# Draft Water Resources Management Plan 2024

## Feasible Demand Management Options Paper

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## Background and Introduction

1. This paper should be read in conjunction with the following reports as detailed in Figure 1.

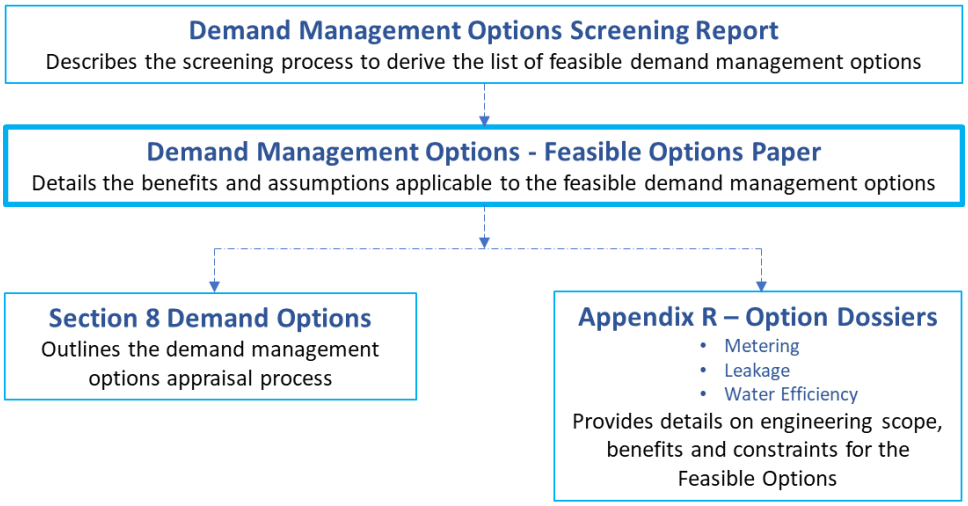


Figure 1: Overview of draft WRMP24 demand management options reports

The purpose of this paper is to detail the benefits and assumptions applicable to the Feasible Demand Management Options identified by the Demand Management Screening Process.

The Demand Management Options Screening Process, identified a list of Feasible Demand Management Options for inclusion in the Water Resources Management Plan 2024 (WRMP24). They were categorised into three areas: Metering, Water Efficiency, and Leakage.

This paper details the benefits and assumptions associated with these options and forms an appendix to, and should be read in conjunction with, the Demand Management Options Screening Report, September 2022.

### Feasible Demand Management Options

2. The Feasible Demand Management Options for inclusion in WRMP24 are summarised in Table 1. There are 18 individual interventions in total, categorised into three areas. The black text refers to options included in WRMP19 which have been reassessed for inclusion in WRMP24. The green text highlights new options for WRMP24 which have been identified through further work and discussions with stakeholders.

Table 1: Feasible Demand Management Options Summary

| Leakage | Metering | Water Efficiency |
|---|---|---|
| Advanced District Metered Area intervention (DMAi) | Progressive Metering Programme (PMP) | Digital Engagement |
| Leakage Innovation | Progressive Smart Upgrade Household (HH PSUP) | Household Innovation and Tariffs |
| Mains Rehabilitation | Bulk Metered Area (BMA) | Smarter Home Visits (SHVs) - (PMP) |

| Leakage | Metering | Water Efficiency |
|---|---|---|
| | Mini Bulk Metered Area (mBMA) | SHVs - Optants |
| | Progressive Smart Upgrade Non-household (NHH PSUP) | SHVs - Progressive Smart Upgrade Programme (PSUP) |
| | Metering Innovation – PMP | Wastage Fix |
| | Metering Innovation – (PSUP) | Green Redeem |
| | | Smarter Business Visits (SBVs) |

Black Text – Options included in WRMP19 and reassessed for inclusion in WRMP24
Green Text – New options for WRMP24

3. This paper provides the detail that informs these interventions, further information can be found under the Metering, Water Efficiency and Leakage Reduction Sections of this report.

# Metering

## Metering interventions

4. The demand management options screening process identified seven feasible metering interventions. The interventions are described in Table 2.

Table 2: Feasible metering intervention descriptions

| No. | Feasible Intervention | Description |
|---|---|---|
| 1 | PMP | The PMP is a progressive programme where currently unmeasured household customers are compulsorily metered. This programme is applicable to all property types (detached, semi-detached and terrace properties and individual dwellings in Mini Bulk and Bulk properties).<br>For WRMP24 digital meters will be installed which are either AMI or AMR meters (see Section - Meter technology) for more details on meter technology). The new meters enable water use reduction through customer behavioural change, and identification of wastage and customer side leaks. |
| 2 | PSUP - household | The PSUP is a proactive programme to upgrade households with a basic meter to meters with smart or AMI technology. The new smart meters allow for easier identification of customer side leaks. |
| 3 | BMA | This programme installs a large smart meter to detect supply pipe leakage to multiple properties. Individual household and non-household properties within the meter area can be unmetered and unmeasured.<br>• BMA are typically fitted to blocks of flats where the supply covers more than 25 properties<br>• mBMA are appropriate for single buildings and supplies which cover less than 25 properties |
| 4 | mBMA | |
| 5 | Metering innovation - PMP | This option investigates and implements innovative technologies and approaches to meter properties currently regarded as unmeterable under the PMP and PSUP interventions.<br><br>The PMP and PSUP programmes are limited by current deliverability and technological constraints:<br>• 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)<br>• Unmeterable properties - properties where it is impractical or a health and safety risk to provide an installation<br>This option aims to reduce the number of no access and unmeterable properties through:<br>• No access innovation<br>– Compulsory metering of properties when customers vacate or move into a property.<br>– Extending access to customer support, increased meter installation and operating hours and covering a portion of reinstatement works where an external meter installation impacts a customers' driveway or garden |
| 6 | Metering innovation – PSUP | |

| No. | Feasible Intervention | Description |
|---|---|---|
| | | • Unmeterable innovation – employing innovative and emerging technological solutions to meter customers who are currently considered unmeterable.<br>• Investment in innovation trials through AMP8. The technology and approaches to achieve the ambition for metering innovation is either emerging or is yet to be developed. |
| 7 | Progressive Smart Upgrade Programme – non-household (NHH PSUP) | The PSUP NHH is a proactive programme to upgrade non-household properties with a basic meter to meters with smart or AMI technology. The new smart meters allow for easier identification of customer side leaks. |

5. The feasible metering options and the types of benefits associated with each option are shown in Table 3. This table also indicates whether an option was considered at WRMP19.

