

Title:	<b>Report AR1206 Annex A</b>		
	<b>Customer supply pipe losses</b>		
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Author(s):	Dene Marshallsay Joseph Sanders	email:	rob@artesia-consulting.co.uk

**This document is one of five technical annexes that accompany the main report “The long-term potential for deep reductions in household water demand” produced for Ofwat by Artesia Consulting.**

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## 1. Introduction

The scope of the main report is to analyse factors that affect domestic water consumption. For example, customer behaviour, design and use of water-consuming products, use of water meters, and tariffs, and the Internet of Things (IoT). This study has therefore concentrated on the potential to reduce consumption in the home expressed as per-capita consumption (PCC). The PCC metric does not include supply pipe leakage. However, supply pipes are the responsibility of the homeowner, and represent a ‘demand’ from domestic properties from the water network. Therefore Section 3 of the main report looks at the potential to reduce leakage from customer supply pipes. This annex provides some additional background data and evidence to support the findings contained in the main report.

## 2. Definitions

### 2.1. What are customer supply pipes?

There is no statutory definition of the customers’ water supply pipe; the legislation does however define the service pipe. This section explores the formal definitions of service and supply pipes that are in common use, and presents the definition of the customer supply pipe used in this report.

The Water Industry Act 1991<sup>1</sup> provides the following definitions:

*“service pipe” means (...) so much of a pipe which is, or is to be, connected with a water main for supplying water from that main to any premises as—*

- a) *is or is to be subject to water pressure from that main; or*
- b) *would be so subject but for the closing of some valve”.*

The Service Pipes Manual<sup>2</sup> provides the following definitions for the elements of a service pipe:

*“In simple terms the service pipework represents that part of the water supply systems which conveys the water from the distribution main to the customer’s property and is normally subject to the available water pressure from that main. The “service pipe” is defined as so much of a pipe connected with a water main as is subject to pressure from that main; but it is usual to consider the complete service pipework as comprising three main elements:*

<sup>1</sup> The Water Industry Act 1991, Chapter 56, 25 July 1991.

<sup>2</sup> The Service Pipes Manual. The Foundation for Water Research. 1993.

- the communication pipe;
- the supply pipe;
- the internal plumbing.”

An UKWIR report<sup>3</sup> on supply pipe adoption, provides the following definition:

*“The supply pipe is normally the length of the service pipe that is between the boundary of the part of the street in which the water main is laid and any terminal fitting connected to it (e.g. tap, float operated valve or inlet to an appliance). The definition further divides in common use into the underground supply pipe and the above ground supply pipe. The usual termination between these is the internal stop valve.”*

The report goes on to provide further clarification, which it suggests should be used in defining the supply pipe when discussing supply pipe adoption:

*“For the purposes of the analysis the adoptable portion of the supply pipe that is under consideration is the underground supply pipe, (i.e. that part between the property boundary through to its emergence above ground through the floor or in an external wall box). It is assumed that the underground supply pipe is or can be terminated at the internal stop valve.”*

This definition avoids potentially difficult cases of blocks of flats which may either have separate above ground supply pipes to each flat, or may have a common feed for all or part of the supply. The above ground pipework before entry to each flat is assumed to remain the responsibility of the landlord/freeholder.

In Defra/Welsh Government’s consultation document<sup>4</sup>, the following definitions are used:

*“For the purpose of this consultation private water supply pipes are the service pipes which connect a property to the water mains and which are not in the ownership of the water supply companies. The private water supply pipe is generally the pipe that runs from the boundary of a property through to its emergence above ground in the property or in an external wall box of the building itself. This portion of pipe is normally owned by the property owner.”*

In summary, the various definitions detailed above are similar, but vary in their precise description, and therefore may convey an element of confusion to the non-technical reader. For the purposes of discussing the issues surrounding the customer’s supply pipe in this project we have used the following definition:

The customer supply pipe is the underground supply pipe, i.e. that part between the property boundary, the Company’s boundary valve (A) in Figure 1, through to its emergence above ground through the floor of the property or in an external wall box. In Figure 1 the green section of pipe illustrates the customer’s underground supply pipe.

