Revised Draft Water Resources Management Plan 2024

Technical Appendix N - Metering

Contents

Figures

Tables

Background and Introduction

N.1 Our supply area was designated as being in an area of serious water stress[1] and, in 2012, legal powers were granted to us to compulsory meter properties across our area by the Secretary of State. In the Water Resources Management Plan 2014 (WRMP14), this led to our Progressive Metering Programme (PMP) being initiated within the London Water Resource Zone (WRZ).

N.2 The Water Services Regulation Authority (Ofwat), Department for Environment, Food and Rural Affairs (Defra), the Greater London Authority (GLA) and CCW (formerly the Consumer Council for Water) have all stated support for metering as the fairest way for customers to pay. Metering also has broad customer support, recognising that it is fair to pay according to how much water is used, it encourages water efficient behaviour and helps deliver a secure and reliable service into the future.

N.3 Our household and non-household metering programmes are using smart water meters, based on Advanced Metering Infrastructure (AMI) capability. Our smart meters are recording hourly consumption reads and relaying this data through a dedicated Fixed Area Network of communication masts across London and parts of Thames Valley. Each meter aims to provide 24 hourly reads each day.

N.4 Our programme of progressive metering is underway in London and Thames Valley, with over 1,000,000 smart meters installed by the end of June 2023. The data from these meters is being used to improve the accuracy of water balance calculations, educate customers on their water consumption, enable customers to self-fix their internal 'wastage' leaks, inform our Water Efficiency Smarter Home Visit (SHV) programme, engage with non-household (NHH) retailers on consumption and continuous flow volumes, and build up our database on water consumption and customer side leaks (CSL).

N.5 This section provides an overview of our metering delivery programme in AMP6 and AMP7, the information used to determine our metering programme for AMP8 and beyond and the interconnections between metering and other demand management interventions.

N.6 This appendix should be considered in conjunction with WRMP24 Section 8 – Demand options.

[1] Environment Agency and Natural Resources Wales, 'Water stressed areas – final classification', July 2013

AMP6 and AMP7 Metering Performance

Metering Delivery

N.7 The total demand reduction obtained from metering is dependent on the type of metering undertaken and whether it results in a consumption reduction (behaviour change + wastage), leakage reduction or both. In AMP6 and AMP7, our metering programme included four delivery models: our Progressive Metring Programme (PMP), bulk metering, optant metering and replacement metering on both household and non-household properties.

PMP

N.8 Our PMP applies to any currently unmetered household property where a meter can be installed. This applies to detached, semi-detached and terraced properties as well as metering individual dwellings in small or large blocks of flats.

N.9 PMP metering on household properties provides both a consumption benefit, from reduced customer consumption and internal wastage reductions, and a leakage benefit, from the increased ability to detect and repair CSLs.

N.10 Meters can be fitted either externally or internally at a property. This means:

- External: a meter is fitted in the pavement in the boundary box which houses the outside stop valve. This meter is fitted at the property boundary so will record leakage on the customer's supply pipe, aiding quicker leakage repair. External meters are also easier to install and read
- Internal: a meter is fitted at the first stop tap inside the property, for example under the customer's kitchen sink. An internal meter requires customer approval for access into the property and is fitted if the property does not have an individual supply pipe. A significant proportion of dwellings that would need an internal meter fitted are deemed unmeterable due to lack of property access, lack of suitable access to pipework, multiple water inflow pipes into single properties, shared supply pipework, or communal hot water systems using separate pipework.

N.11 Due to the ability to achieve both a usage reduction and leakage reduction (through CSL repair) from an external meter installation, we attempt an external meter installation in the first instance. Where an external meter installation is not feasible, we will conduct an internal meter installation. Meter installations are conducted according to the following hierarchy:

- External:
    1) In an existing meter chamber
    2) To replace an existing outside stop valve (OSV)
    3) On the customer side if there is an existing meter chamber
    4) On the customer side to replace an existing OSV
    5) On the pavement side, at least 2m from the point of entry to the building

6) On the pavement, less than 2m from the point of entry to the building but only where the contractor assesses there is a low risk of leakage or failure based on the material and condition of the supply pipe

- Internal:

7) At the nearest practicable point after the inside stop valve (ISV)

N.12 It is not possible to meter all properties. This applies to properties that:

- Fall outside the above meter location hierarchy
- Have an unacceptable installation health and safety risk
- Require more than two meters per supply to calculate consumption
- It is not physically possible to fit a meter in accordance with our meter installation specification (e.g. shared supply pipework, communal hot water system supply separate pipe network)

Bulk Metering Programme – Bulks and Mini Bulks

N.13 Bulk metering refers to the installation of bulk meters on the supply pipes of a block of flats or household properties that are deemed unmeterable. They are typically planned and costed into large and small bulk meter categories.