Table 3: Feasible metering options

| Option | | Customer Side Leakage Reduction | Household Behavioural Use Reduction | Household Wastage Reduction | Non-Household Reduction | WRMP19 or New |
|---|---|---|---|---|---|---|
| 1 | PMP | Yes | Yes | Yes | | WRMP19 |
| 2 | Progressive Smart Upgrade Programme Household (HH PSUP) | Yes | | | | WRMP19 |
| 3 | BMA | Yes | | | | WRMP19 |
| 4 | mBMA | Yes | | | | WRMP19 |
| 5 | Metering Innovation – PMP | Yes | Yes | Yes | | New |
| 6 | Metering Innovation – PSUP | Yes | | | | New |
| 7 | NHH PSUP | Yes | | | Yes | New |

### Property types and meter sizes

6. The metering interventions are targeted at different property types and in some cases target groups of properties. The types of properties targeted, and the meter installation types associated with them are described in this section.

7. **Houses** – terraced, detached or semi-detached. Meters can be installed internally or externally. An external meter requires the installation of a standard boundary box. If this is not present, dig work is required in order to install the meter.

8. **Individual dwellings in a block of flats** – installation of a meter to measure the supply to individual dwellings in a block of flats – a meter is required for each individual dwelling. Similar to houses, the meters may be installed externally or internally. Meter installation is only possible if each

individual dwelling has a single supply pipe and is not possible where any dwellings have shared supplies.

9. **Bulks and mini bulks** - installation of a single bulk meter on the supply pipe of a block of flats. This requires the installation of a large chamber outside the property to house the meter which is significantly more labour intensive and therefore expensive than the standard boundary box required for houses. Bulk meters do not measure supply to individual dwellings within the block of flats.

- A BMA is described as:
  - 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 include metered and unmeasured and household and non-household properties within the BMA
- An mBMA is described as:
  - Feeds up to 25 properties
  - Supplies one building only[1]
  - 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 premise) within the mBMA

### Meter technology

10. New basic meters are no longer being installed but are still operational at properties where they have previously been installed. Basic meters are a conventional meter with a register dial. Meter readings 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 record and check the meter serial number. Basic meters do not have any smart connectivity.

11. Smart meters

- **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)[2] and wide area network (WAN) communication system is available.

  Electronic readings are remotely passed from the meter to our Smart Meter Operations Centre (SMOC) which is responsible for the storage and analysis of our smart meter data.

[1] Exception – Terraced houses of up to 4 properties
[2] 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' 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.

- The current WAN covers 95% of London and parts of the Thames Valley. By 2025/26, we aim to have WAN coverage across the Thames Valley, which will enable our PMP meters to be switched for an AMI mode at the start of AMP8. AMR meters will be installed by exception such as in the accommodation of religious or personal customer circumstances.

### Meter installations

12. To assess costs and benefits of the feasible metering interventions, the number of meters for installation were modelled. This was done by modelling the quantity of meters in each District Metered Area (DMA) based on property type, internal/external split and survey to fit ratio.

13. Each property to be metered is surveyed to:

- Determine whether it is technically feasible to meter (Section - Feasibility of meter installation – survey to fit ratio)
- Determine the most appropriate meter installation type (Section -
- Meter installation location (internal / external split)
- Obtain the required details pertaining to the property

### Meter installation location (internal / external split)

14. Meters can be installed internally or externally at a property:

- External - a meter is fitted in the pavement at the stop tap position. This has the benefit that the meter will record leakage on the customer's supply pipe aiding quicker leakage repair and the meters are easier to install and read:
  - Where there is an existing sufficient sized standard boundary box a screw in meter can be installed.
  - Where there is not a suitable boundary box, one must be excavated.
- Internal - a meter is fitted at the first stop tap inside the property. This location is used if the property does not have an individual supply.

15. In order to accurately understand the distribution of meter types in a DMA, it is necessary to understand the split of internal and external meters. Table 4 and Table 5 show the split of internal and external meters for different property types relevant to WRMP24.

Table 4: Type of meter installation by property type for London – percentage of installations by property type[3]

| Property type | External - Screw In | External - Dig | Internal |
|---|---|---|---|
| Detached | 33.34% | 34.48% | 32.18% |
| Semi-detached | 30.24% | 30.18% | 39.58% |
| Terrace | 31.92% | 31.97% | 36.12% |
| Dwellings in mBMAs | 4.49% | 3.90% | 91.60% |
| Dwellings in BMAs | 1.32% | 0.98% | 97.70% |
| Unknown | 0.00% | 5.36% | 94.64% |

Note: Some of the values in the table may be subject to rounding due to being displayed to 2 decimal places.

Table 5: Type of meter installation by property type for Thames Valley – percentage of installations by property type[4]

| Property type | External - Screw In | External - Dig | Internal |
|---|---|---|---|
| Detached | 33.97% | 29.13% | 36.91% |
| Semi-detached | 32.08% | 21.75% | 46.17% |
| Terrace | 36.95% | 17.68% | 45.38% |
| Dwellings in mBMAs | 9.42% | 4.33% | 86.25% |
| Dwellings in BMAs | 3.79% | 2.17% | 94.04% |
| Unknown | 0.00% | 10.00% | 90.00% |

Note: Some of the values in the table may be subject to rounding due to being displayed to 2 decimal places

### Feasibility of meter installation – survey to fit ratio

16. It is not possible to install meters at all properties. This can be for a variety of reasons, both technical and economic. Typical reasons preventing a meter installation include but are not limited to:

- More than two water meters per supply are required to calculate the consumption
- It is unreasonably expensive to do so which is defined as where the total cost exceeds a 50% uplift on the standard cost
- The installation would create an unacceptable health and safety risk
- There is a communal hot water supply

17. To accurately model the potential number of meters installed in a DMA, it is therefore necessary to apply a survey to fit ratio to each property type. The survey to fit ratio is the % of successful installs (governed by the constraints mentioned above) that are expected for a type of meter installation at a property type: e.g. it is expected that an external screw in meter can be successfully fitted at a detached house in the London WRZ in 97.62% of cases.

18. The survey to fit ratios applicable to WRMP24 are summarised in Table 6 and Table 7. These figures are based on our PMP meter installation experience in AMP7 and are presented separately for London and the Thames Valley.

3 Based on all of London PMP campaigns - 1.4M surveys
4 Based on all of Guildford and 8 London (representative PMP campaigns - 158k surveys)

Table 6: Survey to fit ratio for meter installations for London WRZ – percentage of successful installations by property type[5]

| Property type | External - Screw In | External - Dig | Internal |
|---|---|---|---|
| Detached | 97.62% | 97.59% | 30.48% |
| Semi-detached | 98.29% | 98.42% | 27.98% |
| Terrace | 98.63% | 99.09% | 33.79% |
| Dwellings in mBMAs | 90.82% | 90.78% | 11.83% |
| Dwellings in BMAs | 86.14% | 97.40% | 18.31% |
| Unknown | 21.95% | 66.67% | 1.10% |

Table 7: Survey to fit ratio for meter installations for Thames Valley WRZ – percentage of successful installs by property type[6]

| Property type | External - Screw In | External - Dig | Internal |
|---|---|---|---|
| Detached | 97.15% | 97.12% | 29.93% |
| Semi-detached | 97.47% | 97.57% | 28.44% |
| Terrace | 97.36% | 97.87% | 29.88% |
| Dwellings in mBMAs | 90.10% | 84.67% | 23.15% |
| Dwellings in BMAs | 86.57% | 96.11% | 22.01% |
| Unknown | 27.27% | 50.00% | 1.85% |

### No access and unmeterable properties

19. As noted above, it is not always possible to fit a meter at a property. As a result, there are a proportion of properties which are unmeterable under the PMP and PSUP programmes. Similar constraints apply to those who opt to have a meter installed outside of these programmes. There are two key constraints to properties being regarded as unmeterable:

- Properties which cannot be metered due to technical or safety constraints (see Section - Feasibility of meter installation – survey to fit ratio)
- Properties which cannot be metered due to limitations on accessing the property. It may be possible that there are no technical restrictions to metering these properties, however access to them cannot be gained

20. The metering innovation programmes (both PMP metering currently unmetered properties and PSUP for upgrading to smart meters) target resolving properties currently regarded as unmeterable through innovative approaches to resolving technical, safety and access constraints.