## 2.2. Customer supply pipe leakage, household consumption definitions

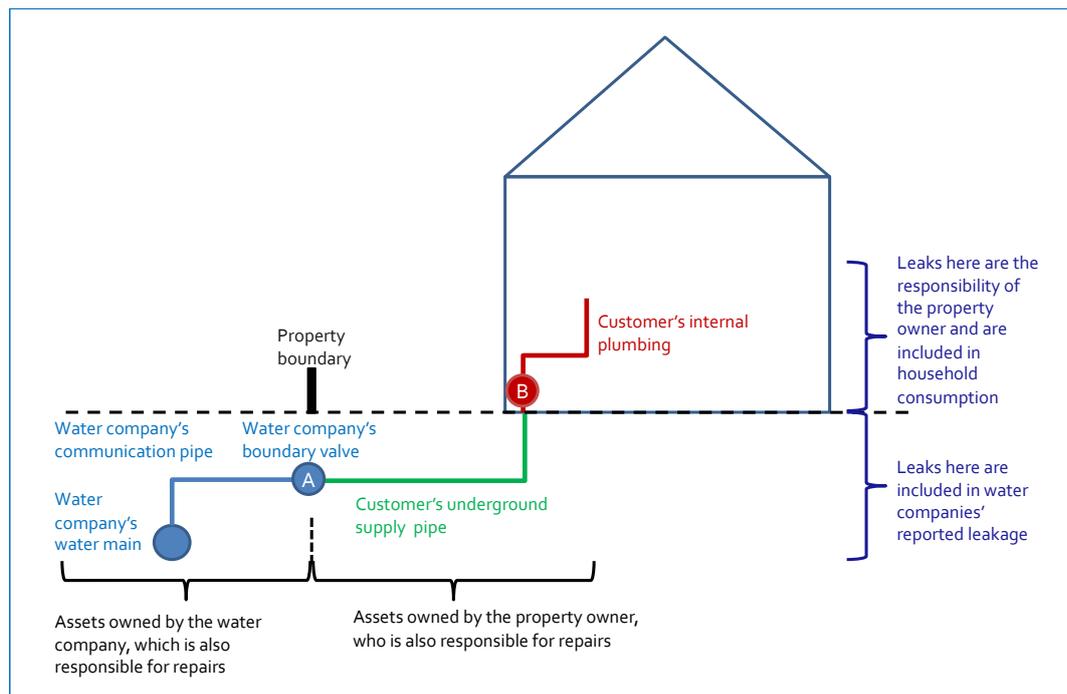
Referring to Figure 1:

- Household water consumption is the water flowing into the property past point ‘B’. This includes water consumed, water wasted and losses inside the household or from external taps.
- Customer supply pipe leakage includes any losses from the pipe connecting point ‘A’ and ‘B’.

<sup>3</sup> UKWIR, Issues regarding the potential adoption of supply pipes: costs, customer service and regulatory impacts. Report Ref. No. 09/CU/01/4. 2009.

<sup>4</sup> Consultation on the future management of private water supply pipes. Defra/Welsh Government. 23 May 2013.

Figure 1 House consumption and customer supply pipe leakage definitions



### 2.3. Responsibilities

Referring to Figure 1, the pipe coloured blue (the water main and communication pipe) is generally owned by the water company. The pipes coloured green (the underground supply pipe) and red (the internal plumbing) are normally owned by the property owner. This study is focussed in household consumption and customer supply pipe losses. Household consumption includes all water consumed or wasted after point B in Figure 1, this includes any plumbing losses or leaks from pipes and appliances. Leaks or losses from the underground supply pipe (the green pipe in Figure 1) are included in Water Companies' reported leakage, although the property owner is still responsible for the underground supply pipe asset and for repairs to that asset.

Figure 1 shows the case for a single property. However, in some situations, the underground supply pipe may be shared by several properties. In these situations, the properties that share the supply pipe (or a section of the supply pipe) generally have joint responsibility for that section of pipe, although this may vary for some water companies. This is shown graphically in Figure 2 and described in Table 1, sourced from Ofwat<sup>5</sup>, for single and shared supply pipes serving more than one property. Table 1 also identifies what type of land the supply pipe may run under and provides an indication of who has responsibility for the pipe.

Note: There are slight variations to this definition from water company to water company; therefore, the situation should be clarified with each individual water company.

The lack of understanding around ownership of customer supply pipes, with only 44% of households knowing it was their responsibility to fix a CSPL<sup>6</sup>, makes it a challenge to reduce this area of water demand in households. The challenges increase when there is shared ownership of a supply pipe between a number of customers.

