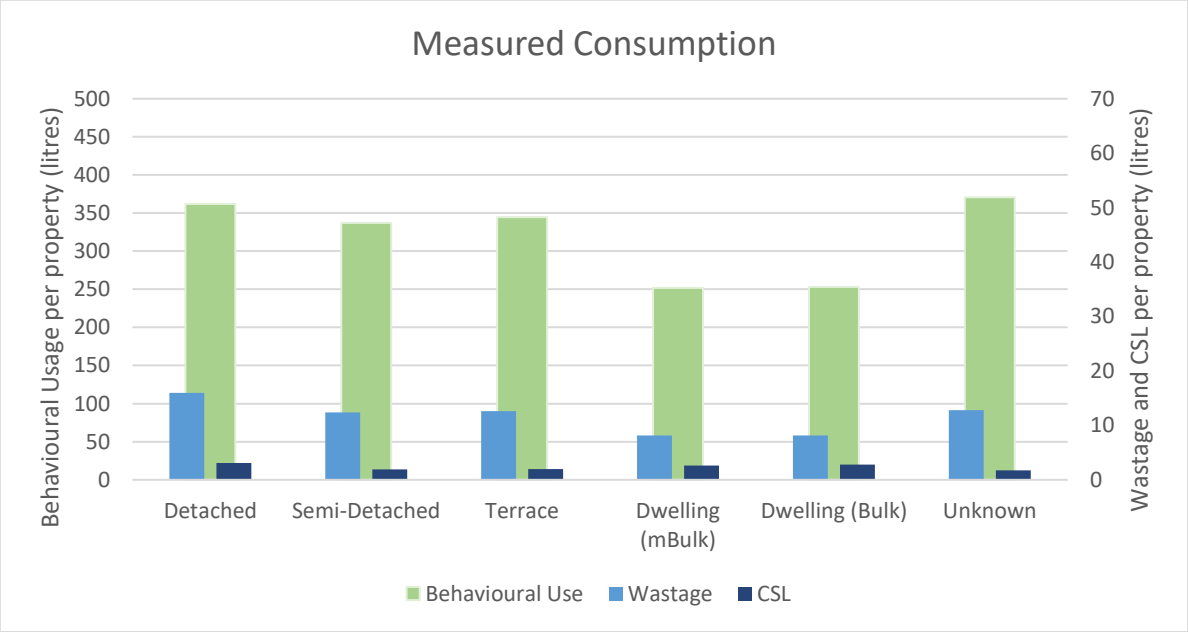

Figure 8-15: Measured Consumption from smart meter benefits study

8.240 Our assessment of the volume that can be saved from household innovation and tariffs assumes that customers can reduce their behavioural use, especially in response to tariffs. For example, a measured terraced property consumes 345 litres per day of water from behavioural use and 13 litres per day in wastage. This volume could be reduced by almost eliminating the wastage and making some more personal changes to save a further 10 – 30 litres per day per terraced property.

8.241 It must be noted that the figures quoted here assume these customers have had no other water efficiency activity applied. Once a measured customer receives an SHV or wastage repair their average behavioural use and wastage volumes will be less than is presented in Figure 8-15.

8.242 We have been careful to distinguish the household innovation and tariffs options from our metering and water efficiency options, so that we have not double counted savings. We have been ambitious in our PCC reductions for this option, but we also have planned how we can achieve these savings, are not wholly reliant on solutions which have not been developed yet, and will closely monitor actual demand reductions delivered via meter data throughout any innovation or tariff activity.

8.243 Consumption benefits have been increased in our AMP11 and AMP12 estimations, when compared to our dWRMP24 plan. This represents further 7.2 Ml/d and 10 Ml/d reduction in HH consumption compared to figures for AMP11 and AMP12, respectively. It is anticipated that the continued research and final application of the high use targeting as laid out in Artesia's high use study[24] will contribute to these reductions.

Costs

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Household Innovation & Tariffs	£26.04	£69.63	£82.50	£103.78	£114.58

Table 8-24: Household innovation & tariffs costs (£m, non-cumulative)

8.244 Household innovation and tariffs options as described above have been group together, and had high-level assumptions placed on them for cost as follows:

- Starting in AMP8 at £5m per Ml/d saved, the base cost of activities grows by £0.5m each AMP (up to £7m in AMP12)
- Maintenance on these activities begins in AMP10, with a 10-year delay (i.e. maintenance for AMP7 activities is performed in AMP9
- Maintenance costs are 10% of the cost per Ml/d for the AMP in which the maintenance is undertaken in

Smarter Home Visits

8.245 The foundation of the SHV option is free home visits by our qualified staff to install water saving devices and provide personalised water saving advice to households. It includes an app which our advisors use to produce a tailored water savings report for every customer. This report helps customers to quantify their potential water, energy, and monetary savings from changing their water use behaviour in the home. SHVs are the most intensive and face-to-face communication we have with our customers about water use.

8.246 SHVs are offered to customers' who are smart metered through our PMP, PSUP or Optant programmes.

8.247 In WRMP19, we also offered SHVs to unmeasured and basic metered properties. In WRMP24 the volume of unmeasured properties has drastically reduced as we approach the conclusion of our PMP and complete the majority of our PSUP installs in AMP8.

8.248 Through AMP6 and AMP7, our approach has been to offer SHVs to newly smart metred households, irrespective of their average daily consumption level. Following the analysis

of both household usage and demand reduction amounts from SHV activities, we have changed the delivery programme to focus on and prioritise high usage households.

8.249 In revised draft WRMP24 we intended to offer SHVs to 'high' and 'normal' water using households. In our final WRMP24 we have changed to specifically target high water using households to maximise demand reduction, bill reductions for customers and PCC outcomes.

Greenredeem

8.250 Greenredeem is a scheme whereby smart metered customers are incentivised through non-financial offers to be more efficient with their water consumption.

8.251 Greenredeem aims to influence customer behaviour by awarding points that can be exchanged for money off vouchers, charity donations, prize draw entries and days out. We provide water reduction targets for customers based on their current usage and award points that may differ depending on whether they can reach their water saving target, whether they sustain the reduction in water usage and whether they exceed their target.

8.252 It is assumed that 22% of SHVs will result in a Greenredeem sign up. This is based on our data from AMP7 experience. Of those who sign up a 3% reduction in household consumption is assumed.

8.253 Our AMP8 activity aims to increase the proportion of smart metered customers that register with Greenredeem, and maximise the potential demand reductions from smart meter investment and data analysis.

8.254 The cost of greenredeem is based on the number of properties who sign up and a flat unit rate per year.

Wastage Fix

8.255 Wastage Fixes are offered to customers following an SHV if they are found they have a leaking toilet or tap.

8.256 The number of wastage fixes is based on the uptake rate. It is found that around 10% of SHVs will identify the need for a wastage repair. Of these:

- 72% are leaking toilets
- 14% are leaking taps
- 14% are smaller leaks that are not claimed under our wastage fixes demand option

8.257 The average saving achieved from these wastage fixes, as measured through smart meter data, is:

- Leaking toilet repair = 234 litres per day
- Leaking taps repair = 136 litres per day

8.258 These figures are based on the analysis of data from over 12,000 properties who received a water efficiency wastage fix over the latter six-month period of 2021-22.

8.259 In comparison with WRMP19, the benefits assumed from a leaking toilet have slightly increased. In WRMP19, we assumed toilet repair saved 212 litres per day.

8.260 The cost of wastage repair is based on the unit rate per repair. This is based on contractor quotes for 2022-23 and assumes a rate increase in labour and materials.

Benefits

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Smarter Home Visits	3.4	0.8			
Green Redeem	0.1	0.02			
Wastage Fix	0.9	0.2			

Table 8-25: Smarter home visits consumption savings (Ml/d, non-cumulative)

8.261 SHVs are offered to high-use customers metered on the PMP and PSUP programmes. The proportion of high users is based on our AMP7 data analysis and includes:

- High users from PMP = 29.39%
- High users from Optants = 10.73%
- High users from PSUP = 20.40%

8.262 Not all metered customers will take up the offer of an SHV. We are using an assumption of an uptake rate of 21.67%. This is halfway between our current AMP7 uptake rate of 13.33% and our future aspirational rate of 30%.

8.263 The benefit of an SHV is the same for all three workstreams, PMP, Optants and PSUP. The assumed saving in customer behavioural change from an SHV is:

- High Users = 70.5 litres per day
- Normal users = 37.94 litres per day

8.264 These figures are based on the analysis of 241,345 properties who received an SHV between 2019 and 2021.

8.265 In WRMP19, we assumed each SHV saved 37 litres per day. In WRMP19 we did not target high users', so this figure is comparable to our WRMP24 normal users saving which is within the same range. The consistency between our WRMP19 and WRMP24 assessments give us confidence that these savings are accurate and reliable.