### Total number of meter installations

21. The number of meters that will be installed in each DMA is calculated as illustrated by Figure 2 to Figure 4:

[5] Based on all of London PMP campaigns - 397k surveys
[6] (Based on all of Guildford and 8 London (representative PMP campaigns - 56k surveys)

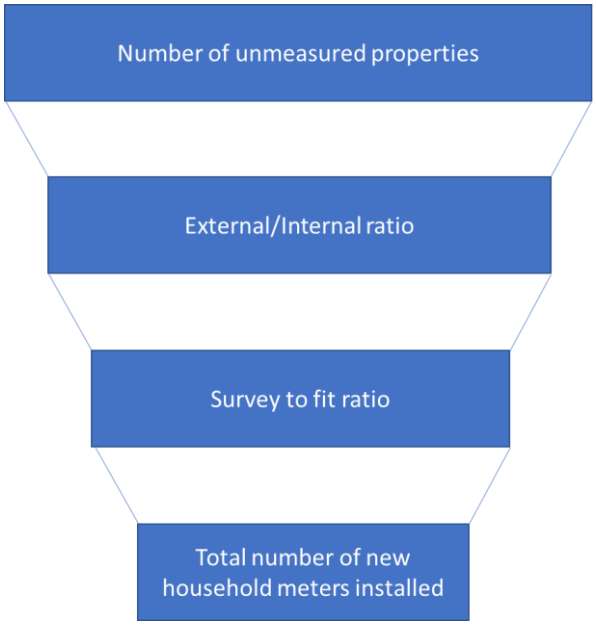


Figure 2: Number of household meters installed – PMP and Optants (for further detail refer to dossiers)

Note: The external/internal ratio and the survey to fit ratio differ by property type (see Section - Meter installations). This method applies to both households and dwellings within blocks of flats.


Figure 3: Number of household basic meters upgraded to smart meters – PSUP (for further detail refer to dossiers)

Note: the survey to fit ratio differs by property type (see Section - Meter installations). This method applies to both households and dwellings within blocks of flats. For PSUP, the external/ internal ratio is already known as existing basic meters are being upgraded.

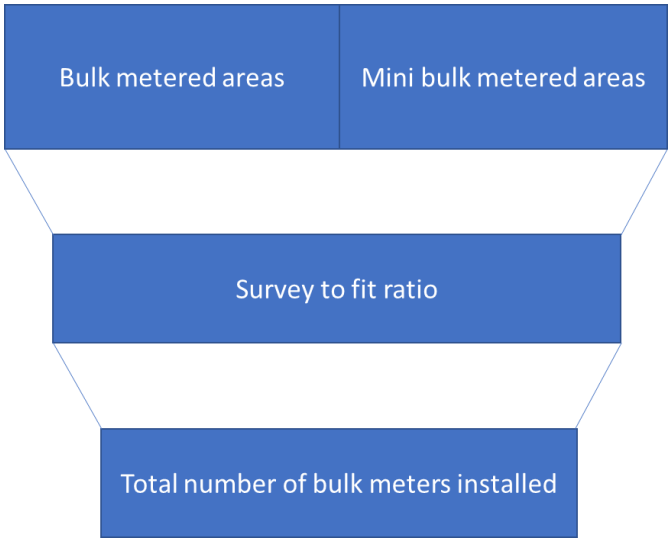


Figure 4: Number of bulk meters installed

Note: This applies to both large blocks of flats and small blocks of flats (see Section - Meter installations for the survey to fit ratio breakdown).

### Metering benefits

22. Metering (including upgrading existing basic meters to smart meters) provides demand management benefit through:

- Reduction of per capita consumption. This comprises two elements:
  - Customer behavioural change – customers changing their discretionary usage habits to reduce water consumption
  - Wastage reduction – identifying and fixing internal wastage within a property, e.g. leaking toilets or taps
- Identification of and reduction of customer supply pipe leakage

23. The assumed benefits are applied to the number of each water efficiency activity to calculate the total benefit expected from metering. The Section - Meter installations summarises the assumptions and data used to calculate the total benefit.

### Identification of leakage and wastage

24. When a customer has a smart meter fitted it will identify if there is a continuous flow of water on the property. Continuous flow is where the flow rate does not drop below a minimum consistently for a number of days.

- Continuous flow on an external meter indicates the customer either has a customer side leak on their supply pipe or wastage within their property (i.e. a leaking tap)
- Continuous flow on an internal meter indicates the customer has wastage within their property

25. When a property is identified as having continuous flow, it is labelled as a point of interest (POI) and our leakage teams will visit the property and prove whether there is a supply pipe leak or internal wastage. For WRMP24, it is assumed that a POI is applicable when a property has continuous flow greater than 5 l/hr.

26. To calculate the volume of water attributed to customer side leakage, the number of POI's raised is multiplied by the % POIs confirmed as CSL or wastage by the unit savings associated with fixing the identified supply pipe leak or wastage.

### Number of Properties with POIs and CSLs

27. For WRMP24 it is assumed that 3% of properties with external meter installations will have a supply pipe leak. This data has been derived from the PMP and this assumption is applied to all property types.

28. As noted above it is not possible for internal meters to identify a supply pipe leak, though they can help identify wastage within a property.

### Customer behaviour change and wastage reduction benefits

29. In WRMP19, we assessed the total customer consumption reduction from PMP using our Metered Consumption Model (MCM)[7]. This model compared basic meter readings to estimated unmeasured consumption per property to forecast savings from PMP.

30. Unmeasured consumption was estimated using our Domestic Water Use Study (DWUS) which consisted of approximately 1000 properties whose consumption was metered but the customer was not charged on a metered bill. We assumed these customers behaved as unmeasured customers. Measured consumption was based on 8,567 properties with a dumb meter some of these had been fitted since 1990.

31. In WRMP19 our MCM was the best and most robust dataset available to assess the savings from PMP. Although the model could forecast total consumption reduction savings from PMP, it could not split these savings into customer behavioural use changes and wastage. Our WRMP19 model showed an average usage reduction of 17% per property when a meter was fitted.

