Sewerage and Water Board of New Orleans

Water Loss Control

Final Report • April 4, 2024

Edward Michel, CIG

Inspector General

OIG NEW ORLEANS OFFICE OF INSPECTOR GENERAL

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Re: The Sewerage and Water Board of New Orleans Water Loss Control

I certify that the inspector general personnel assigned to this project are free of personal or other external impairments to independence.

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Inspector General

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The Office of Inspector General for the City of New Orleans (OIG) conducted an evaluation of the Sewerage and Water Board of New Orleans (SWBNO) water loss controls. The purpose of this evaluation was to determine if and how much water the SWBNO was losing through its water distribution system; if the SWBNO's policies and practices regarding water loss were in line with best practices; and if the SWBNO had implemented effective water loss control programs.

The SWBNO identified its mission as reliably and affordably providing safe drinking water. The entity had a history of above-average non-revenue water, which included "real" water loss, "apparent" water loss, and "free" water. These high levels of non-revenue water continued through the scope period of this evaluation. While the SWBNO acknowledged limitations and deficiencies in its water loss programs, particularly where data collection and analysis were concerned, it had yet to effectively implement any policies or practices to mitigate water loss. The SWBNO did not have the capacity to collect the appropriate data on which to base effective water loss control programs or satisfy its reporting requirements.

The evaluation included the following findings:

- The SWBNO had rates of non-revenue water far greater than industry averages.
- The SWBNO did not have a comprehensive, integrated water loss control program that was consistent with the framework and best practices offered by the U.S. Environmental Protection Agency and the American Water Works Association.
- The SWBNO did not report water loss to the City Council as required by Louisiana Revised Statute 33:4091.

Based on these findings, the OIG made the following recommendations to the Sewerage and Water Board of New Orleans:

- The SWBNO should firmly place its water loss control programs within best practice frameworks, beginning with annual water audits, and dedicate the necessary resources to keep these programs on track over the long term.

- The SWBNO should enhance its data collection efforts to ensure it can provide meaningful data in complying with reporting requirements.

In its official response, the Sewerage and Water Board of New Orleans accepted the recommendations of the OIG. The OIG acknowledges the efforts the SWBNO is making in addressing its operational and reporting shortcomings, but reiterates the necessity of adequately supporting these efforts to ensure their successful implementation.

I. OBJECTIVES, SCOPE, AND METHODS

The Office of Inspector General of the City of New Orleans (OIG) conducted an evaluation of the Sewerage and Water Board of New Orleans' (SWBNO) internal controls, policies, and practices related to water loss.

The purpose of this evaluation was to determine whether the SWBNO adopted best practices for water loss control that were consistent with industry standards. This project also examined the SWBNO's capacity to monitor, mitigate, and remediate negative impacts of real water loss on city infrastructure and resources. The review was limited to water loss control efforts between February 2019 and April 2023.

Pursuant to Sections 2-1120(12) and (20) of the Code of the City of New Orleans and La. R.S. 33:9613, evaluators interviewed personnel, viewed public meetings, and reviewed board meeting materials. In addition, evaluators reviewed the SWBNO's policies and procedures, financial reports, water loss control audits, and additional documentation and data that were either publicly available or provided by the entity.

The OIG was greatly assisted in the preparation of this report by the full cooperation of SWBNO staff. This evaluation was performed in accordance with the Principles and Standards for Offices of Inspector General for Inspections, Evaluations, and Review.[1]

[1] Association of Inspectors General, "Quality Standards for Inspections, Evaluations, and Reviews by Offices of Inspector General," *Principles and Standards for Offices of Inspector General* (New York, NY: Association of Inspectors General, 2014).

II. INTRODUCTION

The Sewerage and Water Board of New Orleans (SWBNO) was created by state law to construct, control, maintain, and operate a public water system.[2] According to the SWBNO, its mission included "reliably and affordably providing safe drinking water."[3] The term "water Loss" encompassed the concept that utilities often experience inefficiencies in operations. These inefficiencies may have involved real losses, such as distribution system leakages. Alternatively, the inefficiencies may have been apparent losses due to accounting and metering errors, or unauthorized consumption.[4] According to the American Water Works Association (AWWA), water loss control programs may help increase revenue, reduce production costs, and reduce waste of natural resources. Additionally, water loss control programs can help reduce service disruptions, lead to equitable water rates, and reduce stress on infrastructure above and below ground.[5]

Both the AWWA and the United States Environmental Protection Agency (EPA) suggested that a water loss control program begins with a water audit.[6] The SWBNO commissioned a series of water audits, the most recent of which was published in 2019.[7] Due to a lack of detailed data, the author of the audit estimated large amounts of water loss.[8] The 2019 audit recommended the SWBNO begin laying the foundations of a water loss control program primarily by enhancing its ability to collect better data.[9] Just prior to the release of the audit, the SWBNO reported in February 2019 that it was working to standardize a process that would lead to improvements in controlling and managing water loss,

[2] La. R.S. 33:4071.
[3] Sewerage and Water Board of New Orleans, *2022–2027 Strategic Plan* (New Orleans, LA: Sewerage and Water Board of New Orleans, 2022), 20, accessed January 22, 2023, https://www.swbno.org/Reports/Others.
[4] American Water Works Association, *Manual of Water Supply Practices—M36: Water Audits and Loss Control Programs. 4th ed.* (Denver, CO: American Water Works Association, 2016), 2.
[5] Ibid., 282.
[6] American Water Works Association, *Manual of Water Supply Practices*, 2; United States Environmental Protection Agency, *Control and Mitigation of Drinking Water Losses in Distribution Systems* (Washington, D.C.: United States Environmental Protection Agency, 2010), vii, accessed February 23, 2023, https://nepis.epa.gov/Exe/ZyPDF.cgi/P1009VCZ.PDF?Dockey=P1009VCZ.PDF.
[7] Nora Freeman, *Water Audit Update FY2008-FY2017: Technical Memorandum, Sewerage and Water Board of New Orleans* (Denver, CO: Freeman, LLC, 2019), accessed March 8, 2023, https://www.swbno.org/Reports/Others.
[8] Ibid., 3, 9.
[9] Ibid., 5-6.

including instituting regular water audits.[10] The SWBNO embarked on a series of strategic structural changes shortly thereafter and released a new strategic plan in 2022.[11]

[10] Sewerage and Water Board of New Orleans, *Report of Board* (February 1, 2019), 3, accessed March 7, 2023, https://www.swbno.org/Reports/Board.
[11] Sewerage and Water Board of New Orleans, *2022–2027 Strategic Plan*.