Costs

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Smarter Home Visits	£5.1	£2.02			
Green Redeem	£0.04	£0.02			
Wastage Fix	£0.48	£0.22			

Table 8-26: Smarter home visits costs (£m, non-cumulative)

8.266 The cost of an SHV is based on the unit rate per visit. This is based on contractor quotes for 2022-23.

Government Led Demand Reduction

8.267 Government led interventions are a category of household consumption savings where potential government policies would result in changes to the volume of water being used through initiative such as water labelling and minimum standards.

8.268 WRSE have set out a range of possible government led scenarios along with timings in their government demand savings document. The policies are designed to represent introduction of combinations of the following:

- Water labelling; a mandatory scheme to require water-using devices to label usage rates to inform customers and through this encourage water saving

- Water standards for water fittings
- Building regulations; regulation to ensure new build properties are water efficient with regards to devices, possibly including further measures such as the installation of water butts or grey water reuse where possible
- Further government water efficient campaigns to promote water efficiency

8.269 The approach set out by WRSE groups these activities into three levels of interventions by the government resulting in either a low, medium, or high level of water efficiency reductions at a per person level.

8.270 As our supply area is an area of serious water stress it was appropriate to understand how the combination of government interventions and our own demand management programmes could drive PCC down within the region and support the ambition of achieving an average 110 l/p/d across all five regions by 2050 as set out in the WRMP directions.

8.271 Achieving the government national water targets and long-term demand reduction performance commitments such as PCC and Business Demand will be reliant on the government led demand reduction actions. Water company-led activities such as smart metering and water efficiency, will form a key part of the total demand reduction agenda, but will not deliver the national targets alone.

8.272 Table 8-27 below sets out the different government interventions that have been modelled and summarises the impact each of the policies have on PCC. Further information has been provided by WRSE for the draft plan[25], and a revised version will be published to accompany the final WRSE regional plan.

8.273 The different scenarios are built up from underlying policies (all benefits are profiled linearly over time, from 0 l/h/d benefit in the year the profile is introduced):

- Low - Water labelling without minimum standards – 6 l/h/d benefit 15 years after policy introduced.
- Medium – Introduction of minimum standards on white goods – additional 6 l/h/d benefit 15 years after policy introduced.
- High – Full government support including optimistic estimate for water labelling and minimum standards on white goods, in addition to introduction of buildings regulations changes – additional 12 l/h/d 15 years after policy introduced.

8.274 The C+ programme assumes the “low” profile from 2025 onwards, with the “medium” savings introduced from 2030 onwards and the “high” savings introduced from 2035 onwards. Table 8-28 below shows the benefits from different policies in the C+ profile.

Gov-Led Policy	2024/25	2029/30	2034/35	2037/38	2039/40	2044/45	2049/50	2074/75
A	0	2	4	5.2	6	6	6	12
B	0	2	4	5.2	6	6	6	12*
C	0	2	4	5.2	6	6	6	24
C+	0	2	6	10.8	14	20	24	24
C++	0	3	9	14.4	18	24	24	24

[25] WRSE, Nov 2022, Government demand management savings and implementation profiles, Version 2.0

Gov-Led Policy	2024/25	2029/30	2034/35	2037/38	2039/40	2044/45	2049/50	2074/75
D	0	2	4	5.2	6	8	10	12
E	0	2	4	6.4	8	10	12	24
F	0	0	2	3.2	4	8	10	12
G	0	0	2	3.2	4	10	14	18
H	0	2	4	5.2	6	6	6	6

Table 8-27: Government led policy profiles (l/head/d)

**Note that policy B has a further intervention post 2074/75, differentiating it from policy A.*

	AR30	AR35	AR40	AR45	AR50
Water labelling (l/h/d)	2	4	6	6	6
White Goods Standards (l/h/d)	0	2	4	6	6
Buildings regs (l/h/d)	0	0	4	8	12
Total	2	6	14	20	24

Table 8-28: Benefits from different policies in government-led C+ profile

8.275 As is described in Section 10 of our WRMP (Programme Appraisal), we have investigated the implications of different PCC reductions being delivered by government action (through the scenarios A-H), in terms of required investment in supply-side schemes. We have also examined the PCC outcome in 2050, in comparison with the government's 110 l/h/d by 2050 target. The Government C+ scenario was chosen to be included within the primary investment modelling runs and has been discussed with regulators as a plausible scenario, which would result in achievement of the 110 l/h/d target, to explore in the WRSE regional plan. All water companies within WRSE are planning on the basis of the Government C+ scenario. Since February 2022 WRSE have continued to consult on other potential scenarios and are aware that there are various alternative publications which set out potential ways forward. At this time Defra are working with Water UK on development of these options.

8.276 For the draft WRMP, within the Household Water Use chapter of WRMP24 Section 3 – Demand, we explained our inclusion of a "Trend Adjustment Factor" accounting for increasing efficiency of water using devices that has been observed over time. We first used this trend adjustment within our WRMP19 and carried it into our dWRMP24 baseline forecasts, this was done prior to WRSE exploring Government led demand savings. As the water labelling component of government led interventions would also work by improving device efficiency it is important that we do not double-count potential water use savings. As such, for the revised draft, we have removed this trend adjustment from our baseline (as required in the recent updates to the Water Resources Planning Guideline), wholly accounting for this in the Government led policies.

8.277 This leads to a significant difference in the government led policy profiles (Table 8-27), compared with our draft WRMP. It also means that we are now aligned with other WRSE companies in terms of how we classify this trend adjustment.

8.278 Government-led actions as laid out by WRSE are required in order to achieve the government ambition of 110 l/h/d PCC.

Feasible Options – Business Use

8.279 For our business use reduction options we have considered both traditional options such as NHH metering replacements and Smart Business Visits (SBVs), as well as more innovative options.

Option	AMP8	AMP9	AMP10	AMP11	AMP12
NHH PSUP Consumption	1.6	0			
Smarter Business Visits	23.4	15.0	8.0	6.0	4.0
NHH Continuous Flow Targeting	4.5	6.0	6.0	4.0	3.0
NHH Retailer Activity	0.5	1.0	1.5	2.0	2.0
NHH Tariffs			1.0	2.0	3.0

Table 8-29: Estimated non-household use reductions (Ml/d, non-cumulative)

Metering

New Meter Installation

8.280 Progressive metering for NHH properties reached its conclusion prior to WRMP24.

8.281 In our baseline (2021/22) demand forecast, the proportion of metered NHH properties is roughly 90% for most WRZs (80% for London).

WRZ	Measured	Unmeasured	% Measured
London	113.2	28.2	80%
SWOX	17.8	1.4	93%
SWA	8.8	0.6	93%
Guildford	2.8	0.3	90%
Kennet Valley	5.7	0.6	91%
Henley	0.7	0.1	89%
Company	148.9	31.2	83%

Table 8-30: Base year (2021/22) NHH properties (000's)

8.282 Unlike HH metering, metering innovation is not being considered to specifically target the unmeterable NHH properties at this time.

8.283 We have 6,611 Legacy Long Unread NHH meters (June 2023). With our smart meter replacement programme, we will continue to target these meters to improve the market and unaccounted for water.

Non-household Smart Meter Upgrades

8.284 Our Progressive Smart Upgrade Programme for non-households (NHH PSUP) refers to our proactive programme to upgrade 'basic' meters with 'smart' AMI technology meters.

8.285 This is a new feasible option for WRMP24.

8.286 In our revised draft WRMP24 we noted a misalignment with our PR24 submission due to a change to our NHH PSUP programme, acceleration of the programme to include all meter replacements in AMP8. This change has been made to our final WRMP24 which now aligns with our PR24 submission.

8.287 A minor change to the volume of NHH PSUP installations was also made between revised draft WRMP24 and final WRMP24, the addition of 3,837 NHH PSUP installations, following updated analysis of reactive installs.