<sup>5</sup> <http://www.ofwat.gov.uk/consumerissues/rightsresponsibilities/supplypipes>

<sup>6</sup> UKWIR. Supply Pipe Ownership - The Customer View. Report ref: 14/CU/01/8

Figure 2 Water pipes – responsibilities

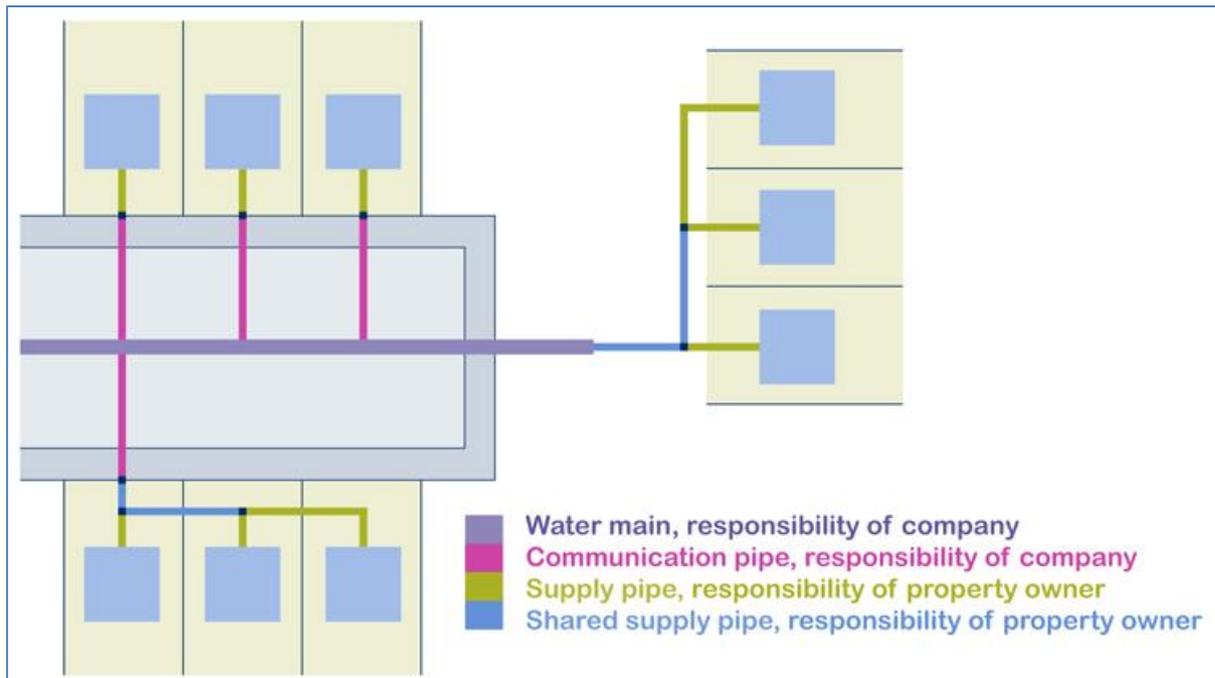


Table 1 Responsibilities for water pipes

Type of pipe	Laid under	Responsibility for pipe
Water mains	Highway	Water company
	Property owner's land	
	Land owned by someone else	
Communication pipe	Highway	Water company
Supply pipe serving a single property	Highway	Property owner
	Property owner's land	
	Land owned by someone else	
Shared supply pipe serving more than one property	Highway	Joint responsibility of all property owners served by pipe.
	Land owned by any of the property owners served by the pipe	
	Land owned by someone else	

### 3. Customer supply pipe materials

Materials historically used for supply pipes, and can therefore still be found in the ground throughout the UK, are:

- Lead
- Galvanised steel (or galvanised "iron")
- Copper (bare and sheathed)
- Black polyethylene (LDPE and HDPE)
- Blue Medium Density Polyethylene (MDPE)- including barrier pipe

Not all these materials are still being used, for example lead; and nowadays all materials and fittings used must comply with Water Supply (Water Fittings) Regulations 1999<sup>7</sup>. Blue medium density polyethylene (MDPE) pipes are currently the most commonly used material for below ground communication and supply pipes.