III. SEWERAGE AND WATER BOARD NON-REVENUE WATER

Water utilities examined water loss in terms of non-revenue water (NRW), defined by the AWWA as water that was treated and introduced into the distribution system for consumption, but that was not billed or sold and resulted in no revenue.[12] NRW included water provided to certain customers at no charge (free water), plus any apparent and real losses.[13] As stated above, apparent losses related to errors in metering, billing, or unauthorized consumption.[14] Alternatively, real losses were physical water losses along the distribution system, from the utility's storage tanks up to customer consumption.[15] See **Appendix A**.

The AWWA acknowledged that all water utility distribution systems experienced leaks and that only the amount varied.[16] In order to help mitigate water loss, the AWWA produced a methodology, metrics, and performance indicators for water audits.[17] The AWWA recommended such audits be conducted annually "*as a standard business practice,*" and the EPA identified them as a "critical first step" of a water loss control program.[18] A series of formal water audits following the AWWA methodology were commissioned by the SWBNO covering 2008-2017.[19] The most recent audit was released in 2019. Since then, SWBNO regularly collected aggregate data on treated and untreated water and referred to it for internal decision-making purposes.

[12] American Water Works Association, *Manual of Water Supply Practices*, 386.
[13] Ibid.
[14] Ibid., 379.
[15] Ibid., 386.
[16] Ibid., 170.
[17] Ibid.; Will Jernigan, et al., *AWWA Water Loss Control Committee Report: Key Performance Indicators for Non-Revenue Water* (Denver, CO: American Water Works Association, 2019).
[18] American Water Works Association, *Manual of Water Supply Practices,* 281, italics in original; United States Environmental Protection Agency*, Control and Mitigation of Drinking Water Losses in Distribution Systems*, vii.
[19] Nora Freeman, *Water Audit FY 2008-2010: Technical Memorandum, Sewerage and Water Board of New Orleans* (Denver, CO: Freeman, LLC, 2011); Nora Freeman, *Water Audit FY 2008-FY 2015: Technical Memorandum, Sewerage and Water Board of New Orleans* (Denver, CO: Freeman, LLC, 2017); Nora Freeman, *Water Audit Update FY2008-FY2017*.

FINDING 1: The Sewerage and Water Board of New Orleans had rates of non-revenue water far greater than industry averages.

The EPA estimated average water loss for public water systems at 16 percent, up to 75 percent of which was considered recoverable.[20] A study presented to and validated by the AWWA, with data from 29 other utilities, showed an average NRW of 26.6 percent of total input volume of treated water, with a range between 6.8 percent and 45.5 percent.[21] According to the SWBNO's 2019 water audit, the SWBNO had a ten-year average non-revenue water loss of approximately 73 percent between 2008 and 2017.[22] The author of the audit noted "that SWBNO's NRW by volume (70+%) is extremely high for municipal water utilities."[23]

According to their 2021 annual report, the SWBNO treated a total of 56.4 billion gallons of water and had a total billed consumption of 13.9 billion gallons.[24] This left approximately 42.49 billion gallons of the treated water as unbilled non-revenue water. Additionally, the SWBNO provided "free" water to the City of New Orleans, Audubon Park, New Orleans City Park, the New Orleans Museum of Art, and the Orleans Parish School Board, as required by law.[25] According to SWBNO data, the SWBNO provided approximately 24.9 million gallons of free water in 2021. After deducting the amount of free water from the NRW, the SWBNO still had a total of 42.46 billion gallons of real and apparent losses. This amounted to a loss of approximately 75 percent of the total water produced. See **Figure 1** for a breakdown.

SWBNO officials stated the water identified as real and apparent losses likely consisted primarily of real losses caused by leaks in the infrastructure. Based on SWBNO estimates for Carrollton and Algiers Water Systems, it cost the utility

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[20] J. Thornton et al., *Water Loss Control Manual, 2nd ed.* (New York: McGraw-Hill, 2008), cited in United States Environmental Protection Agency*, Water Audits and Water Loss Control for Public Water Systems* (Washington, D.C.: United States Environmental Protection Agency, 2013), 1. The EPA report does not specify whether the figure presented represents real water loss or non-revenue water loss.

[21] Nora Freeman, *Water Audit Update FY2008-FY2017*, 13.

[22] Ibid.

[23] Ibid., 12.

[24] Sewerage and Water Board of New Orleans, *Annual Comprehensive Financial Report* (New Orleans, LA: Sewerage and Water Board of New Orleans, 2021), IV-18 - IV-19, IV-6.

[25] La. R.S. 33:4096(A)(1). "Free" water was metered, but unbilled.

approximately $213 to treat one million gallons of water in 2021.[26] Therefore, evaluators calculated that SWBNO lost over $9 million treating and distributing water that was ultimately unbilled and unmetered.