Benefits

8.288 Smart meter replacement numbers, and their associated savings are provided in Table 8-31 to Table 8-34.

Meter Size	AMP8	AMP9
Small (<25 mm)	42,939	
Medium (>=25 to <50 mm)	9,606	
Large (>=50mm)	1,263	

Table 8-31: External NHH Meter Upgrades

Meter Size	AMP8	AMP9
Small (<25 mm)	52,596	
Medium (>=25 to <50 mm)	6,202	
Large (>=50mm)	676	

Table 8-32: Internal NHH Meter Upgrades

Option	AMP8	AMP9	AMP10	AMP11	AMP12
NHH PSUP Consumption	1.6				
NHH PSUP CSL	2.9				

Table 8-33: NHH PSUP savings (Ml/d, non-cumulative)

	AMP7	AMP8	AMP9
NHH Smart Meter Upgrades	55,000	113,286	0
Smart Meter Penetration of meterable NHH's (%)	35%	100%	100%

Table 8-34: NHH Smart Metering Summary

8.289 The benefits of NHH PSUP are based on the output of our NHH model[26].

8.290 This model first calculated the average consumption from NHH PSUP based on the size of the property meter. The volume saved was based on data from the Market Operator Services Ltd (MOSL) data from 2019.

8.291 The non-household consumption reduction was calculated assuming that 0.5% of the total consumption would be reduced following NHH PSUP.

The CSL benefit from NHH PSUP was calculated assuming that a certain percentage of the total consumption was leakage based on the size of the property meter and then assuming 50% of this volume could be reduced.

Costs

Option	AMP8	AMP9	AMP10	AMP11	AMP12
NHH PSUP	£50.3				

Table 8-35: NHH PSUP costs (£m, non-cumulative)

8.292 There are four types of cost associated with our NHH PSUP:

- Meter install
- Meter read

[26] Artesia consulting, 20th May 2022, 'NHH Meter Calculator_Artesia_Thames Numbers_10th May 22'

- CSL fixes
- Maintenance

Constraints

8.293 The following assumptions have been applied to calculate the maximum deliverable volume of NHH PSUP:

- All externals are 100% successfully replaced
- The survey-to-fit ratio is 73.4% for internal installs. This number has been based on technical management expert judgement
- Assume that we will upgrade some basic meters before the end of their asset life (less than 14 years old)
- Assume that 10% of all external PSUP will be digs in the case where a boundary box has been buried

Water Efficiency

8.294 Non-household customers make up a significant proportion of demand in our supply area, and since the introduction of the non-household market in April 2017, we have continued to carry out demand reduction activities and water efficiency visits on businesses under the market rules, to ensure the focus on non-household demand reduction is appropriate to help drive sustainable water use and security of supply across our region.

8.295 Three new options for our revised draft WRMP, not previous considered for our draft are Continuous Flow Targeting, Tariffs, and Retailer Activity. Since our draft plan, the guidance around business use has changed, with targets of 9% reduction by 2037/38, and 15% reduction by 2049/50, introduced by the Environmental Improvement Plan document.[8] Further discussion around this is included in the Targets and Discussion section.

8.296 In addition, our Smarter Business Visits option has been extended into AMP9 and beyond, with significant usage reduction anticipated for continued support.

Smarter Business Visits

8.297 A Smarter Business Visit (SBV) includes a free visit by our qualified plumbers to install water saving devices, fix leaking taps, toilets, showers and install controls to previously uncontrolled urinals in non-households. This is one of the most effective demand reduction programmes in non-households.

Benefits

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Smarter Business Visits	23.4	15.0	8.0	6.0	4.0

Table 8-36: Smarter business visits consumption savings (Ml/d, non-cumulative)

8.298 It is assumed that there will be a 10% uptake rate from businesses that are offered an SBV. These visits are offered both through lettering and contact with the businesses.

8.299 This figure is based on our lettering in AMP7 to 9,854 businesses.

8.300 The average saving from an SBV is 2,724 litres per day. This is based on the average savings achieved from over 10,000 SBVs up to July 2021.

8.301 In comparison with WRMP19, the benefits from SBVs have doubled. In WRMP19, we assumed each SBV saved 1,316 litres per day. This was based on the average savings

from SBVs of 350 businesses up to 2017. In the five years since, we have increased our SBVs to over 10,000 and found that the average saving from business is significantly higher. Due to the substantial increase in the sample size used for this analysis we are confident in the reliability and deliverability of our WRMP24 saving.

Costs

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Smarter Business Visits	£3.77	£2.60	£1.60	£1.34	£1.07

Table 8-37: Smarter business visits costs (£m, non-cumulative)

8.302 The cost of SBVs is calculated based on a unit rate per visit based on costs from 2022-23 and quotes for future programmes of work.

Continuous Flow Targeting

8.303 With the rollout of our smart meters on non-households, we are able to use our smart meter data to identify continuous flow and use this to help notify Retailers and business customers of potential customer side leakage (CSL) of external leaks or internal wastage. This has been piloted in AMP7 and initial results are very promising.

8.304 Continuous flow targeting can be performed, distinct from SBVs and metering, in order to prioritise those properties that are identified as having continuous flow of water.

8.305 Continuous flow is defined as where the flow rate does not drop to 0 l/hr every hour for 14 days. Continuous flow on an external meter indicates the customer either has leakage or wastage within their property.

8.306 For this option, we have envisioned that a dedicated element of our SBV team would be added to prioritise the identification and reduction of continuous flow elements, and we will also be notifying and encouraging businesses to self fix any CSL.

Benefits

Option	AMP8	AMP9	AMP10	AMP11	AMP12
NHH Continuous Flow Targeting	4.5	6.0	6.0	4.0	3.0

Table 8-38: NHH continuous flow targeting consumption savings (Ml/d, non-cumulative)

8.307 Benefits for continuous flow have been estimated with expert judgement. Further potential for continuous flow fixes can be realised after AMP9, as further metering data is available to us for targeting. Potential will likely trial off in later AMPs as get closer to the full potential of the option.

Costs

Option	AMP8	AMP9	AMP10	AMP11	AMP12
NHH Continuous Flow Targeting	£0.73	£1.04	£1.20	£0.89	£0.80

Table 8-39: NHH continuous flow targeting costs (£m, non-cumulative)

8.308 As with the benefits, costs of continuous flow targeting have utilised high-level assumptions. In particular, these costs mirror the costs per Ml/d saved of the smarter business visit option. This carries a relatively low cost, with a slight increase over time as the option approaches full implementation.

Tariffs

8.309 In the NHH sector, water usage tariffs are envisioned to be brought in from AMP10 and onwards. These tariffs would look to implement higher cost rates for overuse of water in the commercial sector, in order to drive down demand. As with HH tariffs, charge rates and usage requirements for each rate are yet to be determined.

8.310 The Retailer-Wholesaler Group (RWG) is currently working to simplify NHH tariffs. It is recognised that different NHH tariff structures and approaches to pricing may be required as a core demand reduction option longer-term. We will continue to work with the RWG on NHH tariff improvement, as well as investigate innovative NHH tariff options and pilot opportunities.

Benefits

Option	AMP8	AMP9	AMP10	AMP11	AMP12
NHH Tariffs			1.0	2.0	3.0

Table 8-40: NHH tariffs consumption savings (Ml/d, non-cumulative)

8.311 Benefits for tariffs have been estimated with expert judgement. The option is expected to be carried out starting from AMP10, with savings expected to increase until AMP12.

Costs

8.312 For tariffs, costs have been assumed to be negligible. This assumption is in place due to the lack of invasive action (on-site work) required compared to other options. This omits the administrative or implementation costs of the option.

Retailer Activity

8.313 The recent update of the Retailer Exit Code did not provide additional margin for Retailers to undertake increased levels of water efficiency and wider demand reduction with their business customers.

8.314 PR24 will see the introduction of a new performance commitment on Business Demand Reduction. This will be a percentage reduction in total business demand against a baseline year.

8.315 Wholesalers will now need to take a lead role on NHH demand reduction delivery. The actual water efficiency interventions could be either wholesaler-led or in collaboration with Retailers. Our AMP7 NHH water efficiency activity is already delivering both of these activity types and has informed our proposed AMP8 work streams and demand reduction volumes.

8.316 Thames will be communicating with NHH water retailers to further reduce business use by incentivising change and enabling greater demand reduction delivery using smart meter data. This will likely be a combination of:

- Combined Thames-Retailer engagement and on-site water efficiency delivery to install water savings devices and fix continuous flows. These initiatives could be a mix of Thames and/or joint branded offers to business customers.
- A retailer-led water efficiency or continuous flow fix scheme, using our smart meter and analysis. Our Digital Data Service, plus bespoke water efficiency programme effort, would be aimed to provide Retailers with evidence of continuous flow and demand reduction opportunity, which would enable the Retailer to undertake their own engagement and/or water efficiency programme with business customers.

Benefits

Option	AMP8	AMP9	AMP10	AMP11	AMP12
NHH Retailer Activity	0.5	1.0	1.5	2.0	2.0

Table 8-41: NHH retailer activity consumption savings (Ml/d, non-cumulative)

8.317 Benefits for retailer activity have been estimated with expert judgement. Savings from this option are expected to increase over time, beginning to plateau by AMP12.