N.14 There is a leakage benefit associated with bulk metering due to the increased ability to detect CSLs on the shared supply pipe with smart metering data. There is no additional usage benefit claimed against the options as bulk customers are not billed individually based on their water use.

N.15 Bulk meters are non-revenue meters that measure the water supplied to a whole multi-occupancy building. In this case the data is used to understand consumption in the whole building, including communal use and customer supply pipe leakage.

Replacement Metering Programme

N.16 Proactive replacements have been renamed Progressive Smart Upgrade Programme (PSUP) in dWRMP24. All PSUP installations in AMP8 will be AMI smart meters. PSUP installations take place on both household and non-household properties. There are two components to our replacement metering programme in AMP6:

- Reactive replacement programme: response to a contact from a metered customer, meter reader or contractor reporting a possible leak, a meter not working or reduced flow. If the meter needs to be replaced, then, in London, a smart enabled meter will be installed. In the Thames Valley, an AMR meter is installed which will become smart enabled following the rollout of our fixed network infrastructure in AMP7. Reactive replacements form part of our base plan (see WRMP24 Section 3 – Demand Forecast).
- Planned replacement programme: meters greater than 15 years old (basic meters) are replaced in London with a smart enabled meter. This can result in a leakage saving through CSL detection and repair. In the Thames Valley, an AMR meter is installed which will become smart enabled following the rollout of our fixed network infrastructure in AMP7.

Optant Metering Programme

N.17 Our optant metering programme applies to customers who request a meter. These meters are used for billing purposes and result in a reduction in usage from reduced customer consumption. All Optant meter installations will be AMI smart meters.

N.18 Optant meters form part of our base plan (see WRMP24 Section 3 – Demand Forecast).

Developer Services – New Build Properties

N.19 Our developer services programme involves the installation of a meter on all new build properties. This meter installation is completed and financed by the developer. All meter installations in new build properties will be AMI smart meters. All new build homes are required to be individually metered under Building Regulation and planning legislation.

N.20 New build properties form part of our baseline forecast (see WRMP24 Section 3 – Demand Forecast).

Fixed Network Infrastructure

N.21 To enable AMI smart metering, throughout AMP6 we undertook the process of commissioning a 'fixed network' of communication masts across our London water resource zone. These masts will communicate with our AMI smart meters and send data packages consisting of hourly meter readings to a Meter Data Management System (MDMS) database. Consumption data is available to the customer and select Thames Water operational teams at hourly scale and data is transmitted several times per day.

N.22 In AMP6 we worked with telecommunications partners to commission 106 primary masts in London. In AMP7, we are commissioning primary masts in select Thames Valley areas and are working to introduce complementary communications solutions to fill in any coverage gaps created by the primary masts in both London and the Thames Valley. Communication coverage for Thames Valley is driven by PR19 and Green Economic Recovery (GER) commitments. As the fixed network and other complimentary communication capabilities are rolled out, our smart meters are installed with Local Communication Equipment (LCE). These are initially set up as AMR, then switched to AMI as the communication coverage becomes available. From 2017, smart meters are fitted in London for all domestic customers with LCEs fitted where a fixed network mast is available.

N.23 Prior to smart metering, we received roughly 2 million meter reads per year. By the end of 2022-23, we received around 2020 million meter reads per day. Our daily meter read volume is projected to exceed 45 million by 2030.

Monitoring – Smart Metering Operations Centre

N.24 Following the commissioning of a fixed network in London in AMP6, we established a Smart Metering Operation Centre (SMOC), to monitor the performance data from smart meters stock and data acquisition, then initiate immediate action to maintain operability of the smart meter network. The SMOC identifies potential leaks at a customer's property and disproportionate consumption to assist in our DMA enhancement programme (WRMP24 Section 8 – Demand Options), and initiates field-based or digital actions to maintain communications and data service levels performance.

Field Investigations

N.25 In order to carry out our metering programmes, field investigations are required as pre-installation checks. Field investigations are street-level inspections and surveys that need to be undertaken prior to the scheduling of installations, local authority agreements, and field team mobilisation. This on-site physical work is undertaken once a metering programme has commenced.