Evaluators made similar calculations for 2022 and found that the SWBNO produced 58.2 billion gallons of total treated water in 2022, with a total billed consumption of approximately 14.7 billion gallons.[27] This left approximately 43.49 billion gallons of treated water that was unbilled. The SWBNO provided 6.27 billion gallons of free water in 2022, resulting in 37.22 billion gallons (64 percent) of real and apparent losses. That year, it cost the utility approximately $283.75 to treat one million gallons of water, for a loss of $10.5 million in treatment and distribution of non-revenue water.[28]

Figure 1: Non-Revenue Water and Treatment Costs

Water Volumes, Percentages, and Values	2021	2022
Total Treated Water (gal)	56,354,080,000	58,156,660,000
Billed Gallons	13,867,260,500	14,670,661,100
Unbilled Gallons (NRW)	42,486,819,500	43,485,998,900
"Free" Water (gal)	24,928,070	6,266,589,000
Calculated Real and Apparent Losses (gal), (NRW minus "Free" Water)	42,461,891,430	37,219,409,900
Percent Real and Apparent Losses (% of total treated water)	75%	64%
Est. Total NRW Treatment Costs (Dollars)	$9,044,383 ($213.01/1m gal)	$10,561,008 ($283.75/1m gal)

Source: Data provided by the SWBNO and taken from Sewerage and Water Board, *Annual Comprehensive Financial Report,* 2021 and 2022.

[26] Sewerage and Water Board of New Orleans, *Annual Comprehensive Financial Report,* 2021, IV-18 - IV-19.
[27] Sewerage and Water Board of New Orleans, *Annual Comprehensive Financial Report,* 2022, IV-18 - IV-19, IV-6.
[28] Ibid., IV-18 - IV-19.

According to the EPA, the water loss control framework included three crucial and ongoing components: 1) the Water Audit, 2) Intervention, and 3) Evaluation.[29] The water audit included gathering information, calculating performance indicators, and assessing where water losses appeared to be occurring. The intervention component included action items and activities undertaken by the utility to reduce or eliminate water loss in response to the audit. Finally, the utility should evaluate the success of their intervention efforts using performance indicators and adjust intervention activities as necessary.[30]

In addition to this broad framework offered by the EPA, the AWWA published a manual that provided "an overview of some of the best loss control techniques that can currently be implemented for a sustainable water loss control program."[31] The manual was consistent with the EPA framework and offered best practices for conducting water audits, identified potential intervention activities that utilities should consider, and created performance indicators to evaluate whether intervention activities successfully reduced water loss.[32]

FINDING 2: The SWBNO did not have a comprehensive, integrated water loss control program that was consistent with the framework and best practices offered by the EPA and AWWA.

SWBNO officials conceded that they did not have a formal framework for water loss control. Despite the lack of a formal framework, SWBNO officials believed that the utility employed water loss control practices that mirrored those implemented at other utilities. According to SWBNO officials, their main concern was improving data accuracy. SWBNO officials provided evaluators with information and data regarding the programs and practices currently in place at the utility or planned for the future. Evaluators compared these practices to the EPA framework and found significant gaps. Moreover, many of the practices identified were part of

[29] United States Environmental Protection Agency*, Control and Mitigation of Drinking Water Losses in Distribution Systems,* vii.
[30] United States Environmental Protection Agency*, Water Audits and Water Loss Control for Public Water Systems*, 2-3.
[31] American Water Works Association, *Manual of Water Supply Practices*, xiv.
[32] American Water Works Association, *Manual of Water Supply Practices*; Will Jernigan, et al., *AWWA Water Loss Control Committee Report.*

broader plans that had not yet been fully implemented, or even designed, at the time of the OIG's review.

WATER AUDIT DATA NEEDS

The first component of the EPA framework focused on water audit data needs. According to the EPA, "A water audit identifies and quantifies the water uses and losses from a water system."[33] The AWWA recommended a "top-down" approach to assessing water loss. This required gathering preliminary information from existing sources to quickly calculate how much water was being lost and how much these losses cost the utility.[34] Utilities also calculated other performance indicators, assessed where water losses were occurring, and selected appropriate interventions.[35] Although evaluators found a few top-down water audits commissioned by the SWBNO over the past fifteen years, the most recent audit evaluators found was released in March 2019 and included data only through 2017.[36]

According to the author of the 2019 audit, calculating estimates for both real and apparent losses at the SWBNO was challenging. She stated, "SWBNO is restricted…in its ability to extract data from the current information systems and thus inputs and estimates in the water audit are quite limited."[37] Ultimately, the author concluded "the audit's key performance indicators are not reasonably comparable to other water utilities, not within a range of AWWA recommendations, and not yet helpful to decision-making about how to reduce water loss most cost-effectively."[38]

Just prior to the release of this audit, the SWBNO stated in its February 1, 2019 *Report of Board*:

> SWBNO has begun to standardize a process to track and manage water loss that will inform leaders, stakeholders, customers and the public

[33] United States Environmental Protection Agency*, Water Audits and Water Loss Control for Public Water Systems,* 2*.*
[34] American Water Works Association, *Manual of Water Supply Practices*, 35, 37.
[35] Ibid., 3.
[36] Nora Freeman, *Water Audit FY 2008-2010*; Nora Freeman, *Water Audit FY 2008-FY 2015*; Nora Freeman, *Water Audit Update FY2008-FY2017*.
[37] Nora Freeman, *Water Audit Update FY2008-FY2017*, 3.
[38] Ibid., 6.

> regarding the volume of unaccounted gallons due to leaks, theft and other infrastructure deficiencies. Conducting a water loss audit will identify where and how much water is being lost from the distribution system and lead us to improvement in water loss control.[39]

During the course of this evaluation, SWBNO officials were unable to provide any more recent water audits. SWBNO officials also told evaluators they were planning to re-institute water audits, but were not sure when this would happen. Further, the 2019 audit provided several recommendations, one of which was to improve water audit inputs, including gathering data from more current information systems.[40] At the time of the OIG's review, SWBNO officials stated that, while they calculated a monthly aggregate of non-revenue water, their data were not good enough to calculate the components in any granular detail. When presented by evaluators with AWWA performance indicators, SWBNO officials replied that the utility did not have the capacity to collect that kind of data reliably. They also asserted that the SWBNO did not have volumetric water loss data directly related to water leaks, but they knew where the problems were and did track reported leaks and repairs.