    In dWRMP24, our models have been updated to use smart meter data. Our smart meter data has given us the opportunity to reforecast the savings we expect from PMP and to split these savings between customer behavioural changes and wastage. This reforecast has been done in our Smart Meter Benefits Study[8] .

    This assessment showed an average usage reduction of 13% per property when a meter was fitted. Compared with the assumptions made for WRMP19, this is a 4% decrease in the predicted average usage benefit obtained from metering. However, since the beginning of WRMP19, Thames Water has installed and received readings from a greater number and greater variety of property types and across a wider population. This has given a better dataset that more accurately represents the property type and population make up of Thames Water's area.

32. Data for our models is available for reduction in per capita consumption (for both customer behavioural change and wastage reduction) at different property type level. Property types are detailed in the Section - Property types and meter sizes.

33. Please refer to Section 8 of the dWRMP24 for further explanation of the difference between our WRMP19 assessment and dWRMP24 assessment.

[7] Cocks, R, February 2017, 'Using Household Consumption Models to Estimate the Impact of Metering', Thames Water.
[8] Artesia Consulting, May 2022, 'Smart Metering Benefits Template_2022-05-18'

### Identification of and reduction of customer supply pipe leakage benefits

34. Data for our models is available for reduction in customer supply leakage at different property type level. Property types are detailed in the Section - Property types and meter sizes.

35. The leakage deterioration rate is applied to supply pipe leakage savings to account for the natural rate of rise in leakage resulting from aging assets.

### Metering journey and fair billing

36. Our PMP is driven by our commitment to fairer and accurate billing as well as conserving water resources.

37. In order 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. The change in customer behaviour is input into the benefit calculations as a one year depreciation towards the final expected level. This is:

- 10% of complete reductions in the year of intervention – it is assumed that customers will modify their behaviour and use less water immediately upon meter installation before any comparative billing is available
- 100% of complete reductions in the year after the intervention. The one year journey allows customers to see how metering is affecting their potential billing at the end of the first year and it is assumed that all adjustments in behaviour our complete before they are billed as a measured customer

### Meter Asset Life

38. The assumed asset life of meters installed is as follows:

- Installations until 2040 – 15 year life
- Installations between 2040 and 2055 – 20 year life
- Installations post 2050 – 25 year life

## Water Efficiency

39. The demand management options screening process identified seven feasible water efficiency interventions. The interventions are described in summary in Table 8. A more detailed description of each option is provided in the following sections.

Table 8: Feasible water efficiency intervention descriptions

| No. | Feasible Intervention | Description |
|---|---|---|
| 1 | Digital Engagement | Digital engagement will allow smart metered customers to have continuous access to their own water consumption data.<br><br>Customers will be able to view their water consumption and associated costs via a Digital Engagement Portal. The Portal will also provide advice on interpreting the available data, saving water and on identified and fixing potential leakage / wastage issues identified by the data. |
| 2 | Household Innovation and Tariffs | Household innovation and Tariffs encompasses our household activity and future tariffs implementation.<br><br>Household innovation encompasses six potential solutions:<br><br>• AMP8 Water Efficiency Innovation Trials (new) – this is the most critical of the six solutions<br>• Eliminate Wastage (new)<br>• Non-Potable Water Supplies<br>• Water Efficiency on BMAs and mBMAs (new)<br>• Media campaigns<br>• New Water Efficiency Innovation<br><br>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. In WRMP24, we plan to introduce tariffs in 2035, once we have completed our PMP to ensure fairness in billing to customers. |
| 3 | SHV – PMP | SHVs are offered to customers who are newly metered through the PMP programme. An SHV includes a free home visit by one of our qualified staff to install water saving devices and provide personalised water saving advice to households. |
| 4 | SHV - Optants | SHVs are offered to customers who are newly metered through the optants programme. An SHV includes a free home visit by one of our qualified staff to install water saving devices and provide personalised water saving advice to households. |
| 5 | SHV – PSUP | SHVs are offered to customers who are newly metered through the PSUP programme. An SHV includes a free home visit by one of our qualified staff to install water saving devices and provide personalised water saving advice to households |
| 6 | Wastage Fix | Wastage Fixes are offered to customers following an SHV if they are found they have a leaking toilet or tap. |

| No. | Feasible Intervention | Description |
|---|---|---|
| 7 | Green Redeem | Green Redeem is a scheme whereby customers are incentivised through non-financial offers to be more efficient with their water consumption. |
| 8 | Smarter Business Visits | An SBV includes a free visit by one of our qualified staff to install water saving devices and provide personalised water saving advice to non-households.<br><br>Although we are no longer a retailer to business customers following the introduction of the non-household market in April 2017, non-household customers make up a significant proportion of demand in our supply area. |

40. The feasible metering options and the types of benefits associated with each option are shown in Table 9. This table also indicates whether an option was considered at WRMP19.

Table 9: Feasible water efficiency intervention descriptions

| Option | | Customer Side Leakage Reduction | Household Behavioural Use Reduction | Household Wastage Reduction | Non-Household Reduction | WRMP19 or New |
|---|---|---|---|---|---|---|
| 1 | Digital Engagement | | Yes | Yes | | New |
| 2 | Household Innovation and Tariffs | | Yes | Yes | | WRMP19 |
| 3 | SHV – PMP | | Yes | | | WRMP19 |
| 4 | SHV - Optants | | Yes | | | WRMP19 |
| 5 | SHV – PSUP | | Yes | | | WRMP19 |
| 6 | Wastage Fix | | | Yes | | WRMP19 |
| 7 | Green Redeem | | Yes | | | WRMP19 |
| 8 | SBVs | | | | Yes | WRMP19 |

## Digital Engagement

41. Digital engagement will allow smart metered customers to have continuous access to their own water consumption data. At present household consumption data is provided 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

42. Digital Engagement will substantially improve on this system in two ways.

### Digital Engagement Portal

43. We will create a digital engagement portal to enable customers to log on and access their smart meter data at their convenience. This will enable customers to easily track their water consumption and cost each day, enabling them to identify areas where they can save water and on their bill.

44. It is envisaged that the portal will ultimately evolve to be similar to the gas and electric industry where customers can quickly see their consumption through the day. This may be from either:

- Logging on to the online portal
- Viewing their in-home display

### Digital Engagement Advice

45. 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.

46. From being able to track both their water consumption and cost throughout each day, customers will then be able to identify areas where they could save water or money on their bills.

47. 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

## Household Innovation and Tariffs

48. Household innovation and Tariffs encompasses a range of six activities:

- AMP8 Water Efficiency Innovation Trials – this is the most critical of the six solutions
- Eliminate Wastage
- Non-Potable Water Supplies
- Water Efficiency on BMAs and mBMAs
- Media campaigns
- New Water Efficiency Innovation

### AMP8 Water Efficiency Innovation Trials (new for WRMP24)

49. The technology and approach to reduce household consumption through innovation is either emerging or yet to be developed. In AMP8, we will invest in trials of both emerging approaches

and technology to test and demonstrate the most cost efficient and viable innovative solutions available to achieve long term, sustainable reductions in household consumption.