Metering Performance

PMP

N.26 The WRMP14 forecast for total Ml/d reduction from the entire AMP6 metering programme was 45.59 Ml/d, split between usage and leakage reductions. With the increased focus on maximising customer-side leakage and wastage reduction, the combined metering programme achieved a 97 Ml/d reduction benefit.

N.27 The revised WRMP19 metering programme aims to deliver 65.80 Ml/d, through leakage and usage reductions across the different household and non-household meter installations. Covid-19 and the associated restrictions on social distancing impacted the programme's ability to engage with customers and install meters for several months through 2020-21. The programme was re-profiled to recover installation volumes in order to meet WRMP demand reduction volumes and AMP7 meter installation performance commitments.

N.28 In response to the Government's call assist with Covid-impacted economy, we proposed to bring forward an accelerated smart metering programme for the Thames Valley. Our Green Economic Recovery (GER) submission was successful and we are now commencing the installation of 204,000 additional smart meter installations by the end of AMP7. These installations will convert 200,000 unmeasured homes to smart metered, plus include 4,000 bulk and non-household smart meter installs, all in the Thames Valley WRZs, which are experiencing higher levels of demand due to post-Covid increase in hybrid working.

N.29 In WRMP14 we forecast that we would install 441,270 PMP household meters over AMP6, however, following an optimisation of the different metering programme types, delivery for the remainder of the AMP was revised to a programme of 300,000. The reduction in household meters was due to the higher-than-expected number of attempted internal meter installations in flats and converted houses which share supplies, which after detailed street investigations and installation activity, proved to be a larger proportion of London homes than first forecast. The insight gained on internal meter installations and challenges arising from different building stock types, influenced our AMP7 smart meter programme, and continues guide our plans for AMP8 PMP which will focus on internal meter installations.

N.30 Our final AMP6 PMP install volume was 331,127 against the revised 300,000 forecast. The PMP installations were forecast to deliver a combined 12.55 Ml/d from the original 441,270 installations. From combined usage and leakage savings, the 331,127 new smart meters delivered a demand reduction benefit of 12.01 Ml/d from the 331,127 installations, achieving a greater water saving per meter.

N.31 Internal installations are more expensive because of the additional cost to get in touch with customers, book an appointment and the high rate of failure owing to a customer not

granting access to the property. Internal installations also have a higher risk of being unmeterable due to the presence of communal water supplies and pipework being inaccessible. This incurs an abortive cost, which impacts the overall unit-rate cost for internal installations, and also impacts on customer satisfaction.

N.32 In response to these lessons from AMP6, in planning for AMP7 greater emphasis was placed on property type analysis and varying the mix of installation types to maximise the demand reduction benefit according to housing stock characteristics. In addition to our household metering programme, we will be targeting bulk meters to minimise the disruption and risk of failure from internal installations on dwellings within flats. Shifting the short-term focus from many internal installations to few shared supply installations (for leakage detection purposes), allows time for internal metering technology to evolve, and for improving methods for property access, reducing the volume of properties deemed unmeterable.

N.33 Additionally, successful methods of customer engagement have prompted us to implement a multi-channel customer journey that utilises text messages, emails, and online appointment booking to secure appointments.

N.34 Our AMP7 forecast for new smart meters in London is around 411,000, exceeding our M01 performance commitment target of 399,000. . By the end of 2022-23 we had installed over 246,000 smart meters. Covid-19 and government-imposed restrictions impacted our ability to engage with customers and undertake forecasted meter installation activity. We recovered the reduced installation activity between 2020 and 2022. Both the progressive and optant metering programmes were suspended for the first three months of the 2020-21 (April, May, and June) due to Covid-19 lockdown and government restrictions, which also meant a reduction in the number of customers requesting a meter under the optant metering programme. We had to re-profile the total AMP7 metering programme as a result of Covid-19 impacts. We worked effectively with our supply chain and delivery partners to address and overcome several challenges including a shortfall in securing additional resources in line with our plan and the constrained availability of smart meters and LCEs caused by the global microchip shortage.

N.35 We are forecasting to recover most of the shortfall by year three, and are maintaining an increased field resource to deliver additional meter installations, and we remain on course to deliver the AMP7 target. Our PMP and PSUP replacement install forecasts are on-track to meet our two meter installation performance commitments M01 (399k PMP installations) and M02 (130k PSUP replacement installations) by end-AMP7.