Costs

Option	AMP8	AMP9	AMP10	AMP11	AMP12
NHH Retailer Activity	£0.08	£0.17	£0.30	£0.45	£0.54

Table 8-42: NHH retailer activity costs (£m, non-cumulative)

8.318 Similar to NHH continuous flow targeting, the NHH retailer activity option costs are based on the costs per Ml/d saved of the smarter business visit option. This carries a relatively low cost, with a slight increase over time as the option approaches full implementation.

Feasible Options – Leakage Reduction

8.319 For leakage, each of our demand reduction programmes achieve at least 50% reduction in (2017-18) leakage by 2050.

8.320 The leakage reductions included in WRMP24 balance our desire to reduce leakage further and the financial impact of leakage reduction on customers' bills.

Option	AMP8	AMP9	AMP10	AMP11	AMP12
HH PMP CSL	3.4				
HH PSUP CSL	12.2	3.7			
Bulk Meters CSL	20.8	0.7			
Mini-Bulks Meters CSL	1.9	2.1	1.8		
NHH PSUP CSL	2.9	0			
Metering Innovation PMP CSL			0.4		
Advanced DMA Intervention	28.2	7.0	6.9	2.2	2
Leakage Innovation	1.6	1.7	5.1	10.9	11.0
Mains Rehabilitation	2.8	15.1	13.5	10.0	10.4
AMP7 catch up	19.7				

Table 8-43: Estimated leakage reductions (Ml/d, non-cumulative)

Metering

8.321 CSL reductions from metering have been noted in sections above.

8.322 Assumptions have been made on CSL costs and savings from metering in their appropriate sections, however for certain options (HH Metering Innovation PMP, and NHH PSUP) saving in both leakage and consumption are expected. In these options, the costs to meter are intrinsically linked to the CSL reductions available, as this leakage reduction cannot be realised without metering. As such, costs for CSL activities are not separated out for discussion.

Advanced DMA Intervention

8.323 Advanced District Meter Area intervention (DMAi) is a new option for WRMP24. It has evolved from our experience in implementing DMA Enhancement from WRMP19 and Enhanced Active Leakage Control from WRMP14.

8.324 Advanced DMAi employs capital and operational activity to better understand water demand and pinpoint leaks within a DMA. The Advanced DMAi process is summarised in Figure 8-16.

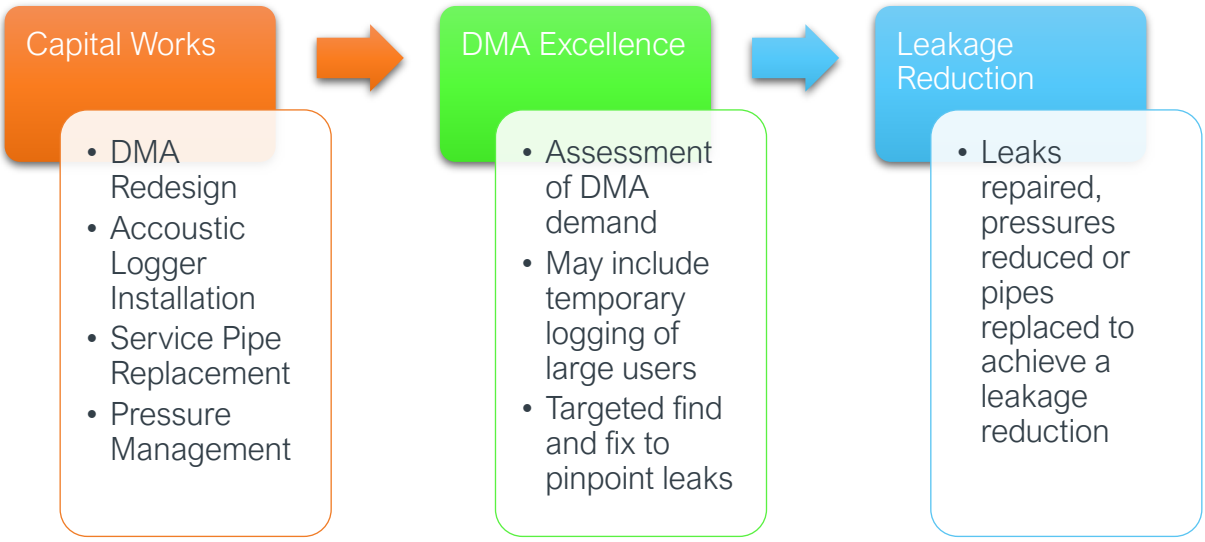

Figure 8-16: Advanced DMAi process chart

8.325 The capital component of Advanced DMAi includes:

- DMA Redesign: capital work to redesign DMAs for leakage identification. This includes DMA splitting and reconfiguration via priority district meter relocation. In WRMP19, this was referred to as DMA Enhancement Plus
- Acoustic logger installation
- Service pipe replacement
- Pressure Management: installation of new pressure management schemes within individual DMAs at sub-DMA level

8.326 The operational component of Advanced DMAi includes:

- DMA Excellence: operational component of the work following DMA Redesign
  - This includes an assessment of demand in the DMA that looks at the assets, properties, and customer water demand. This may include temporary logging of large customers
  - Traditional or innovative find and fix activity is then employed to pinpoint leaks. In WRMP19, this was referred to as DMA Enhancement activity

8.327 The final stage of Advanced DMAi is to fix the leaks identified to realise the leakage reduction.

DMA Redesign

8.328 DMA redesign is a core component of Advanced DMAi and involves DMA splitting and reconfiguration.

8.329 Redesign is sometimes required because some DMAs are particularly large, making it inefficient to detect and pinpoint leaks. Other DMAs may be 'unavailable' for leakage detection due to inherent network configuration issues. For example, a broken district meter located on a major London bus lane may not be accessed for a long period of time due to the requirement for substantial traffic management. As a result, the affected DMAs would not be available for leakage detection and leaks may run undetected.

8.330 The health of a DMA is determined by four factors, the number of district meters, the throughflow of the DMA, the DMA property count, and the length (km) of pipe network. An example of a 'Good' compared to 'Poor' DMA design is shows in Figure 8-17.

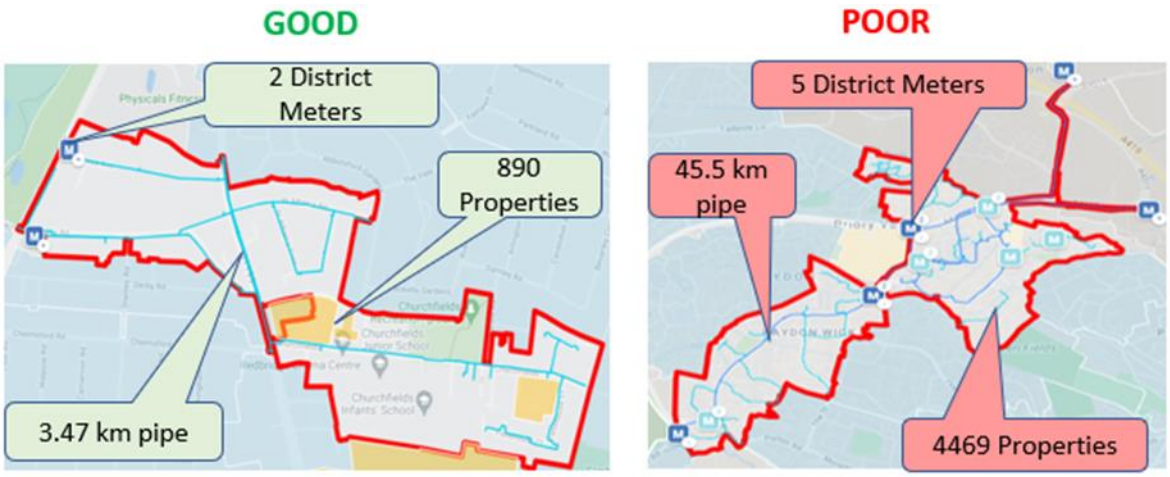

Figure 8-17: DMA design examples

8.331 The driving purpose of DMA redesign is to resolve and enhance long standing network issues and ensure key assets are more readily accessible. This will ensure DMAs will remain available and operable for leakage detection and repair.

Benefits

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Advanced DMA Intervention	28.2	7.0	6.9	2.2	2

Table 8-44: Advanced DMAi leakage reductions (Ml/d, non-cumulative)

8.332 Advanced DMAi benefits have been based on technical expert assumptions from our Asset Management specialists. To do this, they have utilised their experience of AMP7 activity in DMA Excellence to forecast the benefits of our new option, advanced DMAi.