INTERVENTION ACTION ITEMS

The second component of the EPA framework was intervention action items. This component focused on addressing the findings of the water audit through control activities to reduce or eliminate water losses. This component included gathering further information, conducting metering assessments, detecting and locating leaks, and repairing or replacing pipes. This phase also included operation and maintenance programs and changes, and administrative processes or policy changes.[41]

SWBNO officials asserted the utility addressed the issue of data collection and information gathering in the second phase of the program by reviewing and updating planning documents regularly, such as the ten-year Capital Improvement

[39] Sewerage and Water Board of New Orleans, *Report of Board* (February 1, 2019), 3.
[40] Nora Freeman, *Water Audit Update FY2008-FY2017,* 13.
[41] United States Environmental Protection Agency*, Water Audits and Water Loss Control for Public Water Systems, 2*-3.

Program (CIP) budget.[42] Additionally, the utility used GIS mapping technology to map the location, size, and age of pipes, as well as other relevant information such as repair work completed. In the absence of formal water audits, the SWBNO reviewed the monthly non-revenue water calculations and planning document updates, and gathered information by tracking work orders on a weekly basis. However, since the SWBNO did not have the capacity to proactively search for leaks, detecting and locating leaks was done in a primarily reactive manner, as was repairing and replacing pipes.

New intervention activities included implementing an Advanced Metering Infrastructure System (AMI), which included "smart meters," a Water Quality Master Plan, and an Enterprise Asset Management and Work Order System Plan. The SWBNO entered into a contract for its smart meter program in late 2022. At the time of the OIG's review, the Water Quality Master Plan and the Enterprise Asset Management and Work Order System Plan were still in the design phase.

The AMI was intended to remedy data deficiencies and improve data collection. This smart metering system would continuously monitor water flow, pressure, and usage throughout the water supply and distribution system. SWBNO officials expected this program to provide the data necessary to conduct water audits, as well as inform other parts of its operations, such as identifying where water losses may be occurring. The SWBNO entered into a contract for its smart meter program effective December 14, 2022. It was expected to be completed and fully launched in 2025.

The SWBNO also planned to hire a consultant to assist in creating the new Water Quality Master Plan. According to SWBNO officials, the Water Quality Master Plan would also help the utility address water production accuracy questions at its plants. At the time of the OIG's review, the SWBNO had yet to release the formal request for proposals for this project.

The final major program was the new Enterprise Asset Management and Work Order System. According to SWBNO officials, the asset management plan "will include a robust water distribution main replacement protocol taking into account water loss reduction." SWBNO officials also indicated data from the AMI and the

[42] Sewerage and Water Board of New Orleans, *Capital Improvement Program Budget (2022-2031)* (February 18, 2022), accessed August 21, 2023, https://www.swbno.org/documents/Reports/2022%20-%202031%2010%20Year%20CIP.pdf.

Water Quality Master Plan would be fed into this new asset management system and provide a "baseline for future water use and loss data." However, the request for proposals for this project also had yet to be completed. Moreover, SWBNO officials stated that these two programs may not be fully implemented until early 2026.

EVALUATION

The third component of the EPA framework was evaluation of the chosen intervention actions using performance indicators.[43] The AWWA provided a list of recommended performance indicators not only according to volume, value, and validity, but also according to their suitable purposes/uses. Suitable purposes/uses included assessment, benchmarking, target-setting, planning, and tracking.[44] See **Appendix B**. The evaluation component revolved around a series of inquiries utility managers should ask, including whether the goals of the intervention were met, where the system needed more information, how often the water system should repeat the cycle of evaluation, whether additional performance indicators should be considered, how the system's performance compares to the last audit, and what improvements can be made.[45]

However, since the SWBNO could not collect the kinds of volumetric data recommended by the AWWA to conduct a water audit, it also could not evaluate its intervention actions. SWBNO officials acknowledged that "currently there is not a reliable system for clearly evaluating leak/loss factors." Further, in its strategic plan, the utility identified as key issues facing the SWBNO inconsistent documentation, the lack of a continuous improvement or change management system, and the lack of a central data collection source to monitor and benchmark performance.[46] Aside from the regular review of planning documents, evaluators found no policies, processes, or procedures in place to evaluate intervention action items. Since the major intervention action items—the Advanced Metering Infrastructure System, the Water Quality Master Plan, and the Enterprise Asset Management and Work Order Plan—were either in the early stages of

[43] United States Environmental Protection Agency*, Water Audits and Water Loss Control for Public Water Systems,* 2.
[44] American Water Works Association, *Assessment of Performance Indicators for Non-Revenue Water Target Setting and Progress Tracking*, 41.
[45] Ibid., 3.
[46] Sewerage and Water Board of New Orleans, *2022-2027 Strategic Plan*, 31.

implementation or still in the design phase, there was little opportunity to evaluate them.

ADDITIONAL OPERATIONAL AND FINANCIAL CONSIDERATIONS

The SWBNO faced considerable operational and financial constraints. SWBNO officials pointed out that a large portion of the SWBNO's infrastructure was 60-80 years old, while the lifespans of these components were about 50-60 years. SWBNO officials stated lack of funding made water loss control measures impossible to implement at a level that would significantly reduce non-revenue water. Although they were working towards being more proactive, they had to address multiple issues, such as backlogs in paving, while also dealing with hurricanes and other disasters that may arise. One SWBNO official estimated it would cost $3-5 billion to replace the entire SWBNO water line system. Another official estimated replacing all of the water mains would require $45 million per year for the next twenty years.

