

*Exhibit No.:*  
*Issue(s):* *Main Breaks and  
Water Loss Reporting*  
*Witness:* *Andrew Harris*  
*Sponsoring Party:* *MoPSC Staff*  
*Type of Exhibit:* *Direct Testimony*  
*Case No.:* *WR-2022-0303*  
*Date Testimony Prepared:* *November 22, 2022*

**MISSOURI PUBLIC SERVICE COMMISSION**

**INDUSTRY ANALYSIS DIVISION**

**WATER, SEWER & STEAM DEPARTMENT**

**DIRECT TESTIMONY**

**OF**

**ANDREW HARRIS**

**MISSOURI-AMERICAN WATER COMPANY**

**CASE NO. WR-2022-0303**

*Jefferson City, Missouri*  
*November 2022*



Direct Testimony of  
Andrew Harris

1           A.     When a newly constructed distribution system is placed in service, the  
2 integrity of the new piping, fittings, valves, and other components of the system provide a tight,  
3 low water loss condition. As a distribution system ages, corrosion, stress, and material fatigue  
4 are some of the factors that lead to integrity loss and associated breaks and leaks. As breaks  
5 and leaks increase, water delivery efficiencies are reduced, resulting in higher cost per unit of  
6 delivered water.

7           Q.     Can you further describe the factors that are contributory to the cost of  
8 delivered water?

9           A.     All water system production requires pumping power whether the source is  
10 surface water or groundwater. Additionally, depending on the quality of the source water,  
11 treatment chemicals and waste disposal are also factors. Where water is produced for delivery,  
12 yet not delivered and billed, the production costs for the lost volume are lost.

13          Q.     Are main breaks and leaks in pipes always the primary source of water loss?

14          A.     Generally they are the main causes, but there are other sources of water loss  
15 that may be identified and resolved. For example, a city may have public fountains that are  
16 unmetered and leaking a significant amount of water due to deterioration. A water provider  
17 can experience water theft, or have a leaking storage tank. Some water loss that shows up in  
18 calculations may not be water loss at all if errors are made in data handling. Identifying  
19 real water loss, and then finding out where it is being lost, are steps necessary to decrease  
20 water loss.

21          Q.     To better identify main breaks and water loss, did MAWC agree in its last rate  
22 case to provide reports and analysis?

Direct Testimony of  
Andrew Harris

1           A.     Yes.    In paragraphs nine and ten of the *Order and Stipulation* in  
2 MAWC's last rate case, Case No. WR-2020-0344, MAWC agreed to annually provide  
3 two reports – a Main Break and Water Loss Report that identifies MAWC systems  
4 experiencing more than 20% water loss and a Water Loss Analysis Report, which targets  
5 one system annually for improvements.

6           Q.     What led to the development of an annual Main Break and Water Loss Report?

7           A.     As part of the *Stipulation and Agreement* in the las rate case, WR-2020-0344,  
8 MAWC agreed to prepare an annual Main Break and Water Loss Report in order to  
9 understand the magnitude of water losses by district. MAWC agreed to provide this report in  
10 paragraph nine of the *Stipulation and Agreement*. As main breaks and leaks are the highest  
11 contributor to system water losses, this report reviews water main breaks and losses by district,  
12 with detailed explanations of items believed to be major contributors to these losses. While all  
13 water systems experience water loss, it is important to limit the amount of loss to the degree it  
14 is economically efficient. MAWC submitted its first Non-Revenue Water and Main Break  
15 Report with 2021 data to Staff in February 2022; this report focused on water loss across all  
16 MAWC service areas in 2021.

17          Q.     Why was water loss exceeding 20 percent established as the threshold for these  
18 annual reports?

19          A.     The parties to the *Stipulation and Agreement* agreed upon this as an appropriate  
20 goal for limiting water loss while hopefully avoiding economically inefficient efforts at loss  
21 reduction. It is possible for systems that are exceeding 20 percent water loss to move well  
22 below this goal without excessive cost, but this cannot be known without conducting the kind  
23 of analysis in this report.