8.333 The advanced DMAi volume each AMP has been assessed on the volume we would like to achieve to meet our ambitious reductions for leakage into the future. These targets are based on our group assessment of potential opportunities across our area based on our experiencing implementing similar solutions in AMP7.

8.334 Between revised draft WRMP24 and final WRMP24 we revised the level of leakage ambition for the SWOX WRZ. In response to a regulator request that we provide additional resilience to the supply-demand balance in this WRZ, we considered the additional leakage reduction which we may be able to deliver. Having considered additional leakage reduction that may be feasible, we have included 11 Ml/d of advanced DMAi in SWOX WRZ across AMP8-12.

8.335 This additional 11 Ml/d of advanced DMAi leakage reduction will be delivered without offsetting ambition in other WRZs and aligns with our PR24 submission.

Costs

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Advanced DMA Intervention	£112.7	£34.8	£37.7	£13.2	£13.0

Table 8-45: Advanced DMAi costs (£m, non-cumulative)

8.336 As with benefits, the costs of advanced DMAi are also based on technical expert assumptions.

8.337 Based on the assumptions made, advanced DMAi is the most cost efficient of the Leakage only solutions, being cheaper than both Leakage Innovation and Mains Rehabilitation.

8.338 To maintain the savings from advanced DMAi, it is assumed that one third of the leakage reduction achieve each AMP will reoccur within 15 years of the advanced DMAi leakage fixes. Further investment will then be needed within 40 years. This assumption is consistent with that of supply pipe leakage repairs.

8.339 The future cost of resolving leakage reoccurrence is assumed to be 25% of the original cost of advanced DMAi. This is included to ensure we are not under-estimating the costs of such a solution.

Leakage Innovation

8.340 Leakage Innovation includes activities that provide a new and cost-efficient way to reduce leakage on our distribution mains network. Leakage Innovation is designed to be more cost efficient than Mains Rehabilitation.

8.341 Leakage Innovation includes activities that we are currently aware of and those that will be developed in the future.

8.342 Some of the activities included in Leakage Innovation are:

- Adoption of keyhole repair techniques
- Advancement of technologies for precise and accurate leak location – acoustics
- Advancement of technologies for precise and accurate leakage location – tracer gases
- New quality or design of joints so they are leak free – product development
- Advancement of technologies to repair pipes from the inside
- Enhanced detection equipment or innovation in detection
- Enhanced repair methods or innovation in repair methods

8.343 The technology and approach to achieve our long-term leakage reduction ambition is either emerging or is yet to be developed. It is critical to understand the emerging technology and approaches to ensure the deliverability of Leakage Innovation in our plan.

8.344 In AMP8, we will invest in trials of innovative technology and leakage reduction and repair approaches. This investment is crucial to test and demonstrate the most cost-effective innovative solutions available prior to their full implementation in later AMPs.

8.345 In WRMP19 we concluded our leakage reduction activity in 2055. In WRMP24, we continue leakage reduction activity beyond 2050 with Leakage Innovation, which assumes that through future innovation approaches both costs and customer inconvenience will be reduced compared to our current assumptions.

8.346 Our leakage innovation includes activities that we are currently aware of, those that are emerging and those that may be developed in the future. There is uncertainty around the costs and benefits of emerging and yet to be developed technologies. We plan to invest in trials in AMP8 to test and demonstrate cost effective innovative solutions and will incorporate the findings of these trials in our WRMP29. We will review our leakage costs and benefits at each WRMP cycle with updated insight into leakage innovations.

8.347 We strongly follow and actively engage with the UKWIR leakage roadmap – PALM (Prevent/Aware/ Locate/Mend) identifying projects/areas we wish to accelerate and drive forward in the business. We are currently most active in the Locate and Mend areas with recent projects such as Aquapea and Origin No dig being evaluated and implemented. We are also leading on a nationally engaged project called "No dig-leak repair" which is currently being proposed to the Ofwat Innovation fund and hopes to transform how we cost effectively locate and mend leaks. We are also part of an Ofwat Innovation funded project called "Designer liner" being led by Yorkshire Water which is specifying/developing lining technologies for the water industry of the future. Through the Smart Water programme we are digitally enhancing our data capability and visualisation which is making a step change in how we operate, for example our System Risk Visualisation is currently evaluating and testing the role of fibreoptics in leak detection.

8.348 We engage and support to steer both research and suppliers (including the oil and gas industry) to be aware of advances and new technologies both available and emerging. We directly implement or trial under controlled conditions depending on the development stage of the solution. We have our own pilot facilities to support this including a full scale Trunk Mains test facility at Kempton Park WTW.

Benefits

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Leakage Innovation	1.6	1.7	5.1	10.9	11.0

Table 8-46: Leakage innovation leakage reductions (Ml/d, non-cumulative)

Period	Leakage Reduction (Ml/d)
AMP13	0.8
AMP14	0.9
AMP15	3.0
AMP16	5.0
AMP17	5.0
AMP18	5.0
AMP19	5.0
AMP20	4.9
AMP21	4.9

Table 8-47: Leakage Innovation savings post-2050 (non-cumulative)

8.349 Leakage innovation benefits have been based on technical expert assumptions from our Asset Management specialists. The Leakage innovation volume each AMP has been assessed on the volume we would like to achieve to meet our ambitious reductions for leakage into the future.

8.350 We will trial innovative methods of leakage reduction from 2025 to develop innovative methods of leakage reduction so they can be used in significantly greater volumes by 2035.

Costs

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Leakage Innovation	£33	£52	£197	£664	£756

Table 8-48: Leakage innovation costs (£m, non-cumulative)

Period	Cost (£m)
AMP13	£40.4
AMP14	£39.7
AMP15	£159.2
AMP16	£280.3
AMP17	£274.3
AMP18	£274.3
AMP19	£274.3
AMP20	£268.4
AMP21	£268.4

Table 8-49: Leakage Innovation costs post-2050 (non-cumulative)

8.351 Leakage innovation is assumed to be more cost efficient than Mains Rehabilitation. However, we still expect it to reflect the increasing cost profile over time like that of mains rehabilitation. Therefore, we have assumed the cost of Leakage Innovation is 50% of the unit cost of Mains Rehabilitation. This assumes that leakage innovation will be able to achieve the same leakage reduction as mains rehabilitation using innovative methods to reduce overall cost. For example, repairing leaks from within a pipe to avoid the costs of traffic management and digging in a road or spray lining.

Mains Rehabilitation

8.352 Water mains rehabilitation is a traditional and long-term sustainable option to reduce leakage from our distribution mains network. It refers to the replacement or refurbishment of water mains and service pipes that are our responsibility.

8.353 We are responsible for over 31,000km of water mains across London and Thames Valley.

8.354 Some of our original cast iron mains were installed well over 100 years ago. Although these water mains have served customers well, the increase in road traffic, corrosive soil conditions, and ground movement mean they are more likely to leak.

8.355 In WRMP24, we include mains rehabilitation to replace old or damaged water mains to both reduce leakage and prevent further leaks into the future.

Benefits

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Mains Rehabilitation	2.8	15.1	13.5	10.0	10.4

Table 8-50: Mains rehabilitation leakage reductions (Ml/d, non-cumulative)

8.356 To date, the approach to mains rehabilitation has been based on results combining national research, our experience over the last 20 years, experience gathered from other water companies and discussions with manufacturers.

8.357 However, since 2011, an approach to target pipe condition as well as performance has been investigated to ensure mains replacement is targeted to deliver sustainable benefits. This means mains replacement targeting is being done at street and 'superstring' level. Superstrings are pipes connected to each other of the same age, material, and diameter. By analysing the performance of each pipe, those pipes within a DMA that are performing the worst can be targeted.

8.358 The distribution of mains replacement at pipe level is first modelled in the Distribution Mains Model. The output of this model is input into our IDM model to provide us with the volume, leakage reduction and costs for mains rehabilitation.

Costs

Option	AMP8	AMP9	AMP10	AMP11	AMP12
Mains Rehabilitation	£114	£925	£1,066	£1,227	£1,423

Table 8-51: Mains rehabilitation costs (£m, non-cumulative)

8.359 The cost of mains rehabilitation is input into the Distribution Mains Model based on information from our internal cost models.

