Draft Water Resources Management Plan 2024

Technical Appendix M - Leakage

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Introduction

M.1 Leakage occurs as a result of water pipes failing. It goes very much hand in hand with the occurrence of bursts and therefore the level of service that we provide to our customers in relation to the number of interruptions to supply. Additionally, the act of repairing a leak and reinstating the area can result in disruption for our customers and stakeholders.

M.2 Customers and stakeholders have clearly indicated to us that they wish to see leakage further reduced beyond the existing level and have recognised that, within the realms of affordability, this will have to be paid for (Appendix T: Our customer priorities and preferences has further information on customer research).

M.3 Our ambition is to strike the right balance between our mutual desire to further reduce leakage, the additional cost of this work and its impact on customers' bills, the need to maintain a robust and efficient water distribution network and the need to manage impacts on traffic congestion and household disruption.

M.4 Our approach to leakage management is holistic and can be considered as to be made up of four types of activity: minimising leak occurrence, understanding where leakage is, locating leaks and repairing leaks. Figure M - 1 illustrates the activities under each type.

	Minimising leak occurrence (consistently)	Understanding where leakage is (quickly and accurately)	Locating leaks (quickly, accurately and efficiently)	Repairing leaks (quickly, efficiently, to quality with minimal interruption to supply)
Maintaining leakage level	• Pumping regimes • Surge vessels • Variable speed pumps • Managing commercial customer demand • Pressure Management Valve (PRV) and Pressure Management Area (PMA) maintenance work • Network reconfiguratin to meet new customer demand • Mains replacement to offset deterioration	• Network meter verification • Maintain customer meters • Maintain District Metered Area (DMA) meters • Install loggers on new customers • Maintain DMAs and Flow Monitoring Zone (FMZ) bounaries and function sets • Network meter repair and replacement • Maintain commercial loggers	• Reactive and recovery leakage surveys • Run step tests • Correlation survey and sound • Gas detection • Sahara surveys and lekage investigations • Seepage investigations • Maintain waste areas and meters	• Capacity planning, job planning and dispatch • Wastage fixes • Valve maintenance • Traffic management and streetworks • Repairs on visible leaks, active leaks and customer side leaks and fast reinstatements • Special focus on fast repair of visible leaks • Trunk main repairs
Reducing leakage	• New PMA schemes • Network reconfiguration to reduce pressures • Mains replacement to enhance asset	• Improve network metering • Improve DMA operability as part of DMA Enhancement • Sub- divide DMAs as part of DMA Enhancement • Integrate use of smart meters	• Special surveys • Campaigns management and burst sectorisation • Join up acoustic logger data with DMA flows	• Reduce repair times

Figure M - 1 – Holistic approach to leakage management

M.5 With the experience of many years of leakage management, a large effort across a varied range of activities is put into holding leakage at current levels. For example, to maintain present leak recurrence levels we have surge protection in place on the network, to minimise load on the pipes when we turn pumps on and off. In order to prevent the burst rate from increasing we need to

continue to maintain these vessels to ensure they continue to function correctly. This work does not reduce leakage but helps to maintain the present level.

M.6 Our objective is to not only complete the work we do to maintain current leakage levels but to seek better and more efficient ways to do this. One example of this is in the deployment of noise loggers to find leaks with a reduced leakage detection resource effort.

M.7 Mains rehabilitation is important to both maintain leakage levels by offsetting the deterioration of the pipe network and reduce leakage. If we undertake enough activity we can reduce leakage while also improving asset condition and performance.

M.8 The introduction of smart metering (Appendix N: Metering) and capturing data with a frequency of at least one hour allows for more accurate analysis. This allows us to better identify how much water is consumed by our customers and how much is lost through leakage. This is currently an area of considerable development.

M.9 In the last couple of years, we have been developing our approach to leakage detection. This is moving us on from the traditional approach where, in response to the district meter area (DMA) flow increasing, we complete detection and repair of leaks to return the DMA flow back a level seen historically. This is still important, but we are now looking at these past levels in each DMA and challenging ourselves to drive leakage lower. This can result in finding customer demand we did not know about, correcting our understanding of our pipe network, or finding a long standing leak on a customer supply pipe which couldn't be detected with conventional leak detection techniques. In fact, during this asset management plan (AMP) period we have had very good success with installing meters on private mains networks, of which we have a high number in London, and working with our customers to locate and repair leaks on their pipework.