The SWBNO produced a 10-year CIP budget for the years 2022-2031. In their *Adopted 2022 Operating and Capital Budgets* report, the utility explained that capital needs were categorized as either "critical," "urgent," or "necessary." However, the utility noted that, due to their debt load, they could not fund all of the capital needs in 2022.[47] The capital expenditures budgeted in the CIP for water systems in 2022 were approximately $218 million. Of this amount, $209 million, or almost 96 percent, was budgeted for projects deemed "critical."[48] Although the CIP budget represents a wish list, the SWBNO only spent about $82 million of the budgeted amount in 2022.[49] SWBNO officials said this discrepancy represented an absence of funding and noted that the SWBNO was usually in a reactionary, "feast or famine" mode. When it came to infrastructure issues, the SWBNO was often "chasing funding."

As already noted, while the AMI System was in the implementation phase, the Water Quality Master Plan and the Enterprise Asset Management and Work Order System were still in the design phase. Successful implementation of these projects

[47] Sewerage and Water Board of New Orleans, *Adopted 2022 Operating and Capital Budgets* (New Orleans, La.: Sewerage and Water Board of New Orleans, 2021), 65.
[48] Sewerage and Water Board of New Orleans, *Capital Improvement Program Budget (2022-2031)*.
[49] Sewerage and Water Board of New Orleans, *Comprehensive Annual Financial Report,* 2022, IV-1.

would likely depend upon whether the SWBNO could secure adequate funding in the future.

Recommendation 1: The SWBNO should firmly place its water loss control programs within best practice frameworks, beginning with annual water audits, and dedicate the necessary resources to keep these programs on track over the long term.

While acknowledging the efforts of the SWBNO to mitigate water loss and the operational and financial challenges facing it, the OIG recommends the SWBNO firmly commit to designing and implementing a comprehensive, integrated water loss control program, based on best practices established by both the EPA and the AWWA.

As noted in Finding 1, a Water Loss Control Program begins with the water audit. Therefore, the OIG recommends the SWBNO institute regular water audits as soon as possible. The AWWA and the EPA provided guidance with best practices on how to conduct water audits, and the types of information needed to determine the amount of water being lost through leaks in the infrastructure.[50] The SWBNO should design and implement a water audit consistent with the guidance provided.

The OIG recognizes the intervention actions that the SWBNO has already planned to detect leaks and form a more comprehensive picture of inputs. In the future, the OIG recommends the SWBNO design and implement its intervention and evaluation activities based on validated, suitable data derived through its water audits. Finally, the OIG recommends, the SWBNO adopt performance metrics against which it will assess the success of its intervention actions. The AWWA recommended that utilities "set system-specific loss targets."[51] Additionally, the

[50] American Water Works Association, *Manual of Water Supply Practices*, 35-110; United States Environmental Protection Agency, *Control and Mitigation of Drinking Water Losses in Distribution Systems*, 4-1 - 4-3.
[51] Will Jernigan, et al., *AWWA Water Loss Control Committee Report*, 4.

organization provided a list of key performance indicators to help utilities set benchmarks and assess operational and financial efficiency.[52] See **Appendix B**.

The AWWA stated that a water loss control program can be initiated or enhanced with little or no specific funding.[53] Such a program could be launched simply by convening the appropriate personnel to facilitate discussion and begin designing the process and gathering available data, a recommendation also touched upon in the 2019 audit.[54] However, given the large amount of NRW experienced by the SWBNO annually, the OIG recommends the utility specifically dedicate funds and personnel to ensure the long-term progress of any water loss control programs and activities.

[52] Ibid., 11; American Water Works Association, *Assessment of Performance Indicators for Non-Revenue Water Target Setting and Progress Tracking*, 41.
[53] American Water Works Association, *Manual of Water Supply Practices*, 285.
[54] Ibid.; Nora Freeman, *Water Audit Update FY2008-FY2017*, 13.

Transparency and accountability are basic components of good governance. Often, oversight of independent parties, including governmental entities, helps ensure accountability of organizations to their stakeholders.[55] Oversight bodies are responsible for guiding the overall direction of the entity, and ensuring accountability of management and staff. Further, the oversight body monitors and communicates with the entity related to the achievement of objectives and the remediation of deficiencies. Although a state agency, the SWBNO received oversight from the New Orleans City Council. By law, the SWBNO was required to report on its operations, including percentages of water loss, to the New Orleans City Council.[56]

FINDING 3: The SWBNO did not report water loss to the City Council as required by La. R.S. 33:4091.

Section 4091(C) of Title 33 of the Louisiana Revised Statutes required the SWBNO to make quarterly reports to the City Council on a number of issues, including water loss percentages. However, the SWBNO failed to report the percentage of water loss to the City Council on a quarterly basis. After reviewing publicly available information, evaluators found only four *Reports of Board* that included the percentage of water loss between October 5, 2018 and May 1, 2023. In its October 5, 2018 report to the City Council Public Works Committee, the SWBNO representatives definitively stated that the utility "do[es] not track water loss."[57] Evaluators found that between February 2019 and March 2023 the SWBNO only provided water loss data on the following dates: February 1, 2019; May 1, 2019; September 4, 2019; and February 3, 2020.[58] Neither the September 2019 or

[55] United States Government Accountability Office, *Standards for Internal Control in the Federal Government* (Washington, D.C.: United States Government Accountability Office, 2014), 13.
[56] La. R.S. 33:4091.
[57] Sewerage and Water Board, *Report of Board* (October 5, 2018), 3, accessed March 7, 2023, https://www.swbno.org/Reports/Board.
[58] Sewerage and Water Board of New Orleans, *Report of Board* (February 1, 2019), 4, accessed March 7, 2023, https://www.swbno.org/Reports/Board; Sewerage and Water Board of New Orleans, *Report of Board* (May 1, 2019), 1, accessed February 22, 2023, https://council.nola.gov/getattachment/Committees/Public-Works-Sanitation-and-Environment-Committee/Exhibit-1-5-1-2019-Q1-Report-to-City-Council-(1).pdf/; Sewerage and Water Board of New Orleans, *Report of Board* (September 4, 2019), 1, accessed March 21, 2023, https://council.nola.gov/council/media/Assets/Committees/Public-Works/9-1-2019-City-Council-

February 2020 reports provided new information, as both repeated the same data presented in the May 1, 2019 *Report of Board*.