8.360 In WRMP24 the average cost of Mains Rehabilitation is £1,400 per meter of pipe. This is based on:

- Two DMAs in London from our AMP7 Conditional Allowance programme. They represent the most up to date costs in mains rehabilitation
- The price supplied by two of our contractors
- Whole DMA pricing
- They do not include some London DMAs that are expected to be a higher cost, potentially up to £2,000 per meter of pipe

8.361 The mains rehabilitation costs originally forecast for inclusion in the WRSE regional plan were lower than final costs. These were based on our costs assessment from November 2021, and were the latest cost estimates we had at the time of the Regional Plan modelling.

8.362 However, since then, in June 2022, we have updated our cost assessment of mains rehabilitation using the AMP7 Conditional Allowance project. These new costs have been utilised in our WRMP24, and initial feedback from the regional modelling suggests that this has had no significant impact on the timing or benefit required from the strategic options.

8.363 An increase in price in mains rehabilitation costs since WRMP19 has been caused by a number of factors:

- A substantial increase in council's charging for lane rentals, and restrictions meaning we are needing to stay on site for longer
- Cost of labour increase due to specialist labour shortages
- Recent economic inflation: Cost of labour and materials

8.364 We assume the dominant factors of council behaviour and labour costs are unlikely to change. Therefore, this higher rate of Mains Rehabilitation is likely to be a more accurate reflection of future costs.

8.365 The merits of the Conditional Allowance programme are being considered for future AMPs, where the focus will be on improving the resilience of the distribution and trunk mains, especially to weather shocks from cold winters, dry summers, and freeze-thaw effects. At this stage no formal decision has been made as to whether to progress with a multi-AMP programme of resilience-focussed mains rehabilitation. When it is, our WRMP will take account of the leakage benefit that this achieves.

AMP7 leakage catch up

8.366 As outlined in Appendix M – Leakage we expect to underdeliver against our WRMP19 leakage reduction forecast by 19.7 Ml/d at the end of AMP7.

8.367 We have adjusted the baseline (see WRMP24 Section 3 – Demand) to account for these leakage levels and added additional leakage reduction to our demand management plan to catch up the leakage reduction by 2029/30.

Option	AMP8	AMP9	AMP10	AMP11	AMP12
AMP7 leakage catch up	19.7				

Table 8-49: AMP7 leakage catch up (Ml/d, non-cumulative)

Modelling

8.368 Four different demand management programmes have been considered for use within the WRSE modelling. These are distinctly different to the draft WRMP programmes and have been created based on assumptions.

Programme	Description
Low	The low programme excludes innovative options, including digital engagement, HH innovation & tariffs, SBVs for AMP9 and beyond, and NHH innovative options.
Medium	The medium programme closely mirrors our medium programme from our draft WRMP24. The major change that is included is further savings associated with HH innovation and tariffs (as well as changes to the Government-Led savings) in order to help hit the 110 l/h/d PCC target.
High	Compared to the medium programme, the primary additions for the high programme are the NHH innovation policies (continuous flow, retailer activity, and tariffs), and the inclusion of further smarter business activities post AMP9.
High+	Compared to the high programme, the high plus programme accelerates the PCC reductions through HH innovation & tariffs, and the leakage reduction 50% target is moved forward to 2037/38, with significant investment in the mains rehabilitation and leakage innovation options.

Table 8-52: Demand programme descriptions

8.369 Targets for leakage and consumption have been used to create constraints for the optimisation of these programmes, demonstrated in Table 8-53. These are based on regulatory guidance (see section on Governance) and will be expanded upon in the later Targets and Discussion section.

Programme	Leakage	PCC*	Business/NHH Consumption
Low	Reduced to 50% of 2017/18 level by 2049/50	N/A	N/A
Medium	Reduced to 50% of 2017/18 level by 2049/50	Reduced to 110l/h/d PCC by 2049/50	N/A
High	Reduced to 50% of 2017/18 level by 2049/50	Reduced to 110l/h/d PCC by 2049/50	Reduced by 9% of 2019/20 level by 2049/50
High+	Reduced to 50% of 2017/18 level by 2037/38	Reduced to 110l/h/d PCC by 2049/50	Reduced by 9% of 2019/20 level by 2049/50

Table 8-53: Targets for programmes

**PCC targets including the government-led C+ profile of demand management options alongside Thames-led options.*

Optimisation

8.370 Further technical detail is discussed in Appendix R, Scheme Dossiers.

8.371 The optimisation of demand programmes is performed as follows:

- Options which are considered to be either enabling options, or = necessary to the success of the wider programme (through hitting key targets) are selected with justification and savings are applied prior to optimisation. This applies primarily to metering options, as metering options enable targeted water efficiency activity, digital engagement, and the introduction of tariffs.
- Options that are considered to be "all-or-nothing" approaches are each individually assessed to ensure they are cost-effective compared with other options. "All-or-nothing" options are selected if they match with each programme as outlined in Table 8-52.
- Remaining options are considered as variables in the optimisation. The volumes and timings of implementations of these options are assessed to ensure they are realistic, cost effective, and that the combined programme hits the targets outlined above.
- Optimisation is carried out, with 2049/50 targets (outlined in the section on Governance) used as constraints. 2037/38 targets are considered soft constraints, meaning that while they were checked against, they were not the primary consideration. Further detail on this is discussed in the section on Targets and Discussion.

8.372 A reasonable number of the feasible options for WRMP24 were assessed to be necessary.

Option	Classification	Justification
HH PMP	Necessary	Metering policies are determined to be necessary, as these enable many other options to be available.
HH PSUP		
HH Bulks & HH Mini-Bulks		
NHH PSUP		
Metering Innovation PMP		
Metering Innovation PSUP		
Digital Engagement	All-or-nothing	As an improvement to digital infrastructure, Digital Engagement will be a relatively cheap option to provide actionable data to customers, at a relatively low cost.
Household Innovation & Tariffs	Variable	
Smarter Home Visit	Necessary	Home/Business visit related policies are considered necessary, as these are one of the most effective ways to reduce customer side losses.
Wastage Fix		
Green Redeem		
Smarter Business Visits*		
NHH Continuous Flow Targeting	All-or-nothing	Support for activities aiming to reduce continuous flow is expanding due to high expectations on potential savings, as such we want to ensure that we commit to this activity
NHH Retailer Activity	All-or-nothing	Support for further coordination with retailers is judged as being necessary (both for Thames, and retailers) and is expected to be cost effective in reducing business consumption.

Option	Classification	Justification
NHH Tariffs	All-or-nothing	For fairness, business tariff rollout will likely take an all-or-nothing approach. At this time we expect this to be a very cost-effective solution.
Advanced DMA Intervention	All-or-nothing	Information gained on our DMA condition from DMA intervention activities is instrumental to expand leakage control going forward.
Leakage Innovation	Variable	
Mains Rehabilitation	Variable	

Table 8-54: Options classification for optimisation

**For smarter business visits, two different profiles were considered, one for low and medium with savings only in AMP8, and one for high and high+ with savings in AMPs 8-12.*

8.373 Under this assessment, only two variable options remain for leakage reduction (leakage innovation & mains rehabilitation), and only one for HH consumption reduction (HH innovation and tariffs). No option is considered as variable for NHH consumption reduction, this is inconsequential as NHH consumption targets were achieved under the high and high+ scenarios with a combination of the necessary and all-or-nothing options chosen.

8.374 Delivery profiles for volumetric savings and costs associated with "Necessary" and "All-or-nothing" options were determined primarily through identification of capacity constraints. For example, our plan for the household PMP option includes what our internal teams consider to be the maximum deliverable programme of meter installations during AMP8. As such, for those options which we consider core parts of our programme, we are enacting programmes as quickly as we can.

Variable Options

8.375 The remaining three variable options were assessed for use as follows.

Household Innovation and Tariffs

8.376 Three separate paths were considered for HH innovation and tariffs. The first, for the low programme, was simply zero savings. As the low programme was initialised as the "no innovation" programme, this was deemed appropriate.

8.377 The second path was considered for both the medium and high programmes (Table 8-55). This path considers a slow start to activities, with gradually increasing savings over time, stopping short at AMP12 once the PCC target is achieved. This slower start is included to allow time for innovative solutions to be developed, and also because tariffs cannot feasibly be introduced until a sufficient meter penetration is achieved (requiring our AMP8 and AMP9 metering).

Household Innovation & Tariffs	AMP8	AMP9	AMP10	AMP11	AMP12
HH Consumption Savings (Ml/d)	5.2	12.7	13.7	14.7	15.0
Option Cost (£m)	£26.04	£69.63	£82.50	£103.78	£114.58

Table 8-55: Household innovation & tariffs medium/high programme (non-cumulative)

8.378 The third path was considered for the high+ programme (Table 8-56). This allows for PCC reductions past the PCC target, and also allows for much higher expectations of savings resulting from greater investment in the area.