M.10 We have also looked at innovation to improve our ability to locate leaks. Some are still in development, such as the use of satellites and drones. Others, such as the deployment of permanent noise loggers, we feel present far more promise in the shorter term.

M.11 Our network is complex, with continuous property development requiring connection, especially in London. Developing new processes and systems to improve our tracking of the development of our region has given us an opportunity to keep aware of increasing water demand, and thereby improve our management of leakage.

Historical Leakage Performance

M.12 Leakage reduction is a key element of our plan to manage the balance between supply and demand.

M.13 In AMP4 (2005-2010) a considerable leakage reduction of 27% was achieved through mains rehabilitation and pressure management. During this period we undertook a large mains rehabilitation programme to improve asset condition, with an average of over 400km of mains replaced each year. This was supported by a programme of new pressure management schemes and a proactive plan to detect and repair leakage on our trunk mains network. Find and fix activity continued to manage leakage recurrence.

M.14 In AMP5 (2010-2015) the target was to maintain leakage over the AMP period. Mains replacement funding was reduced to maintain asset condition and leakage was reduced by 2% over the AMP period. We continued to deliver new pressure management schemes, albeit on a smaller scale given that the largest schemes had already been delivered, and work continued on trunk mains leakage and find and fix activity to manage leakage recurrence.

M.15 In AMP6 (2015-2020) our Water Resources Management Plan 2014 (WRMP14) set out an ambitious plan to reduce leakage by a further 9% (59 Ml/d) over the five year period, driven by the supply demand position in London. We set out to deliver this reduction through a combination of mains replacement, introduction of new pressure management schemes, reduction in customer side leakage identified through the installation of customer meters, and further find and fix activity made possible through better understanding of leakage using new smart meters. This was underpinned by ongoing find and fix and trunk mains activity.

M.16 Although replacing the oldest and leakiest pipes in our network is the best way to make long term sustainable reductions in leakage, detecting and repairing leaks still forms a key part of our leakage strategy to offset leakage recurrence levels. In AMP6 we detected and repaired some 65,000 leaks per annum, with an estimated leakage benefit value in excess of 400 Ml/d per year.

M.17 In 2016-17, 2017-18 and 2018-19, we missed our leakage target and consequently introduced our Leakage Task Force to rectify our performance.

M.18 In 2019-20, the last year of AMP6, we outperformed our leakage target of 606 Ml/d, with annual average leakage at 595 Ml/d.

M.19 During 2019-20, we made significant progress in reducing leakage. This improved performance was driven by a number of factors and company wide effort. We increased our repair and maintenance resources to the highest numbers since 2015 and implemented new, innovative tools to improve leak detection and repair productivity, along with the further optimisation of network water pressure. The Executive Steering Group of the Leakage Task Force met fortnightly to monitor performance and review progress of improvement initiatives. We also improved our measurement of the many of the components of demand by, for example, finding and fixing broken meters and updating assessments of customer wastage, to ensure we were reporting as accurately as possible. This in turn improved our ability to better target those areas of high leakage.

AMP7 Leakage Performance

M.20 In 2020-21, year 1 of AMP7, our company-wide leakage, uplifted to dry year values as required in WRMP reporting, was 607.2 Ml/d, against a WRMP19 target of 623.1 Ml/d. This means we met our target for leakage reduction for the second year in a row in 2020-21. In 2021-22, our company-wide leakage was 605.9 Ml/d, against a WRMP19 forecast of 603.5 Ml/d, again both dry-year uplifted values.

M.21 Leakage reduction is one of our key performance indicators and, since missing our target for three years in 2016-17, 2017-18 and 2018-19, it has been one of our biggest focuses. Our aim is to reduce our reported leakage by 20% between 2020 and 2025.

M.22 Our leakage reduction plan focuses on a mix of innovation, increased productivity and data-driven decision making.