The length of customer supply pipe is not accurately known, however using an estimated length per property of 9 meters, and assuming about 25 million homes in the UK, there are approximately 225,000 km of customer supply pipe in England and Wales. This compares to about 340,000 km of water mains in England and Wales. Neither is the material that they are made from accurately known, this is normally assumed from the age of the property and the material used at the time of construction.

### 4. Leakage from underground supply pipes

As explained in Section 2.3 it is the customers who are responsible for the maintenance of their supply pipes, it is the water companies who are responsible for reporting of leakage to their regulator. The total reported leakage includes supply pipes leakage, and therefore water leaking from a customer's underground supply pipe has an impact on the Water Company's ability to meet their leakage target. The responsibility for leakage from the communication pipe, underground supply pipe and internal plumbing is illustrated in Figure 1.

In order to allow water companies to manage leakage from the underground supply pipe, water companies have a legal right (under the Water Industry Act 1991) to insist that customers repair leaks on their supply pipes. In practice, water companies have a range of different policies for dealing with underground supply pipe leaks.

Many water companies will work with their customers to resolve underground supply pipe leaks, but the companies can also issue a formal 'waste notice'. This means that the water company can insist that the leak is repaired, or carry out the repair on the owner's behalf and charge them for the repair. A summary of the various customer supply pipe leak policies currently in operation is listed below:

- CSPL repair free of charge under certain conditions (e.g. the first leak is free of charge).
- Advice and information about approved plumbers or underground installers is given to customers.
- CSP replacement free of charge under certain conditions.
- Advice on responsibilities and leakage allowance.
- Subsidised CSP replacement.

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<sup>7</sup> Statutory Instruments 1999 No. 1148, Water Industry England and Wales, The Water Supply (Water Fittings) Regulations 1999.

- The first repair free if supply is metered. The second repair subsidised if the supply is metered. Subsidised replacement.
- Advice on responsibilities. Information on local contractors. If repair carried out within 30 days of discovering a leak, a contribution to the cost may be made.

In addition to leak detection and repair support, many water companies offer a reduction in a customer's bill if a leak on their supply pipe is found. This only applies to customers who pay on a metered basis and is given as rebate for water lost through the leak. In such cases water companies will estimate the volume of water that could be attributed to the leak but will only offer the rebate if the leak is repaired or the pipe replaced (through a water company's scheme or by a third party).

From a water company's perspective repairing or replacing underground supply pipes carries a large amount of risk. The cost of the repair or replacement is well understood, however it is the reinstatement of the customers land that has a potentially significant cost. This is due to the wide variety and expense of the surfaces that customer supply pipes lie under from brickwork drive ways to landscaped gardens. This makes the management and costs of resolving customer supply pipe leaks much harder to estimate than the rest of the network. It also means that the skill set for CSP repair contractors needs to be much wider than those contractors just carrying out pipe repairs and replacements in the carriageway, footpaths or verges. When these costly reinstatements are not carried out this causes issues with customer satisfaction, which impacts on SIM metrics.

Certain companies have had success by not offering a supply pipe repair for free, but support the customer through the process with a designated team. This has helped them improve their SIM score, and helped to reduce customer supply pipe leakage.

Customer supply pipe leaks are found either by sounding on the stop tap to listen for a leak or by investigation of high anomalous meter reads. For unmetered customers sounding is the only option, this means that small, but significant leaks could be running for months, or even years, without detection. For metered customers the frequency that the meter is read for billing purposes affects the length of time a leak can be running. With new smart meters being installed the length of time for a leak to be identified should be reduced significantly.

Smart metering, higher frequency meter readings and analysis has the potential to improve the detection and quantification of CSPL. Potential leaks can be confirmed more quickly leading to shorter leak run times for CSP leaks. Smart leak sensors for customers' internal plumbing that can identify internal losses and notify the customer have recently entered the market. These combined with the smart meters would further assist with the clarification between a CSPL or an internal water loss.

## 5. Changing supply pipe ownership

All of this makes reducing leakage from this asset a complex and challenging problem, balancing the needs of customers with water companies' targets and ODIs for leakage and customer service.

This is recognised by Government, and in 2013/14 was the subject of a consultation on the ownership of customer supply pipes, and whether they should be brought under the control of water companies in a similar way to private sewers. During the consultation there was a significant amount of research carried out by both water companies (through UKWIR), and Government on the impacts to customers, the costs and benefits of customer supply pipe leakage.