1 Q. What is the current water loss for the seven major systems MAWC owns?

2 A. While the percentage fluctuates by year, five out of seven of the major  
3 systems exceeded 20 percent in 2021, where major systems are identified with system delivery  
4 over 500 million gallons per year.

5 For 2021, MAWC reported the following loss percentages for its larger systems:

6 St. Louis County – 26.7%

7 Mexico – 22.0%

8 Joplin – 21.2%

9 St. Joseph – 20.8%

10 Jefferson City – 20.4%

11 Warrensburg – 13.8%

12 St. Charles – 4.3%

13 Capital costs of modifications, repairs, and construction increase significantly as system  
14 components are modified and replaced. Improving systems exceeding 20 percent water loss  
15 represents improvement over current conditions, ideally without major additional capital cost of  
16 main replacement that would outweigh the cost reduction benefit of reduced water production.

17 Q. What led to the development of an annual targeted Water Loss Analysis?

18 A. MAWC agreed to prepare an annual targeted Water Loss Analysis in order to  
19 better understand all contributors to water loss in systems exceeding 20% and to identify  
20 opportunities to reduce losses. MAWC agreed to provide this analysis in paragraph ten of  
21 the *Stipulation and Agreement* in Case No. WR-2020-0344. This report targets service  
22 areas with greater than 20% loss or unaccounted for water with the goal of identifying  
23 sources of water loss and enabling MAWC to better enact modification, repairs, construction,  
24 or operational changes necessary to reduce water loss. MAWC does not complete a

1 targeted analysis for a single system more often than once every five years. MAWC submitted  
2 its first Water Loss Analysis to Staff on May 25, 2022; this analysis focused on water loss in  
3 the Joplin service area.

4 Q. What led to selecting the Joplin system for development of a first targeted  
5 Water Loss Analysis?

6 A. Working with Staff and other interested parties, MAWC identified the  
7 major systems that exceeded 20 percent water loss in 2021. MAWC, in coordination with  
8 Staff and other parties, selected Joplin as the first major system for more in-depth analysis  
9 and reporting. This more in depth analysis and reporting is done in addition to the annual  
10 system-wide report.

11 While not the largest or most complex of the major systems, Joplin provided an  
12 opportunity for the development of a template report format that could be used for other  
13 systems, including more complex systems. The Joplin report, dated May 25, 2022, identified  
14 main breaks and system leaks as the greatest source of loss, but also discusses opportunities for  
15 improvement that include meter replacement at the production facility and upgrading to  
16 advanced metering infrastructure throughout the system. Improved metering accuracy will  
17 provide more accurate system delivery and billing data. The results of improvements that are  
18 completed will be analyzed with the data that is available at the next annual report.

19 MAWC plans to examine in-depth one of its systems exceeding 20 percent water loss  
20 each year. MAWC's examination of each major system occurs no more frequently than once  
21 every five years to accommodate construction time in making improvements.

22 Q. Is there anything preventing MAWC from conducting the in-depth examinations  
23 on multiple systems concurrently?

Direct Testimony of  
Andrew Harris

1           A.     No, but for some of the largest systems it may be difficult to dedicate the  
2 necessary personnel to conduct more than one per year. MAWC may choose to investigate  
3 multiple systems at the same time.

4           Q.     What is Staff's position regarding these reports?

5           A.     Staff is in favor of continuing both the annual system-wide reporting and the  
6 in-depth reporting on a single system. Staff and other interested parties worked with MAWC  
7 through the development of an initial system report for the Joplin system. The Joplin system  
8 report provides a useful quantification of system flow data and explanations of areas where  
9 opportunities for improvements may occur. It is Staff's position that an annual Main Break and  
10 Water Loss Report should continue with the same annual deliverable date of February 15. The  
11 Joplin report should serve as a model for development of similar system reports for the other  
12 major service territories, with a system report provided annually by June 15, with the next report  
13 due June 15, 2023. MAWC should study in-depth each system experiencing more than  
14 20 percent water loss not more often than once every five years.