SWBNO officials stated water loss percentage data had been excluded from their reports because they did not have meaningful data to provide. They also noted that, although the SWBNO had begun to report high-level aggregate data again in its most recent reports, SWBNO officials had concerns about the utility's requirements under the statute when the data were out of date. Specifically, the officials questioned whether SWBNO should report data just to fulfill the requirement or wait until data collection improved.

Despite the SWBNO's statements regarding their inability to track the percentage of water loss according to AWWA standards and the value of the data, the agency had a responsibility to provide the information to their oversight agency as required by law. If the SWBNO felt the data they had access to—the same data provided for this report—did not provide a complete picture of the percentage of water that was lost each quarter, the report could have included additional context that would help explain the limitations of the information contained therein.

Recommendation 2: The SWBNO should enhance its data collection efforts to ensure it can provide meaningful data in complying with reporting requirements.

SWBNO officials expressed concerns that any data provided to the City Council would have been misleading or inaccurate. The AWWA discouraged the use of percentages as meaningful measures of utility performance.[59] According to the AWWA, a percentage indicator doesn't distinguish between the various components of non-revenue water, such as real and apparent losses, and free water, and it "reveals nothing about water volumes and associated costs."[60]

Report-(quarterly).pdf; Sewerage and Water Board of New Orleans, *Report of Board* (February 3, 2020), 1, accessed March 21, 2023, https://council.nola.gov/council/media/Assets/Committees/Public-Works/Public-Works-Quartley-Report.pdf.

[59] American Water Works Association, *Best Practice in Water Loss Control: Improved Concepts for 21st Century Water Management* (Denver, CO: American Water Works Association, 2015), 1, accessed February 16, 2023, https://www.awwa.org/Portals/0/AWWA/ETS/Resources/WLCFlyerFinal.pdf?.

[60] Ibid.

However, the utility had a legal responsibility to report water loss percentages to the City Council.

The OIG therefore recommends the SWBNO comply with La. R.S. 33:4091 and, if necessary, provide supplementary data or information that would make its water loss data more useful and relevant to internal and external stakeholders. This supplemental information may include any limitations of the data and context for interpretation. While doing so, the SWBNO should also enhance its efforts to collect meaningful data that the City Council can use to truly measure the utility's performance. The OIG is encouraged that the SWBNO has already begun to improve its data collection through projects currently in planning and implementation phases, such as the smart meter plan. The OIG recommends the SWBNO take steps to ensure the planned intervention actions are sufficiently funded, prioritized, and carried out to completion.

VI. Conclusion

The Sewerage and Water Board of New Orleans faced serious issues of water loss and non-revenue water. Between 2008 and 2017, the SWBNO experienced non-revenue water averaging above 70 percent per year.[61] A review of more recent SWBNO data by OIG evaluators revealed that the SWBNO continued to experience significant water loss several years after the utility's last water audit was released in 2019. Moreover, the SWBNO suffered from an inability to collect sufficient data to conduct reliable water audits, despite repeated recommendations in previous audits to correct data collection deficiencies.[62] This inability to collect sufficient relevant data had other far-reaching consequences, namely, the inability to institute a comprehensive water loss program.[63]

The EPA provided a simple water loss framework, consisting of a cycle of water audits, intervention action items, and evaluation of those items, which led to an updated water audit.[64] The AWWA provided technical guidance on water loss control programs, including how to conduct a water audit and possible water loss control actions.[65] The AWWA even provided free online water audit software.[66] Nevertheless, while SWBNO officials asserted they implemented water loss practices similar to other utilities, the SWBNO did not adopt the EPA and AWWA approaches to water loss control. And given its inability to collect sufficient relevant data, it could not even begin the process.

To its credit, the SWBNO instituted a few major programs intended to address the issue of water loss. Most notably, the SWBNO embarked on an Advanced Metering Infrastructure System that was specifically intended to resolve the

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[61] Nora Freeman, *Water Audit Update FY2008-FY2017*, 13.
[62] Nora Freeman, *Water Audit FY 2008-2010, A11-A14*; Nora Freeman, *Water Audit FY 2008-FY 2015*, 13-17; Nora Freeman, *Water Audit Update FY2008-FY2017*, 13-17.
[63] American Water Works Association, *Manual of Water Supply Practices,* 281; United States Environmental Protection Agency, *Control and Mitigation of Drinking Water Losses in Distribution Systems*, vii.
[64] United States Environmental Protection Agency, *Control and Mitigation of Drinking Water Losses in Distribution Systems*, 1-6 - 1-8.
[65] American Water Works Association, *Manual of Water Supply Practices.*
[66] American Water Works Association, Free Water Audit Software, https://www.awwa.org/Resources-Tools/Resource-Topics/Water-Loss-Control/Free-Water-Audit-Software.