Bulk Metering

N.36 In WRMP14, we planned to install approximately 4,700 bulk meters in AMP6, delivering 10 Ml/d of predicted leakage savings. However, we have found that greater leakage reduction benefits than anticipated are being achieved per meter, and this has resulted in early delivery of the leakage reduction target and with fewer meters. Due to this success, we commissioned a second phase of bulk meter installation to maximise the demand reductions within London. By the end of AMP6 we delivered a total leakage reduction of 39 Ml/d from bulk meter installations, exceeding the original 13.3 Ml/d forecast.

N.37 To date within AMP7 we are on-track to deliver our original bulk meter installation forecast and are bringing forward additional bulk meter installs to provide continuity of workforce capability and increase the leakage savings.

Optant Metering

N.38 In WRMP14, we forecasted the need to install approximately 170,000 optant meters, following customer requests. This was revised to 86,000 optant meters during AMP6 based on customer request evidence. This is due to the impact that the rollout of PMP has had on our optant uptake as by engaging with and installing meters for PMP customers, we have seen a reduction in the number of customers opting for a meter. This is likely due to the fact that we are proactively installing one for them and is a pattern we expect to continue into future AMPs as the number of unmeasured customers reduces.

N.39 In 2017 we saw an increase in optant interest compared with the earlier part of the AMP, but this is due to the breaking up of the billing arrangements with some local authority housing into individual accounts; this is forecast to continue for the next few years. By the end of AMP6 we had installed over 93,000 optant meters across our London and Thames Valley water resource zones.

N.40 We forecasted around 81,000 optant meter requests and installs within WRMP19. To date the installation volumes are on-track with this forecast. All optant meters installed in London will be AMI enabled, with the Thames Valley optant meters switching from AMR to AMI during the course of AMP7 as meter communication capabilities are enabled.

Future Direction

N.41 The WRMP24 Section 8 – Demand Options report outlines our approach to the optimisation of the level of metering considered in our plan. This includes details of the costs, benefits, delivery methods and constraints associated with metering.

Meter technology

N.42 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.

N.43 Smart meters come in two different types:

- 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 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.

- 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.

N.44 The current WAN covers 95% of London and parts of the Thames Valley. By end-AMP7 we aim to have WAN, or equivalent complimentary communications solution 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 can be installed by exception such as in the accommodation of religious or personal customer circumstances.

Meter installations - PMP

N.45 To determine the number of meters that can be installed across our area, we model the number of meters that can be installed externally and internally (based on the 'internal/external split') and then apply a 'survey to fit ratio' to account for the fact that not all properties can be metered.

[2] Local Communication Equipment: 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.

Meter installation location (internal/external split)

N.46 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.

N.47 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 N-1 and Table N-2 show the split of internal and external meters for different property types relevant to WRMP24.

N.48 The internal/external splits used in dWRMP24 are.

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%

Table N-1: Type of PMP meter installation by property type for London – percentage of installations by property type[3]

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%

Table N-2: Type of PMP meter installation by property type for Thames Valley – percentage of installations by property type[4]

Feasibility of meter installation – survey to fit ratio

N.49 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

[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)

- The installation would create an unacceptable health and safety risk
- There is a communal hot water supply
- Property survey confirms that necessary inflow pipework is not available or accessible for meter installation

N.50 To accurately model the potential number of meters installed in a DMA, it is 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.

N.51 The survey to fit ratios applicable to WRMP24 are summarised in Table N-3 and Table N-4. These figures are based on our PMP meter installation experience in AMP7 and are presented separately for London and the Thames Valley.

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 N-3: Survey to fit ratio for PMP meter installations for London WRZ – percentage of successful installations by property type[5]

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%

Table N-4: Survey to fit ratio for PMP meter installations for Thames Valley WRZ – percentage of successful installs by property type[6]

** For our draft WRMP, survey-to-fit ratios were based on AMP7 data gathered from the targeting of external meters (as above). For our revised draft WRMP, 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.*

No access and unmeterable properties

N.52 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.

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

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
- 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

N.53 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.

Number of meter installations - PMP

N.54 The number of meters that will be installed by the PMP is calculated as per Figure N-1. For further detail, refer to WRMP Appendix R – Scheme Dossiers.