Household Innovation & Tariffs	AMP8	AMP9	AMP10	AMP11	AMP12
HH Consumption Savings (Ml/d)	5.2	25.0	25.0	25.0	0.0
Option Cost (£m)	£26.04	£137.50	£150.36	£178.75	£17.50*

Table 8-56: Household innovation & tariffs high+ programme (non-cumulative)

**Maintenance cost (cut off for Table 8-54)*

Leakage Innovation

8.379 Only two separate paths were considered for the leakage innovation option, with the low programme taking the same path as the medium and high programmes.

8.380 The first path represents a slow start in AMP8 and AMP9 for innovation (to allow time for innovative solutions to be developed), with a considerable ramp up in AMP10 until AMP12.

Leakage Innovation	AMP8	AMP9	AMP10	AMP11	AMP12
Leakage Savings (Ml/d)	1.6	1.7	5.1	10.9	11.0
Option Cost (£m)	£33.05	£51.52	£196.89	£663.64	£755.71

Table 8-57: Leakage innovation low/medium/high programme (non-cumulative)

8.381 The second path, used for the high+ programme, relies on a significantly quicker exploration into leakage innovation, with a significant saving of 5 Ml/d by AMP8, and steadily increasing additional savings per AMP.

Leakage Innovation	AMP8	AMP9	AMP10	AMP11	AMP12
Leakage Savings (Ml/d)	5.0	7.0	8.9	10.1	10.1
Option Cost (£m)	£106.68	£246.15	£566.79	£420.85	£592.14

Table 8-58: Leakage innovation high+ programme

8.382 Option costs for leakage innovation are based on the mains rehabilitation costs (as outlined by the section on Leakage Innovation). In this way the two above paths are linked to their equivalent path for mains rehabilitation.

Mains Rehabilitation

8.383 Mains rehabilitation modelling was based on Thames Water DMA-level data for the expected leakage pre and post mains rehabilitation, as well as information held in the length of mains the would be replaced, and approximate costs of replacement in each DMA. Costs were normalised to a company-level value of £1,400/m presented in the section on Mains Rehabilitation. DMAs with significant savings were ranked by most to least cost efficient, with the most cost-efficient DMAs being chosen first.

8.384 In each AMP, an amount of mains rehabilitation was taken as part of "capital maintenance", a baseline option to maintain the current leakage level (rather than reducing it, as is represented by the mains rehabilitation option).

8.385 A special consideration was taken for a number of DMAs with less than 0.005 Ml/d saving expected from mains rehabilitation activities. Whilst the savings in these DMAs were judged to be valid, the low reductions available meant that other DMAs have been prioritised above these in our modelling, due to greater savings. These DMAs were left out of the ranking and will only have mains rehabilitation performed once the other DMAs were considered. Around 56.1 Ml/d savings from mains rehabilitation is available prior to considering these smaller saving DMAs (accounting for capital maintenance by AMP12).

8.386 Again for mains rehabilitation two paths were considered, with the low/medium/high programmes taking the first path, and the high+ taking the second.

8.387 The first path echoes expectations of our mains rehab programme, starting in AMP8, ramping up in AMP9, with potential for savings decreasing over time. Mains rehabilitation is not initially a significant component of our plan due to its very high costs, but once we have exhausted other feasible options it becomes the focus of our leakage reduction efforts[27].

Mains Rehabilitation	AMP8	AMP9	AMP10	AMP11	AMP12
Leakage Savings (Ml/d)	2.8	15.1	13.5	10.0	10.4
Option Cost (£m)	£114.15	£924.96	£1,066.11	£1,227.33	£1,423.28

Table 8-59: Mains rehabilitation low/medium/high programme

8.388 The second path (high+) sees a much quicker start up in AMP8, and much more investment in AMP9 and AMP10. Costs are much higher as the potential of renewal is stretched.

Mains Rehabilitation	AMP8	AMP9	AMP10	AMP11	AMP12
Leakage Savings (Ml/d)	5.8	25.3	25.8	10.0	10.4
Option Cost (£m)	£247.28	£1,780.13	£3,269.86	£822.02	£1,213.84

Table 8-60: Mains rehabilitation high+ programme

8.389 As mentioned, a slight modelling artefact is that, beyond 56.1 Ml/d savings, mains rehabilitation actually becomes "cheaper" per Ml/d as the model is allowed to pick from the smaller DMAs. This only has an effect on the high+ programme, as the high programme does not reach this point. This also has the consequence of feeding into the leakage innovation costs for the high+ programme (see Table 8-58).

All-or-Nothing Options

8.390 Additional to the above variable options, some of the all-or-nothing options described in Table 8-54 have not been selected for all demand programmes.

[27] *Please note that, in order to ensure consistency with the Water Resources South East regional group and due to the requirements of the WRSE investment model, we have included individual intervention-level information within our WRMP Tables for each option within each of the four programmes (e.g., we have included options of "Advanced DMA Intervention Low", "Advanced DMA Intervention Medium", "Advanced DMA Intervention High" and "Advanced DMA Intervention High+"). In the case of "All-or-nothing" options, this will mean that these options will either have no associated cost and no associated benefit, or may appear as options with benefits and costs which are identical to one another.*

Digital Engagement

8.391 Digital Engagement has not been selected for the low programme.

Smarter Business Visits

8.392 SBVs have two separate programmes, one basic and one extensive. The basic path has been selected for the low and medium programmes, whereas the extensive is selected for the high and high+ programmes.

Mains Rehabilitation	AMP8	AMP9	AMP10	AMP11	AMP12
Leakage Savings (Ml/d)	23.4				
Option Cost (£m)	£3.77				

Table 8-61: SBV low/medium programme

Mains Rehabilitation	AMP8	AMP9	AMP10	AMP11	AMP12
Leakage Savings (Ml/d)	23.4	15.0	8.0	6.0	4.0
Option Cost (£m)	£3.77	£2.60	£1.60	£1.34	£1.07

Table 8-62: SBV high/high+ programme

NHH Innovative Options

8.393 The NHH innovative options (Continuous Flow Targeting, Retailer Activity, and Tariffs) have not been selected for the low or medium programmes.

WRSE Modelling

8.394 Each of the four demand programmes is fed into the WRSE optimiser. These demand programmes are treated as the options of a single variable, each solution can only pick one of the four programmes. The same programme must be selected for all of our WRZs (e.g., the model may not select the High+ programme in Guildford and High in SWOX).

8.395 Results of WRSE modelling will be discussed in Section 10 – Programme Appraisal and Scenario Testing, and Section 11 – The Overall Best Value Plan.

Carbon Costs Modelling

8.396 Carbon costs have been considered by applying further assumptions to activities. This has been considered by the WRSE optimiser (with every WRSE company using the same assumptions) by feeding into environmental and cost metrics.

Targets and Discussion

8.397 In the final stage, stage 5, the outcomes of the demand reduction programmes are detailed.

Ambitions

8.398 Linking back to the section on Strategy, we discussed our 8 ambitions.

- Ambition 1 – reduce leakage by 50% (from 2017-18 levels) by 2050
- Ambition 2 – maximise feasible PCC reductions by 2050
- Ambition 3 – smart meter all practicable connections by 2035
- Ambition 4 – minimise unmeterable properties by 2040
- Ambition 5 – wipe out most wastage by 2050
- Ambition 6 – minimise impact on customer bills
- Ambition 7 – minimise carbon cost
- Ambition 8 – create a deliverable, resilient and ambitious programme

8.399 Each of our demand reduction options contribute towards these ambitions. Table 8-63 below demonstrates these relationships, with a cross as an indication of contribution from that option to the numbered ambition. Ambition 8 has been excluded from this table as it is expected that in some way each of these options is contributing to this ambition.

Option	1	2	3	4	5	6	7
HH PMP	X	X	X		X	X	X
HH PSUP	X		X		X	X	X
HH Bulks & HH Mini-Bulks	X		X			X	X
NHH PSUP	X		X		X	X	
Metering Innovation PMP	X	X	X	X	X		X
Metering Innovation PSUP	X		X	X			X
Digital Engagement		X			X		
Household Innovation & Tariffs		X			X		
Smarter Home Visit		X				X	
Wastage Fix		X			X		
Green Redeem		X				X	
Smarter Business Visits*					X		
NHH Continuous Flow Targeting					X	X	
NHH Retailer Activity					X	X	
NHH Tariffs					X		
Advanced DMA Intervention	X	X			X	X	X
Leakage Innovation	X					X	
Mains Rehabilitation	X						

Table 8-63: Ambitions contribution from demand reduction options

Targets

Household Use

8.400 As discussed in the Governance section, targets for household consumption are set per capita (per capita consumption, PCC). Each of our four demand programmes (as described above in the Modelling section) have associated reductions to PCC over time.