### Eliminate Wastage (new for WRMP24)

50. This solution is to find innovative ways to understand and approach these customers to repair their wastage issues where they persist after smart metering, smart home visits, wastage fixes and digital engagement. This solution is key to reach our ambition to eliminate wastage by removing the majority of wastage from household properties.

### Non-Potable Water Supplies

51. In dWRMP24, we have considered schemes which are a combination of rainwater harvesting, stormwater harvesting and greywater recycling (see Appendix O for more detail on this water efficiency measure).

### Water Efficiency on BMAs and mBMAs (new for WRMP24)

52. This solution involves conducting an SHV and, where required, a wastage repair on dwellings within revenue and non-revenue BMAs. This solution will specifically focus on those dwellings without a meter. This is a new option for dWRMP24 regarding revenue BMAs.

### Media campaigns

53. In WRMP19 intensive area based media campaigns (campaigns designed to raise awareness about water resources and water efficiency solutions in specific locations throughout our supply area) were designed with overarching messages that congratulated specific areas for saving water.

54. In dWRMP24, we will 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. 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.

### New Water Efficiency Innovation

55. Although we have an indication of the types of future household innovation, there are solutions that are yet to be conceptualised. Our new water efficiency innovation category includes these solutions and make an allowance in our plan for solutions that will be discovered and developed in the future.

### Tariffs

56. 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. In WRMP24, we plan to introduce tariffs in 2035, once we have completed our PMP to ensure fairness in billing to customers.

### Smarter Home Visits and Wastage Fixes

57. SHVs are offered to customers who are newly metered through the PMP, PSUP, or Optant programmes. Each metering type customer represents an individual feasible water efficiency option at WRMP24:

- SHV – PMP – an SHV is offered to those who are newly meter on the PMP (see Metering Feasible Options)
- SHV - optant – an SHV is offered to those who are newly metered after opting to have a meter installed

- SHV – PSUP – an SHV is offered to those who are newly meter on the PSUP (see Metering Feasible Options)

58. Where appropriate, all SHV customers are offered Wastage Fixes where they are appropriate following the SHV. The four feasible options are therefore considered together in this section.

59. An SHV includes a free home visit by one of 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 money 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.

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

61. In WRMP19, we also offered SHVs to unmeasured and basic metered properties. In dWRMP24 the volume of unmeasured properties has drastically reduced as we approach the conclusion of our PMP and complete the majority of our PSUP installations in AMP8. Water Efficiency activity on the unmeasured and basic metered properties that remain is covered by Digital Engagement.

### Green Redeem

62. Green Redeem is a scheme whereby customers are incentivised through non-financial offers to be more efficient with their water consumption.

63. It works by incentivising customers to use less water through 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.

### Smarter Business Visits

64. An SBV includes a free visit by one of our qualified staff to install water saving devices and provide personalised water saving advice to non-households.

65. Although we are no longer a retailer to business customers following the introduction of the non-household market in April 2017, non-household customers make up a significant proportion of demand in our supply area.

66. Each business type is identified by their Standard Industrial Classification (SIC) code to ensure the majority of business types can be allocated to one of the segments. The business type designations are:

- Agriculture
- Business and Social Welfare
- Chemical and Metal Goods Manufacturing
- Defence
- Education
- Health

- Hotels and Catering
- Miscellaneous Manufacturing
- Miscellaneous Administration
- Public Administration
- Retail
- Transport, Construction and Other

67. The benefits associated with SBVs are detailed in the Section - Water Efficiency Benefits.

### Scale of Water Efficiency

68. To assess the benefit and cost of the feasible water efficiency interventions, the number of water efficiency visits must be modelled. This is done by modelling the number of visits in each WRZ based on intervention type, intervention uptake rate and extent of metering.

#### Water efficiency intervention uptake rate

69. Water Efficiency Intervention Uptake Rates are based on the Water Efficiency Programme Uptake throughout AMP7. Table 10 summarises the rates applied to each intervention.

Table 10: Water Efficiency Uptake Rates

| Feasible Intervention | Uptake Rate |
|---|---|
| Digital Engagement | It is assumed that 75% of PSUP customers will engage with digital engagement and make cost savings due to them already having a meter and paying on a metered tariff.<br><br>It is assumed that 25% of PMP unmeterable properties will engage with digital engagement in AMP8. This is assumed at a conservative level to ensure no double counting with the assumption that innovation in technology will allow some unmeterable properties to become metered in AMP10. It is further assumed that 50% of the remaining will engage in AMP9; this is considered an ambitious target. |
| Housing Innovation and Tariffs | Household innovation is dependent upon innovative solutions, many of which are emergent and not yet defined.<br><br>The introduction of Tariffs is dependent upon sufficient smart metering penetration. |
| SHV | An uptake rate of 21.67% among high use customers (those who use more than 500l/d) who are offered an SHV is assumed. This value is based on the mean of:<br>• recently available uptake rate data of 13.33%<br>• an aspirational uptake rate of 30%.<br>Whilst the uptake rate of high users is consistent across the three customer streams who are offered SHVs, the distribution of high and normal (usage of less than 500l/d) customers varies between PMP, Optants and PSUP:<br>• Progressive Smart Metering programme – high user proportion assumed to be 29.39% |

| Feasible Intervention | Uptake Rate |
|---|---|
| | • Metering optants - high user proportion assumed to be 10.73%<br>• PSUP – high user proportion assumed to be 20.40% |
| Wastage Fix | It is assumed that 10% of SHVs will identify a wastage repair. Of these wastage repairs it is assumed that:<br>• 72% are from toilets<br>• 14% are from taps<br>The Wastage Fix programme specially targets toilet and tap fixes. |
| Green Redeem | It is assumed that 22% of Smarter Homes Visits will result in a Green Redeem sign up. |
| SBV | It is assumed that there will be a 10% uptake rate from business that are offered. SBVs are offered both through lettering and groundwork contact with the businesses. This 10% is the assumed rate of uptake resulting from both engagement methods. |

70. In WRMP19, we also offered SHVs to unmeasured and basic metered properties. In dWRMP24 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. Water Efficiency activity on the unmeasured and basic metered properties that remain is covered by Digital Engagement.

71. For Green Redeem, the direct sign-up rate is based on the percentage of sign-ups from SHVs during July 2021. The actual range is between 22-40%, however 22% is used as a more conservative figure.

72. For SBVs, the uptake rate is taken as an estimate based on the number of visits performed after letters had been sent out to non-household properties for 2022 across 18 postcodes in London.