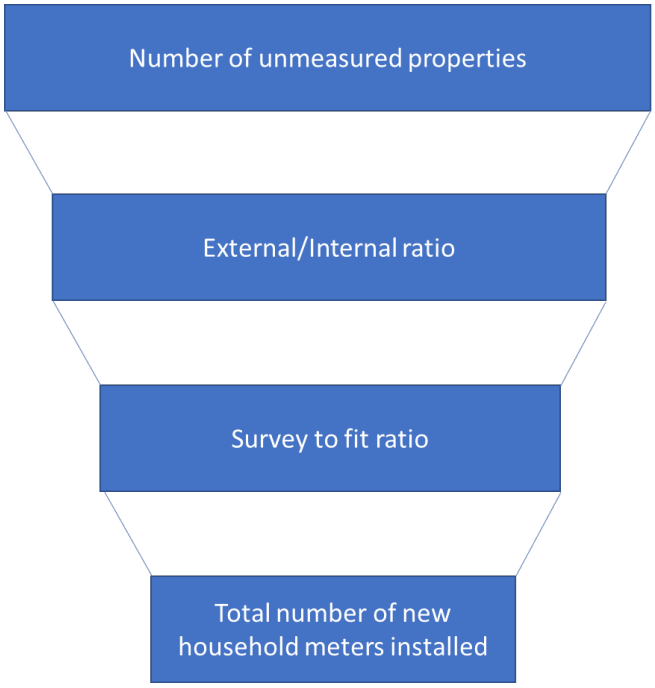

Figure N-1: Number of household meters installed – PMP and Optants

Meter installations - PSUP

N.55 We already know the internal and external split of basic metered properties, since PSUP is based on upgrading basic metered properties to smart.

N.56 However, the success of upgrading a basic meter to smart is still subject to a Survey to Fit ratio. These ratios are based on our activity from AMP7. They are shown in Table N-5.

	External	Internal
All property types	97.35%	41.24%

Table N-5: Survey to Fit ratio for PSUP installations for London and Thames Valley (as at 2022-23)

Number of meter installations – PSUP

N.57 The number of meters that will be installed by PSUP is calculated as per Figure N-2. For further detail, refer to WRMP Appendix R – Scheme Dossiers.

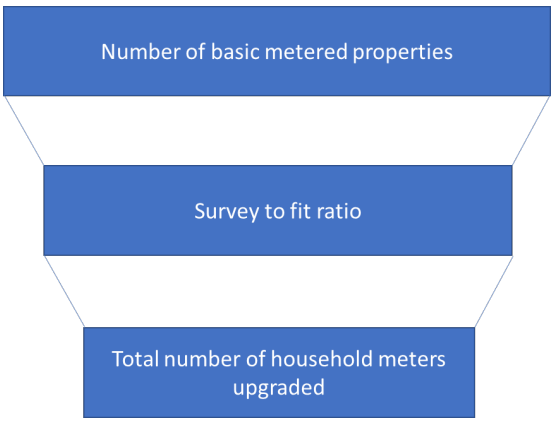

Figure N-2: Number of household basic meters upgraded to smart meters – PSUP

Meter installations - Bulk

N.58 All bulk and mini bulk meters are installed externally.

N.59 The success of installing a bulk meter or the Survey to Fit ratio is categorised by WRZ. These are summarised in Table N-6.

WRZ	Mini Bulks	Bulks
London	52.77%	59.0%
Guildford	56.74%	59.0%
SWOX	48.99%	59.0%
SWA	48.99%	59.0%
Kennet Valley	48.99%	59.0%
Henley	48.99%	59.0%

Table N-6: Survey to Fit ratio for Bulk and Mini Bulk installations

Note: only London numbers were available for Bulks and have been assumed to be applicable for Thames Valley

Number of meter installations – Bulks

N.60 The number of bulk/mini-bulk meters that will be installed is calculated as per Figure N-3.

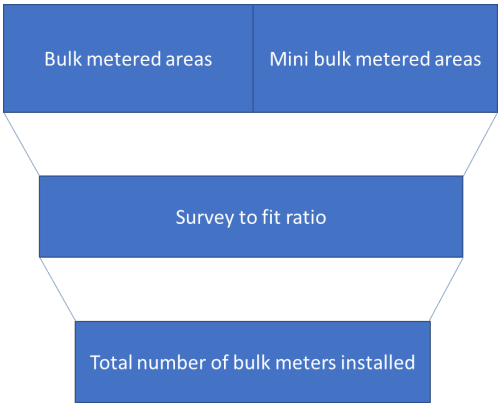

Figure N-3: Number of bulk meters installed


Thames
Water