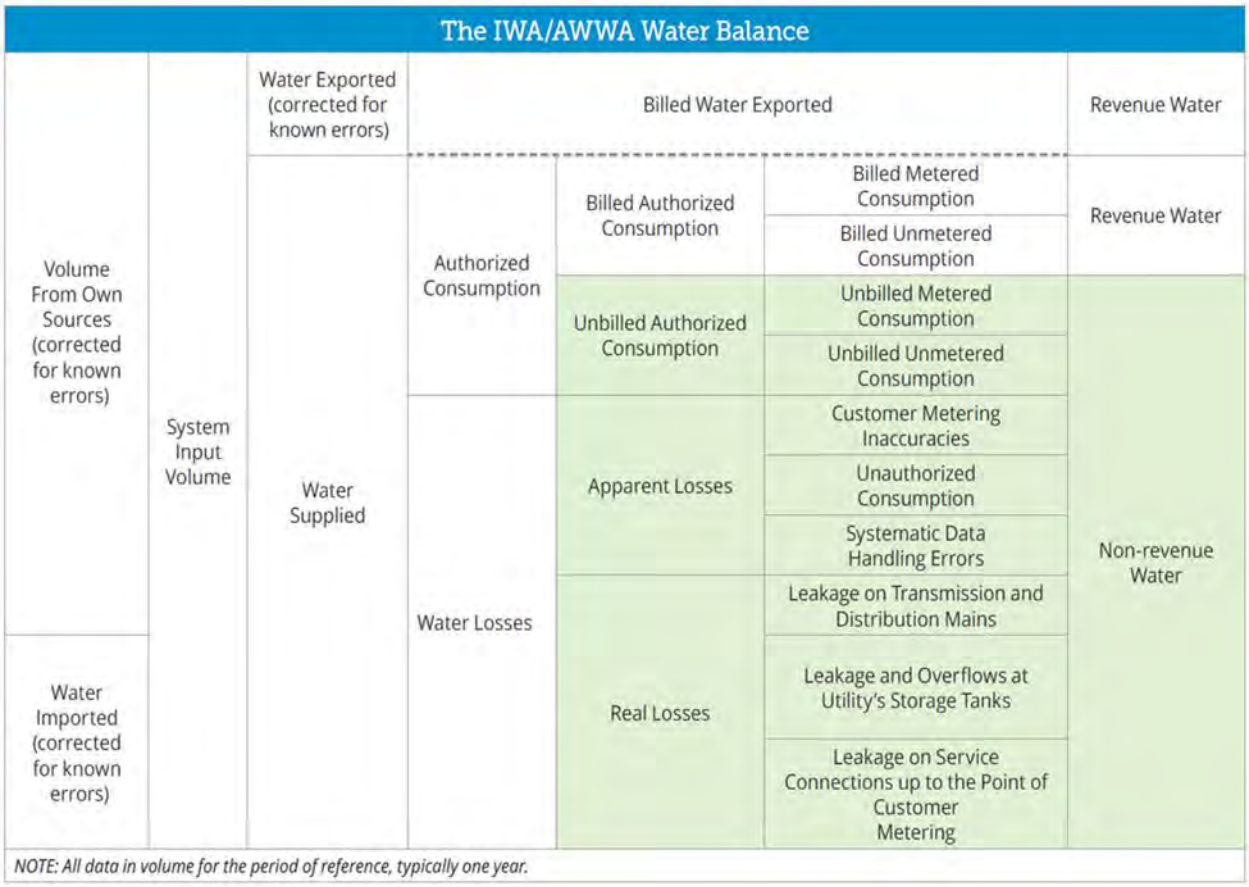
SWBNO's data collection problems. It also began the design of a Water Quality Master Plan and an Enterprise Asset Management and Work Order System. The SWBNO envisioned these programs to be integrated under a single operational umbrella.

However, these programs did not represent a comprehensive water loss program set within best practices. Furthermore, while the smart meter program was contracted in late 2022, it was not expected to be fully completed until 2025. Similarly, the Water Quality Master Plan and the Enterprise Asset Management and Work Order System were still in the design phase and were not expected to be completed until 2025 or 2026. Another potential complicating factor was the SWBNO's financial shortfalls, which challenged its ability to carry out its plans as envisioned multiple years into the future.

Finally, the SWBNO did not report water loss data to the City Council of New Orleans as required by law, largely due to the lack of what the utility considered appropriate data. However, even if SWBNO officials felt they did not have the appropriate data, the utility had a legal responsibility to provide this information to the City Council.

The OIG recommends the SWBNO adopt water management programs in line with identified best practices. The OIG also recommends that policies and procedures be developed in conjunction with the new programs currently in development at the SWBNO, to ensure they are implemented according to best practices for water loss control programs. Additionally, the SWBNO should make every effort to ensure the appropriate resources are dedicated to these programs to keep them on track until they are well-established and operating effectively.

Last, the OIG recommends the SWBNO abide by the relevant laws for reporting while it continues to enhance its efforts to collect appropriate data. If additional data or information is necessary to make its baseline water loss data more relevant or understandable to its stakeholders, then the SWBNO should make efforts to provide that information.



Source: American Water Works Association, *Best Practice in Water Loss Control: Improved Concepts for 21st Century Water Management* (Denver, Co.: American Water Works Association, 2015), 2.