Under this consultation two options were proposed (in addition to the 'do nothing' option), these were:

- 1) The UK and Welsh Governments would work with Ofwat, water supply companies and the Drinking Water Inspectorate to develop a voluntary Code of Practice to complement their current private water supply pipe maintenance and repair policies.

- 2) To transfer ownership of the portion of water supply pipes that are currently privately owned, to the water supply companies. This would be implemented through secondary legislation.

For Option 1, a large proportion of respondents felt that a voluntary approach would be unlikely to provide a consistent industry wide policy and could potentially lead to more confusion for customers. They felt this option would take too long to implement and would not make a significant difference to the policies that currently exist between water supply companies, as they would still not have responsibility and control for the whole supply pipe network and it would be likely that local pressures would again lead to differing policies evolving. It was also felt that there could be increased cases of serving notice and gaining warrants to access private land. However, other respondents felt that a voluntary consistent approach throughout the industry would be sensible, would give peace of mind to customers and establish industry best practice for dealing with supply pipes. Consistent and targeted messaging would help improve customer understanding. Local pressures could still be reflected, while meeting minimum set standards. It was pointed out that other regulated sectors e.g. energy, have voluntary codes in place for suppliers.

For option 2, there were a variety of views, though most responders viewed it favourably. Some strongly supported the option, stating that it would enable water supply companies to develop a strategic and holistic approach to asset management, allowing them to tackle leakage, improve water quality through replacement of lead pipes and public health by addressing deteriorating pipes. Companies could respond quickly and more efficiently to repair leaks. Some also felt it would provide clarity and consistency of ownership and maintenance. Some felt it would benefit both customers and water supply companies. Other comments noted that it would reduce disputes from leaks on shared supplies and would mean customers would no longer need to pay for supply pipe insurance. Some people believed it could generate social benefit for less affluent households as the cost of maintaining water supply pipes would be spread across all water consumers and only lead to a marginal increase in annual water bills. It would also allow action on large private networks whose current owners may not have the skills or money to manage them. Others felt there was insufficient evidence of the benefits of transferring ownership or that customers would even want to give up ownership of their supply pipes and that detailed analysis is needed.

It was acknowledged that under option 2 the additional financial cost to water supply companies would likely be passed on to consumers but that the extent of this is reasonably unclear. It would depend on how much work companies would do on transferred assets and how Ofwat treated expenditure in regulatory accounts. Some responders felt that costs could significantly increase due to higher customer expectations and management overheads. Others felt that there would be only a small impact on bills and that it would be better for customers in terms of cost and reassurance. The situation would alter from the current where a minority of property owners face a one-off unexpected charge for repairs, to an annual charge for all owners. It was also suggested that long term, bills could be reduced as a result of reduced leakage on companies' networks. However, if adoption also covered commercial properties and the costs were spread across the whole customer base, the cost of covering complexities on site networks could make the impact on domestic customer bills high and cause some hardship.

Benefits to customers identified included:

- Reducing confusion over ownership responsibilities
- Addressing some water quality issues
- Reducing disputes over shared supply pipes
- Customers would no longer need to take out supply pipe insurance
- Emerging technologies can significantly reduce the disruption associated with supply pipe maintenance and repair.

Issues identified included:

- Access rights to properties

- Landlords would benefit over tenants who would foot the cost for repairs that are currently the responsibility of the landlord
- Potential implications of for property owners wishing to build extensions over supply pipes by requiring consent from water companies.

That Defra consultation concluded that whilst there were benefits to be gained from transferring ownership of private supply pipes to water supply companies; there was less certain evidence about the range of potential impacts on water bills for various customers, and therefore there was no further work carried out to transfer ownership.

## **6. Summary**

The issues associated with CSP leaks are complex, and there is currently no strategy for managing customer supply pipes (which at about 225,000 km are a significant and vital asset in delivering drinking water to customers) into the future.

Customer supply pipe leakage currently accounts for 8% of total household water demand and about 22% of total leakage. Companies face complex issues when trying to reduce water losses in this area; most notably customer understanding, identification of losses and the cost of reinstatement. There are large reductions to be made, and some companies will begin to deliver these in the next 10 to 15 years. But there are significant challenges to the delivery of these savings.

A strategy for managing these assets would help to reduce customer supply pipe losses and maintain them in the future.