73. For SBVs, the average uptake rate across a range of postcodes in which businesses have been recently contacted regarding SBVs is 8.66%. However it is noted that in some of these postcodes, the visits have not yet taken place so it would be expected that the uptake rate will increase. The majority of uptakes result from carrying out groundwork with the businesses, with a much lower response rate as a result of businesses getting in touch directly after receiving a letter offering a visit. The uptake rate is also dependent on the type of businesses – the groundwork focuses more on harder to secure properties that are likely to yield savings e.g. schools, hotels, gyms and pubs, than those that are not. An uptake rate of 10% has been assumed for SBVs.

74. Water Efficiency Intervention Uptake Rates are based on the Water Efficiency Programme Uptake during the first two years of AMP7.

### Total Number of Water Efficiency Visits

75. The number of water efficiency visits and wastage repairs that can be conducted in each DMA is calculated as indicated in Figure 5 to Figure 7.

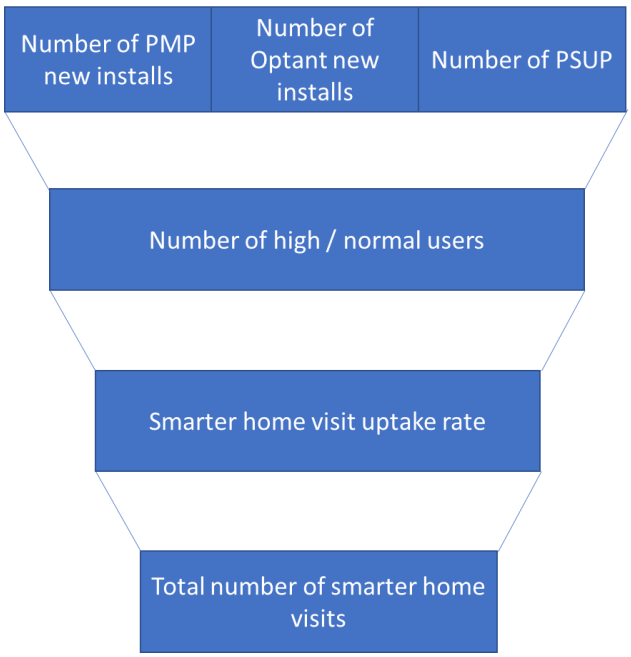


Figure 5: Total number of Smarter Home Visits

Note: the uptake rate of SHVs varies among PMP, Optants and PSUP (see Section - Water efficiency intervention uptake rate for more details).

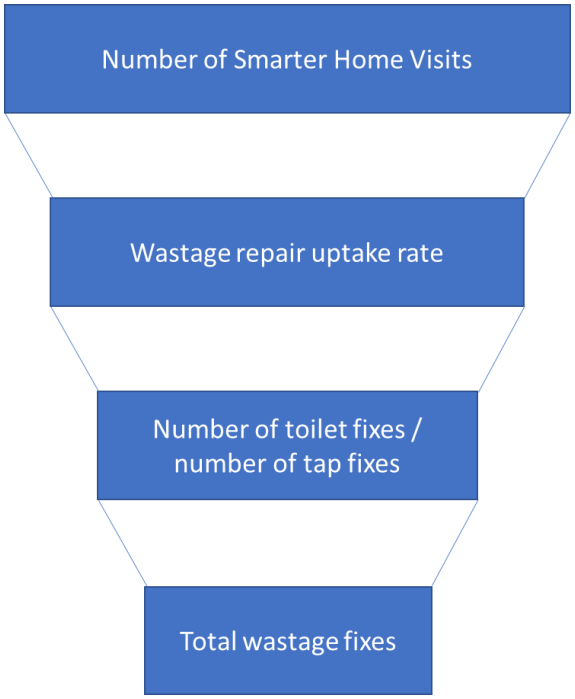


Figure 6 Total number of household Wastage Fixes

Note: See Section - Water Efficiency Benefits for the breakdown of repairs resulting from SHVs and associated Wastage Fixes.

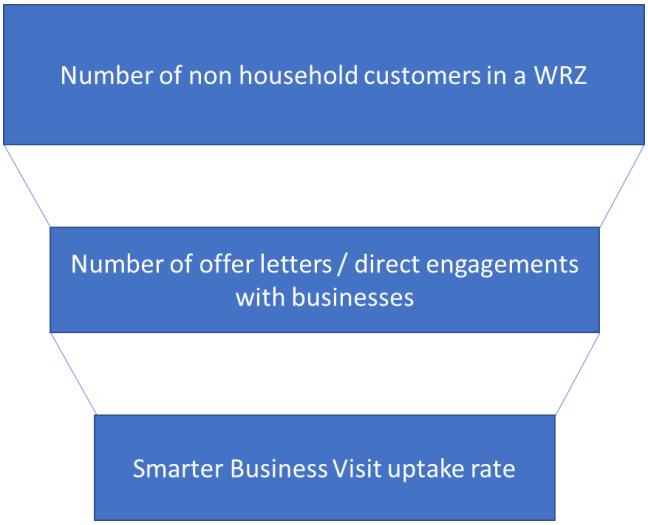


Figure 7: Total number of Smarter Business Visits

Note: See Section - Water efficiency intervention uptake rate for more details on the uptake rate of SBVs

## Water Efficiency Benefits

76. Water efficiency provides demand management benefit through usage and wastage reduction. The leakage savings provided through metering (for the combined metering and water efficiency interventions) are attributed to the metering benefit (see Section - Metering). Table 11 summarises the benefits associated with each intervention.

Table 11: Water Efficiency Benefits by Intervention

| Feasible Intervention | Benefit |
|---|---|
| Digital Engagement | See details in Section - Digital Engagement below. |
| Household Innovation and Tariffs | The benefits of this option are modelled in the form of household consumption reduction. The benefits of household innovation and tariffs have been presented as a single option. |
| SHV | For all three streams of customers offered SHVs (PMP, Optants and PSUP) the assumed resulting savings from customer behavioural change are:<br>• High users are assumed to save 70.5 l/p/d<br>• Normal users are assumed to save 39.4 l/p/d – however normal users from metering optants are not targeted for SHVs<br><br>The savings associated with wastage fixes resulting from SHVs are detailed below. |
| Wastage Fix | The assumed reduction in wastage associated from fixes resulting from SHVs is:<br>• Toilet repair - 234 litres per day<br>• Tap repair – 136 litres per day |
| Green Redeem | A 3% usage reduction is assumed |
| SBV | 2,724 l/p/d – this is a mean value applied to all business types |

## Digital Engagement

77. 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 result 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.

78. 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 per capita consumption (PCC) reduction and wastage reduction.

79. Digital Engagement will build upon the benefits provided by smart metering (PMP, PSUP and those customers who have opted to have a meter installed.) The access to continuous water consumption data is an improvement on what is currently available for customers.

80. The consumption data and advice provided through the digital engagement portal will enable easier identification of the which parts of consumption may be from leakage or internal wastage. The advice will further enable customers to find and fix leakage and wastage issues which their usage data suggests may exist.

81. The details of each of these options are described below.

82. The granularity of the data will also help customers to better understand peak usage periods and adjust their behaviour to save water. It will also alert customers when consumption is increasing, encouraging them to maintain existing savings and if their water usage is entering the "high use" category.