APPENDIX B. RECOMMENDED WATER LOSS PERFORMANCE INDICATORS

	Indicator1	Description	Suitable Purposes / Uses					Principal Users	Further Assessment Needed
			Assess-ment	Bench-marking	Target-Setting	Planning	Tracking		
Volume	Unit total water losses	Strong and understandable indicator; useful for high-level performance measurement	✓	✓	✓	✓	✓	Utilities, Regulators, Customers	
	Unit apparent losses	Strong and understandable indicator for multiple users	✓	✓	✓	✓	✓	Utilities, Regulators	
	Apparent losses/ billed authorized consumption	Very strong and understandable indicator for multiple users	✓	✓	✓	✓	✓	Utilities, Regulators	Assessment needed when water loss audits use defaults
	Unit real losses/ connection	Strong and understandable indicator for multiple users	✓	✓	✓	✓	✓	Utilities, Regulators	
	Unit real losses/ pipe length	Strong and understandable indicator for use by utilities with low connection density	✓	✓	✓	✓	✓	Utilities, Regulators	Assessment of "low" connection density needed
	Unit real losses/ connection/ pressure	Robust specialized indicator; technical rigor may be influenced by network materials	✓	✓	✓	✓	✓	Utilities	Assessment needed for use and applicable context(s) in NA
	Infrastructure leakage index (ILI)	Robust specialized ratio indicator; technical rigor may be influenced by pressure and connection density	✓			✓	✓	Utilities	Guidance needed on wide use in NA
	Pressure management index (PMI)	Robust indicator which can be used on its own or with other parameters or indicators	✓			✓	✓	Utilities	Need standard reference pressure
	ILI * PMI	Robust specialized ratio indicator; correlates very closely to real loss volume	✓		✓	✓	✓	Utilities	Guidance needed on wide use in NA
Value	Unit total water loss cost rate	Indicator with sufficient technical rigor; useful for planning and communication purposes by utilities	✓			✓	✓	Utilities, Regulators, Customers	Assessment needed on indicators or parameters to use with loss cost rates
	Unit apparent loss cost rate	Indicators with sufficient technical rigor; very useful for planning and assessing the cost efficiency of water loss reduction and control interventions and programs.	✓			✓	✓		
	Unit real loss cost rate		✓			✓	✓		
Validity	Data validity tier[2]		✓				✓	Regulators, Utilities	Weightings need to be made available
	Source metering	Weighted data grades are strong indicators of water loss audit data quality if data has been validated; audit provides guidance on priority areas of activity	✓				✓		
	Billed authorized consumption		✓				✓		
	Apparent loss		✓				✓		

Notes: 1. For volume and value indicators, total water losses have no shading; real losses have blue shading; apparent losses have green shading.
2. Data validity tier groups. Data validity grades: Tier I: DVS = 0–25; Tier II: DVS = 26–50; Tier III: DVS = 51–70; Tier IV: DVS = 71–90; Tier V: DVS = 91–100

Source: American Water Works Association, *Assessment of Performance Indicators for Non-Revenue Water Target Setting and Progress Tracking* (American Water Works Association, 2019), 41.

Sewerage & Water Board of New Orleans

Water Loss Control — Report Response

The Sewerage & Water Board of New Orleans (SWBNO) would like to thank the Office of the Inspector General for their review, the associated recommendations, and the opportunity provide a response. In response to the two Recommendations, SWBNO would like to submit the following:

Recommendation 1 — *"The SWBNO should firmly place its water loss control programs within best practice frameworks, beginning with annual water audits, and dedicate the necessary resources to keep these programs on track over the long term."*

SWBNO agrees and understands that water loss control is an important recommended course of action and that the EPA M36 guidance is the basis upon which this process should be carried out. SWBNO is well on its way to implementing the processes, tools, and procedures that will make annual audits a meaningful and standard practice within the utility. Heretofore, as recognized in previous audits, the lack of reliable production and usage data due to irregular meter-reading schedules, major changes in unbilled water reads, and a lack of consistent data collection have made water audits and the recommendation and implementation of their findings challenging and of limited value.

The foundational recommendation of the latest water audit was the critical need for reliable and accurate water production use and production data. Two ongoing projects will absolutely address this issue:

(1) Real-Time Metering at CWP — An ongoing hazard mitigation project at the Carrollton Water Plant will install real-time metering of production leaving the facility, which will allow SWBNO us to be able to track production rates with the level of accuracy that has previously been lacking. This project is slated for completion in the second quarter of this year (2024).

(2) Smart Metering — The second, and by far more critical project, is the Smart Metering Program, which has launched in earnest; and is slated to reach its midpoint this year and completion in 2025.

These projects will provide the raw data necessary to complete the first step: Water Audit Data Needs.

The second step of the EPA M36 guidance of implementation is also being mapped out at this time via the Water Quality Master Plan; which has been awarded and is being kicked off on April 5th. This key planning effort will set the framework for evaluating the data as it is received and will provide the capital improvement planning guidance necessary to produce a clear and defined set of projects that can be communicated to the public and completed if/as funding is available.

With the foundational data available in 2025 and the framework of the Water Quality Master Plan also in place, SWBNO will be able—and is committed to—completing annual water audits and acting upon their findings accordingly.

Recommendation 2 — *"The SWBNO should enhance data collection efforts to ensure it can provide meaningful data in complying with reporting requirements."*

The SWBNO fully agrees with this Recommendation and four key projects are already underway that will make that a reality.

(1) Production Metering — This will be accomplished in the second quarter of 2024 as part of an ongoing hazard mitigation project which will install meters on our sources as they leave the Carrollton Water Plant. We do have a reliable source of production data for our West Bank Algiers Facility.

(2) Usage Metering — The Smart Metering Program—50% complete in 2024 and fully completed in 2025—will absolutely address this item with reliable, accurate, real-time usage data for our revenue as well as non-revenue customers. This data will provide exceptional revenue and non-revenue use information that will allow for a clear picture of apparent and real losses on a regular (hourly if desired) basis.

(3) Master Planning — The award and launch (in April of 2024 and running through Q2 2026), of the Water Quality Master Plan includes the framework necessary to analyze the data taken from the first two initiatives as well as the following project, and formulates the approach and discreet projects necessary to implement and execute the findings of the usage data.

(4) Asset Management — SWBNO is in the process of a needs assessment for a work order and asset management program that will allow for data collection, analysis, and project management. While this program procurement is being developed, our existing work order and GIS data is being analyzed to isolate repeat failure locations, risk factors, and return-on-investment criteria to map and define where water main replacements would yield the greatest benefit.

We believe that these four ongoing projects already have SWBNO well on its way to addressing this Recommendation; and we look forward to being able to report on the findings and path forward as they develop.