8.401 It is important to note that achieving the Government targets on PCC is reliant on all of the identified Government-led policy and demand reduction actions coming into place and

delivering as modelled. Our demand reduction activities such as smart meter, water efficiency and customer engagement, will not meet the Government PCC target of 110 l/head/day without these Government-led policy changes.

Business Use

8.402 Targets around business use were set as percentage reductions. We have assumed that these are reductions from 2019/20 values.

8.403 As mentioned in the section on Modelling, we currently have no variable options for business use reduction, only 'all-or-nothing' options. For business use, the differences between the Low/Medium and High/High+ programmes are resulting from the differing levels of the SBV option, as well as that of the "innovative" NHH options (see the section on All-or-Nothing Options).

Demand Programme	2024/25	2037/38	2049/50
Low	6.91%	6.63%	11.25%
Medium	6.91%	6.63%	11.25%
High	6.91%	12.54%	17.15%
High+	6.91%	12.54%	17.15%
Target		9%	15%

Table 8-64: Demand programme business use reductions from 2019/20 levels

Leakage

8.404 Targets around leakage were set as percentage reductions from 2017/18 values.

8.405 There is no variation around our Low, Medium, and High programmes for leakage. This results from the expectation that we plan to hit our leakage target for 2049/50, resulting in the value constraining each programme.

8.406 High+ presents an accelerated leakage profile, with a target of near 50% reduction by 2037/38. This programme heavily relies on the expensive leakage innovation and mains rehabilitation policies.

Demand Programme	2024/25	2026/27	2031/32	2037/38	2049/50
Low	24.53%	33.50%	43.36%	48.33%	56.58%
Medium	24.53%	33.50%	43.36%	48.33%	56.58%
High	24.53%	33.50%	43.36%	48.33%	56.58%
High+	24.53%	33.87%	44.72%	52.39%	61.79%
Target		20%	30%	37%	50%

Table 8-65: Demand programme leakage reductions from 2017/18 levels

Comparison with WRMP19

8.407 Ultimately, there are a number of differences between our WRMP19 and WRMP24 plans that make it difficult to compare the two with regards to demand management. This is principally due to the reconsideration of data and assumptions around each of our demand management options, and secondarily around the change in actual historical data used to generate the start position of WRMP24 (AR22, 2021/22).

8.408 Our figures for customer use, business use, and leakage for both WRMP19 and WRMP24 are presented in Table 8-66 to Table 8-68 below.

8.409 Notable changes between WRMP19 and WRMP24 for PCC included the striking change in the baseline 2021/22 position. The actual value of PCC for 2021/22 is expected to have been influenced by Covid.

8.410 Profiled reductions for WRMP19 are also higher, with an estimated reduction of 18.4l/h/d over the period, compared to a reduction of 13.8l/h/d for WRMP24. This change is not due to a singular factor, as stated, each of our options has been reassessed for WRMP24, leading to this difference.

8.411 Government-Led interventions have been introduced within WRMP24, and as such are an important change in PCC reduction since WRMP19.

Programme	2021/22	2024/25	2037/38	2049/50
WRMP19	138.8	135.0	121.8	120.4
WRMP24 High	145.5	137.2	132.1	127.7
WRMP24 High (Gov-Led C+)	145.5	137.2	121.3	103.7

Table 8-66: PCC (l/head/d) historical comparison

8.412 A very significant reduction to business use occurred in 2021/22, primarily attributed to Covid. This was an unprecedented event, and was saw business demand increase between 2021/22 and 2023/24.

8.413 As with customer use, business use options are different to WRMP19, with a 22.6 Ml/d reduction in business use for WRMP19, and an equivalent reduction of 29.0 Ml/d for WRMP24 over the period.

Programme	2021/22	2024/25	2037/38	2049/50
WRMP19	466.2	456.9	442.9	443.6
WRMP24 High	391.4	425.0	399.1	379.1

Table 8-67: Business demand (Ml/d) historical comparison

8.414 In order to hit the 349 Ml/d target leakage (50% of 2017/18 leakage), interventions have been slightly increased over the period. The increase comes from the introduction of the leakage innovation option, with a decrease also present from changes to expectations of leakage saved through metering options.

Programme	2021/22	2024/25	2026/27	2031/32	2037/38	2049/50
WRMP19	603.5	540.3	516.4	466.5	420.1	368.6
WRMP24 High	601.9	534.5	471.6	402.9	368.2	310.6

Table 8-68: Leakage (Ml/d) historical comparison

Confidence in Delivery

8.415 We have applied a bottom-up approach to our demand management options, meaning that assumed savings from the options are applied to baseline positions of each metric to estimate changes.

8.416 Our options are a mix of “traditional” options (based on historical data) and “innovative” solutions (based on a mix of historical data and expert judgement).

8.417 Due to the stretch targets provided for PCC, NHH consumption, and leakage any plan going forward requires a combination of these two, as there is simply a limited amount of purely traditional options remaining. As such, we are confident we can deliver required

reductions in volume only from a mix of traditional and innovative solutions, as is incorporated in our plan.

8.418 While we are confident that we can carry out the activities associated with our demand reduction options, there remains an element of risk around the expectation on the public and on the government to assist.

8.419 Ultimately, many of our water efficiency options for both customer and business use require coordination and cooperation from the public to reduce their demand. We have attempted to mitigate this risk by using data and assumption from our known activities, however as activities and pressures are increased going forward, we will understand this better.

8.420 Presently, our plan includes the assumption that government policy will influence customers to reduce consumption (see Government Led Demand Reduction).

8.421 Additionally, the increased start position for business use presents a further risk. Increases to pre-covid expectations for business use could place our plan at risk of missing 2037/38 and 2049/50 targets for business use reductions. Whilst this is true, efforts are being made in conversation with retailers as to prevent this. Coordination with retailers is central to our plan for reducing business use, and our hopes are that these ongoing conversations could potentially enable savings in excess of what our WRMP24 captures in this area, in order to offset risks of under-delivery.

Annex: Changes made between plan iterations

8.422 The text in the boxes below summarises the changes made to this Section between dWRMP24 and rdWRMP24, and between rdWRMP24 and final WRMP24

Changes made between dWRMP24 and rdWRMP24:

- Baseline positions for Asset Management Plan (AMP7) data were updated using AR22 data for leakage and consumption data, compared to AR20 data used for dWRMP24 (See WRMP24 Section 3 – Demand)
- Cost assumptions for metering have been updated
- Metering expectations have been updated, with a number of small changes compared to dWRMP24:
  - PMP (Progressive Metering Programme) installs have reduced very slightly (from 193k to 192k in AMP8)
  - HH PSUP (Progressive Smart Upgrade Programme) replacements have increased slightly (from 632k to 645k in AMP8, and from 247k to 250k in AMP9)
  - NHH PSUP replacements have been moved slightly forward (from 51k to 60k in AMP8, and from 67k to 59k in AMP9)
- Further options have been considered for NHH innovation and water efficiency (Continuous Flow Targeting, Tariffs, and Retailer Activity)
- Smarter Business visits have been expanded, with further savings expected to be possible post-AMP8
- Mains rehabilitation data has been updated
- Demand management programmes (combinations of options used as potential plans) have been reworked, with more focus on regulatory targets for the distinction between them
- Internal metering survey-to-fit ratios for PMP and optants have been revised to be in line with data from the targeting of internal, rather than external, meters

Changes made between rdWRMP24 and final WRMP24:

- Updated metering and water efficiency tables detailing the benefits and costs of our PMP, CSL, SHV, Wastage, GreenRedeem programmes due to;
  - changes to the previously planned Green Economic Recovery (GER) programme
  - changes to PMP survey to fit ratios
  - changes to SHV targeting
- NHH PSUP installations have increased to align with PR24 and meet MOSLs expectation to meet smart meter all large meters within AMP8. An additional 3,837 NHH PSUP installations have also been added following updated analysis of reactive installations
- Added 11 ml/d of additional advanced DMA intervention leakage reduction in SWOX WRZ to provide additional resilience to supply-demand balance
- Added 19.7 ml/d of additional AMP7 leakage catch up and adjusted the baseline to reflect this under delivery within AMP7
- Addition of evidence to demonstrate how the benefits of the household metering programme are derived added to the metering benefits sections
- Addition of evidence of the value of the smart meter roll out
- Addition of a new 'Would more leakage reduction be beneficial?' section and additional information on our leakage innovation approach
- Addition of detail to our water efficiency innovation trials approach


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