### Household Innovation and Tariffs

83. The benefits of household innovation and tariffs have been presented as a single option. Compared to other water efficiency options, less detail is available on the individual solutions which make up this option. This is expected due to many of the options being innovative and new.

84. As innovative solutions are trialled, the benefits that they produce will become clearer.

85. 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. In WRMP24, we plan to introduce tariffs in 2035, once our PMP is complete to ensure fairness in billing to customers.

### Smarter Home Visits

86. The average benefit following an SHV to current measured household properties is based on the statistical analysis, conducted by Thames Water's Decision Support Modelling Team. For existing metered customers who received an SHV, the reduction in consumption was determined by comparing metered consumption before and after an SHV.

87. The average benefit following an SHV to a metered high use (more than 500 l/d) property has been shown to be 70.51 litres per day. For normal use properties (less than 500 l/d) the figure is 37.94 litres per day. These figures are based upon the best available recent data.

### Wastage Fixes

88. The Wastage Fix solution avoids double counting with the wastage savings attributed to Metering due to the degree of wastage picked up by metering compared with the wastage detected by Water Efficiency. That is, the volume of water lost due to a leaky toilet/tap may not prompt a metered customer to call out a plumber based on their meter readings alone. Consequently,

metering captures significant wastage volumes on a proportion of metered properties and often a 'leaky toilet/tap' may be overlooked. However, following the water efficiency wastage campaign, the volume of water lost by each leaky toilet/tap can be captured and repaired.

89. The percentage of Smart Home Visits which have wastage fixes is assumed at 10% and is based on available data for the year 2021/2022.

90. The split of wastage repairs between toilets and taps repairs has been updated based on recently available data, as have the savings associated with the repairs.

### Green Redeem

91. Behavioural change - overall reduction in water usage due to incentive of rewards via the scheme – this is assumed to be a 3% reduction

### Smarter Business Visit

92. For WRMP24 it has been assumed that the average saving resulting from an SBV is 2,274 litres per day. This value has been calculated using data from all SBVs carried out to date.

### Water Efficiency benefits decay

*For household interventions*

93. The life of all water efficiency options has been assumed to be 7 years based on the manufacturer warranty for devices installed. After 2030, this will increase to 10 years based on the assumption that the government will require an improvement in technological reliability as they promote water efficiency.

94. Up until 2030, it is assumed that customers will maintain their savings/fix their own toilets in 65% of cases. This is assumed to then increase to 90% beyond 2030 due to Digital Engagement & Government campaigns.

*For non-household interventions*

95. The life of all water efficiency options has been assumed to be 7 years based on the manufacturer warranty for devices installed. After 2025, this will increase to 10 years based on the assumption that the government will require an improvement in technological reliability as they promote water efficiency. All commercial fittings should also last longer than 3 years.

96. It is assumed that 75% of non-household properties will pay to maintain they own savings up till 2030. After 2030 this increases to 90% of non-household properties.

## Leakage Reduction

97. The demand management options screening process identified three feasible leakage reduction interventions. The interventions are described in summary in Table 12. A more detailed description of each option is provided in the following sections.

Table 12: Feasible leakage reduction intervention descriptions

| No. | Feasible Intervention | Description |
|---|---|---|
| 1 | Advanced District Meter Area Intervention (Advanced DMAi) | Advanced DMAi employs capital and operational activity to better understand water demand and pinpoint leaks within a DMA. |
| 2 | Leakage Innovation | 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. |
| 3 | Mains Rehabilitation | Water mains rehabilitation is a traditional and long term sustainable option to reduce leakage from our distribution mains network. |

98. The feasible leakage reduction options and the types of benefits associated with each option are shown in Table 13. This table also indicates whether an option was considered at WRMP19.

Table 13: Feasible leakage reduction options

| Option | | Leakage Reduction | Household Behavioural Use Reduction | Household Wastage Reduction | Non-Household Reduction | WRMP19 or New |
|---|---|---|---|---|---|---|
| 1 | Advanced District Meter Area Intervention (Advanced DMAi) | Yes | | | | New |
| 2 | Leakage Innovation | Yes | | | | New |
| 3 | Mains Rehabilitation | Yes | | | | WRMP19 |

### Advanced District Meter Area Intervention

99. Advanced District Meter Area Intervention (Advanced 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. Several feasible leakage demand management options from WRMP19 now fall under the remit of Advanced DMAi. Where this is the case, it is noted below.

100. 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.

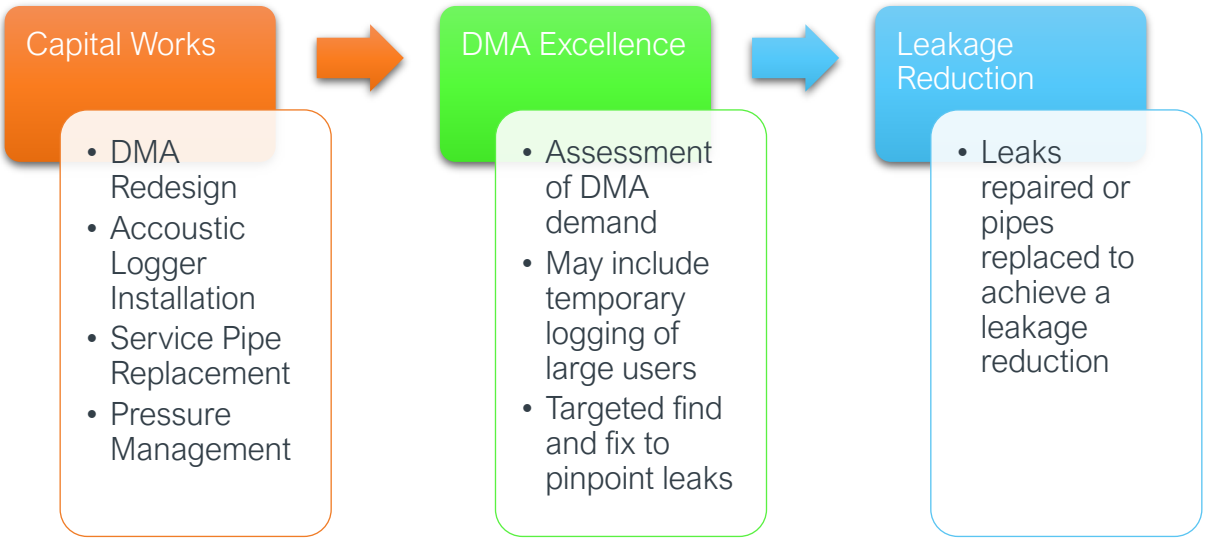


Figure 8: Advanced District Meter Area Intervention (Advanced DMAi) process illustration

### Capital Works Component

*DMA Redesign*

101. DMA Redesign is a core component of Advanced DMAi and involves DMA splitting and reconfiguration. It is required because some existing DMAs are particularly large and/or do not have configurations that make it efficient to detect and pinpoint leaks. Other DMAs are '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 many years due to the substantial traffic management required. As a result, the affected DMAs would not be available for leakage detection and leaks may run undetected.