15          Q.     Does this conclude your direct testimony?

16          A.     Yes it does.

BEFORE THE PUBLIC SERVICE COMMISSION

OF THE STATE OF MISSOURI

In the Matter of Missouri-American Water )  
Company's Request for Authority to ) Case No. WR-2022-0303  
Implement General Rate Increase for Water )  
and Sewer Service Provided in Missouri )  
Service Areas )

**AFFIDAVIT OF ANDREW HARRIS**

STATE OF MISSOURI )  
 ) ss.  
COUNTY OF COLE )

**COMES NOW ANDREW HARRIS** and on his oath declares that he is of sound mind and lawful age; that he contributed to the foregoing *Direct testimony of Andrew Harris*; and that the same is true and correct according to his best knowledge and belief.

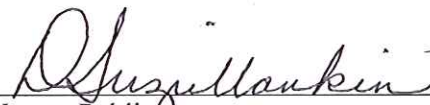
Further the Affiant sayeth not.

  
\_\_\_\_\_  
ANDREW HARRIS

**JURAT**

Subscribed and sworn before me, a duly constituted and authorized Notary Public, in and for the County of Cole, State of Missouri, at my office in Jefferson City, on this 17<sup>th</sup> day of November 2022.

D. SUZIE MANKIN  
Notary Public - Notary Seal  
State of Missouri  
Commissioned for Cole County  
My Commission Expires: April 04, 2025  
Commission Number: 12412070

  
\_\_\_\_\_  
Notary Public



**ANDREW HARRIS**

**CREDENTIALS AND CASE PARTICIPATION**

I am employed by the Missouri Public Service Commission as a Senior Professional Engineer, in the Water, Sewer & Steam Department. My duties include the review, inspection, and investigation of water and sewer systems and the development and preparation of recommendations and testimony regarding those systems. Specifically included are technical issues associated with water and sewer utility rate and acquisition cases including quality of service matters, utility plant utilization, costs incurred for providing utility service, and tariff rules. In addition to formal case work, I handle informal customer complaints that are of a technical nature, and informally assist water and sewer utility companies with respect to day-to-day operations, planning, and customer service issues.

**Educational Background and Work Experience**

I graduated from University of Missouri – Rolla in 1997 with a Bachelor of Science degree in Chemical Engineering. I am a Registered Professional Engineer in the State of Missouri and have been continuously licensed in Missouri since 2003. Previous employment includes experience in both operations and engineering with municipal, industrial, and consulting organizations. I hold certificates of competency at the highest level available from Missouri Department of Natural Resources for water and wastewater treatment as well as distribution system operations.

**Case Participation**

<b><u>Company</u></b>	<b><u>Case No.</u></b>
Missouri American Water Company (MAWC)	SA-2019-0334
Timber Creek	SA-2020-0013
Liberty Utilities	SA-2020-0067
MAWC	SA-2020-0132
Elm Hills	SA-2020-0152
Liberty Utilities	SA-2020-0216
Liberty Utilities	SA-2020-0398
MAWC	SA-2021-0017
MAWC	SA-2021-0074
Mid-MO Sanitation	SA-2022-0029
MAWC	SA-2022-0294
Elm Hills	SM-2020-0146

TUK, LLC	SM-2022-0131
MAWC	SR-2020-0345
Mid-MO Sanitation	SR-2021-0372
MAWC	WA-2019-0259
MAWC	WA-2021-0376
Liberty Utilities	WA-2020-0397
MAWC	WA-2022-0293
MAWC	WA-2022-0361
I-70 Mobile City	WC-2022-0295
Liberty Utilities	WM-2020-0156
Middlefork	WM-2021-0003
Liberty Utilities	WO-2022-0253
Raytown Water Company	WR-2020-0264
Elm Hills	WR-2020-0275
MAWC	WR-2020-0344
MAWC	WR-2022-0303
MAWC	WT-2020-0353