M.23 Each year we are striving to improve the accuracy of our leakage reporting. As a result we restated our leakage for 2017-18, 2018-19 and 2019-20 to ensure consistency with our current reporting approach, to ensure our baselines and associated targets are consistent. Our annual report in AR21 described the approach used. We have used the restated leakage numbers in our dWRMP24 to derive our targets for future leakage levels.

Restating our Leakage – Consistency of Reporting

M.24 Leakage figures in recent annual reports have been calculated through a full Water Balance using the latest available best data and methodology. However, to ensure consistency with these changes, the leakage and PCC figures for 2017-18 and 2018-19 had to be calculated through back-casting the 2019-20 Water Balance to provide the best estimate possible of "consistent" levels for the previous years, using all the newly available data. These figures have been produced to allow the 3-year rolling "baseline" values to be calculated on a consistent basis.

Summary of approach to back-casting leakage and PCC

M.25 Some of the data used to calculate the present Water Balance were not available before 2019-20. This meant that it was not possible to produce a full Water Balance for 2017-18 and 2018-19 that is consistent with present reporting. Consistent values for leakage and PCC for 2017-18 and 2018-19 therefore had to be derived by "back-casting" the 2019-20 Water Balance. This ensured the best data and methodologies were carried over from those used to derive the "Shadow" leakage and PCC for 2019-20 to prior years.

M.26 The back-cast took account of the actual annual changes in properties, population, billed measured volumes, weather and growth in wastage. For leakage it also took account of actual changes in FMZ nightlines, T factors, components of night use, trunk mains leakage and service reservoir leakage.

Differences in the reported leakage levels compared with those submitted in AR20

M.27 Figure M - 2 – Leakage numbers reported in AR20 and AR21, presents the leakage numbers reported in AR20, and those reported in AR21. Note that these figures are 'out-turn', rather than 'dry year uplifted', and so do not align with the figures stated above.

LEAKAGE Original shadow (submitted at AR20)			Actual 2017-18	Actual 2018-19	Actual 2019-20	Target 2020-21	Target 2021-22	Target 2022-23	Target 2023-24	Target 2024-25	
FD Target (3 year average % reduction)		%				4.1%	10.2%	14.1%	17.4%	20.4%	
Actual Performance level	Annual average	Ml/d	645.6	640.0	573.4	569.0					
	3 yr rolling	Ml/d				594.1					
Baseline		Ml/d			619.7						
3 yr target		Ml/d	619.7	619.7	619.7	594.3	556.5	532.3	511.9	493.3	
Inferred annual target		Ml/d				569.5	526.6	500.8	508.3	470.8	
Annual reduction		Ml/d				-3.9	-42.9	-25.8	7.5	-37.5	-102.6
LEAKAGE (submitted at AR21)			Actual 2017-18	Actual 2018-19	Actual 2019-20	Target 2020-21	Target 2021-22	Target 2022-23	Target 2023-24	Target 2024-25	
FD Target (3 year average % reduction)		%				4.1%	10.2%	14.1%	17.4%	20.4%	
Actual Performance level and inferred to deliever target	Annual average	Ml/d	698.1	690.7	626.6	589.6	593.7	548.0	523.0	533.4	
	3 yr rolling	Ml/d				635.6					
Baseline		Ml/d			671.8						
3 yr target		Ml/d	671.8	671.8	671.8	644.3	603.3	577.1	554.9	534.8	
Inferred annual target		Ml/d				615.7	567.7	548.0	549.1	507.4	
Annual reduction		Ml/d				-10.9	-48.0	-19.7	1.1	-41.7	-119.2
Smoothed annual target						616.8	562.3	550.9	532.7	514.7	
Check - 3 year on smoothed target						644.7	601.9	576.7	548.6	532.8	
Annual reduction						-9.8	-54.5	-11.4	-18.2	-18.0	-111.9

Figure M - 2 – Leakage numbers reported in AR20 and AR21

M.28 The 'Leakage (submitted at AR21)' numbers have been used in our dWRMP24, and so our target is to reduce leakage to 50% of the 2017-18 value (698.1 Ml/d, 50% of which is 349.05 Ml/d) by 2050.


Thames
Water