102. DMA Redesign allows for reconfiguring DMAs regarded as having "poor" health towards good "health". The redesign aims to resolve long standing network issues and ensure key assets are more readily accessible for maintenance and repair when required. This will ensure DMAs will remain available and operable for leakage detection and repair. The three factors determining the health of a DMA (as illustrated by Figure 9) are:

- The number of district meters within the DMA. More meters increase the risk of a DMA becoming unavailable for monitoring purposes if a meter fails. Meters allow for calculation of inflows and outflows to a DMA. A DMA becoming unavailable makes understanding the mass balance difficult. Fewer inflows/ outflows and by extension district meters in a DMA contributes to good DMA health
- The number of properties within the DMA. The more properties in the DMA, the harder it becomes to pinpoint leaks because there are more connections. Limiting the number of properties within a DMA contributes to good DMA health
- The length of pipe network within the DMA. The greater the length of pipework the harder it becomes to pinpoint leaks. Limiting the length of pipework within a DMA contributes to good DMA health

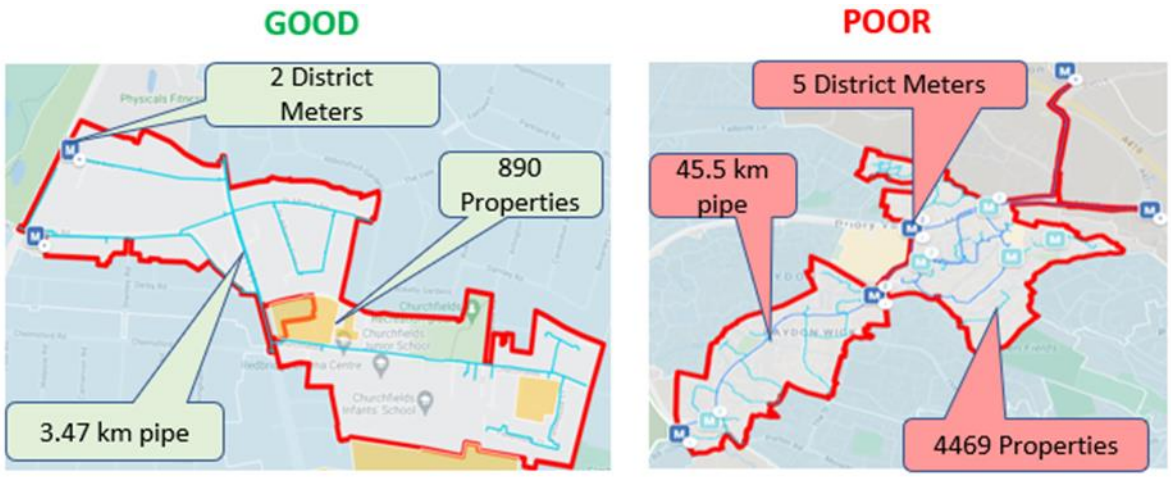


Figure 9: Illustration of DMA design

### Other Capital Works

103. The capital works component of Advanced DMAi also includes:

- Acoustic logger installation
- Service pipe replacement
- Pressure management: install new pressure management schemes within individual DMAs at sub-DMA level.

#### *Acoustic logger installations*

104. The installation of acoustic loggers enables better leakage detection.

#### *Service pipe replacement*

105. The replacement of service pipes connecting our water distribution mains with customer properties.

#### *Pressure management*

106. Pressure Management refers to the reduction of excess pressure and better management of pressure fluctuations within the water mains network to reduce the rate of leakage. To achieve this, Pressure Reducing Valves are installed within a DMA to reduce pressure within the area to a targeted level.

107. Pressure management was a feasible leakage demand management option at WRMP19. At WRMP24 it is now part of the wider Advanced DMAi option. The suitability of a DMA for a pressure management scheme will be assessed as part of this option.

### Operational Works Component – DMA Excellence

108. DMA Excellence is the operational component of work which follows from the capital component of DMA Redesign. It involves a detailed assessment of demand within a DMA that considers:

- Assets
- Properties
- Customer water demand (this may include temporary logging of large customers)

109. Following this assessment, leaks are pinpointed using both traditional and innovative find and fix techniques. At WRMP19 this was referred to as "DMA Enhancement".

### Leakage Reduction Component

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

### Advanced District Meter Area Intervention Costs and Benefits

111. It has been assumed that Advanced DMAi is 65% capex and 35% opex costs. This is based on our activity during AMP7.

112. It is assumed that 1/3 of leakage reduction achieved in an AMP period will reoccur within 15 years of the associated leakage fixes. This is based on the expected life of pressure management interventions, which are a subcomponent of Advanced DMAi intervention.

113. The cost of resolution of leakage reoccurrence is assumed to be 25% of the original cost. This is based upon the cost of recurrence during AMP7. Further investment will then be needed within 40 years. This is in line with what is expected for supply pipe repairs (i.e. leakage on supply pipework within a customer's property boundary).

## Leakage Innovation

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

115. Activities in leakage innovation include (but are not limited to):

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

116. An important part of developing technologies and approaches to leakage reduction and repair that are currently emerging or not sufficiently developed is investment in trials of the technology and approached throughout AMP8. This investment is crucial to test and demonstrate the most cost effective innovative solutions available prior to their full implementation in later AMPs.

### Leakage Innovation Costs and Benefits

117. Leakage innovation is designed to be more cost efficient than Mains Rehabilitation. It has been costed at 50% of the ml/d cost of Mains Rehabilitation. Long term innovation is costed at 50% of the Ml/d cost of median Main Rehabilitation (the cost of Main Rehabilitation in AMP11). This is based on the assumed efficiency that will be achieved through leakage innovation approached compared with traditional mains rehabilitation.

### Mains Rehabilitation

118. Water mains rehabilitation is a traditional and long term sustainable option to reduce leakage from our distribution mains network. We are responsible for over 31,000km of water mains across London and Thames Valley. A lot of London's water mains are between 100 and 150 years old and although the original cast iron mains have served customers well, the increase in road traffic, corrosive soil conditions and ground movement mean they are more likely to leak or burst. We are therefore investing heavily in replacing the original mains.

### Length of Mains Rehabilitation

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

120. 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.

121. The distribution of mains replacement at pipe level is first modelled in the Distribution Mains Model. The output of this model Provides us with the costs and benefits for mains rehabilitation.

### Mains Rehabilitation Costs and benefits

122. The benefits of mains replacement are derived at DMA level based upon leakage reduction.

123. The costs of mains replacement are derived at DMA level based upon:

- Size and length of main to be replaced and the split of techniques (open cut, slip lining, pipe bursting and directional drilling)
- For London, costs are based on costed schemes, borough/cost zone cost models where provided or 4 zone cost models. In Thames Valley, costs are based on inner city and outer city cost models

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