Madison Metropolitan Sewerage District
Mercury Pollutant Minimization Plan/Source Reduction Report
2023

Section I: General Information

Name of Permittee: Madison Metropolitan Sewerage District – Nine Springs Wastewater Treatment Plant

Permit Number: WI-0024597-09

This is: Not the first permit issuance requiring implementation of a PMP/SRM

Dates of previous PMP/SRM Plans: 12/12/2006

Permit Effective Date: 5/1/2020

Date of First PMP/SRM: 12/12/2006

This variance is for: Mercury

Section II: Summary of Pollutant Reduction Work Done in 2023

In the District's pollutant minimization plan (PMP) submitted to WDNR in 2017, mercury identification and reduction tasks were organized by nine broad categories, with specific activities in those categories to be determined each year. Those categories, in the shaded left hand column of the tables below, are taken verbatim from the PMP. The middle column indicates the activities that the District planned for 2023. The Status/Updates column on the right indicates the status of each action as of this report, as well as any observations or planned follow-up actions.

A. Mercury Source Identification Efforts

PMP Action	2023 Planned Actions	Status/Comments
1. Explore possible operational influences on mercury levels, such as process chemicals.	The District will be working with a consultant on a comprehensive waste audit of District facilities in 2023. The District anticipates improving its knowledge and processes related to mercury and other hazardous wastes as a result of this audit.	The District is working with SCS Engineers to complete the waste audit of District facilities. The District provided relevant waste management information to SCS in February 2023, and staff from SCS toured waste generation and storage areas at the plant on 10/10/23. The audit included mercury waste at the plant in its scope. As of this report, the District is awaiting the formal report and recommendations

		determined in the audit. The District also removed seven pounds of mercury devices from campus in 2023, including tilt switches and old thermometers, and disposed of them at Dane County Clean Sweep. District staff who may encounter old mercury devices in the course of their work are educated on recognizing and properly storing such devices.
2. Conduct additional influent and/or collection system monitoring to identify variation in mercury levels based on time, location in the collection system, or other factors.	Depending on the results from the 2022 special sampling for mercury isotope analysis, and on availability of USGS staff and resources, the District may carry out additional sampling for mercury isotope analysis as a source identification measure.	The USGS Mercury lab had instrument issues in 2023, so we're awaiting isotope data for the most recently collected samples from late 2022. However, the USGS provided concentration data with potential implications for future source reduction strategy. See Attachment B for discussion of this data.
3. Review scientific literature and case studies from other POTWs to draw ideas from successful source identification/reduction activities elsewhere.	District staff will continue reviewing online research and articles as needed to find information relevant to mercury source reduction.	District staff initiated a meeting on 4/5/23 with pollution prevention staff at Northeast Ohio Regional Sewerage District (NEORSD) to learn about their mercury minimization efforts, including dental education practices and atmospheric mercury deposition sampling. The District also shared its resources for dental clinics in the interest of approaching mercury minimization collectively with other POTWs, rather than individually.

If any action was not implemented, please explain why.
See comments in Status/Activities column for specific actions.

B. Actions Identified to Minimize Mercury Sources

PMP Action	2023 Planned Actions	Status/Comments

4. Work with partners to extend the reach of mercury disposal messages to specific audiences, such as students.	The District plans to work with Sustain Dane to deliver additional class as part of the Water Steward program. Proper mercury disposal actions will be part of course content.	Two Water Stewards sessions were held on Sept. 15 and Oct. 21, led by Sustain Dane with contributions by the District, MAMSWaP, and the Madison Water Utility. These courses focused on ways that attendees can protect water, and the content included information about mercury's impacts and how to dispose of mercury-containing equipment. 44 people participated in the sessions. In another effort to reach larger audiences with mercury reduction information, the District had been working with WDNR to adapt the District's resources for dental clinics for a statewide audience. WDNR launched its dental mercury reduction page including these resources in March 2023. The page is available here: dnr.wisconsin.gov/topic/SmallBusiness/Dentist.
5. Discuss mercury management in direct meetings with users in healthcare, school and industrial sectors to identify any remaining mercury sources and provide information about disposal/alternatives.	Previous District conversations with sectors other than dental have indicated that mercury-containing products have been largely phased out in schools and healthcare facilities. However, District collection system sampling has indicated that some sector locations could still be mercury sources, whether from current or historical mercury discharges. Special sampling in 2020 indicated high mercury values in sediment in a stretch of sewer where a healthcare facility discharges, so the District plans to investigate the cause of this high value through conversations with the facility and potentially additional sampling.	The District reached out to a hospital lab upstream of the sampling point where a relatively high level of mercury had been detected in 2020 and asked if there were any known events that may have contributed mercury to the sewer. The lab reported no known events around this time. In April 2023, the District collected special samples from the same sampling point to evaluate current mercury levels at that site. The samples had mercury concentration values in the same range as typical mercury influent values at the plant, so there did not appear to be any abnormal upstream mercury contributions at this site. Additional information about this sampling is in Attachment B. The District also contracted with a

		consulting firm to carry out a community values survey in late 2023, following up on a similar survey conducted in 2019. The survey included questions related to mercury in the community. When asked if they had liquid or elemental mercury in their homes not contained in thermometers or batteries, 7% of respondents said yes, and 52% of respondents said they didn't know. These responses indicate an opportunity for District outreach related to mercury identification and disposal.
6. Implement other outreach and/or regulatory approaches as may be informed by research and analysis.	To be conducted if identified as necessary.	The District identified a need for more comprehensive amalgam waste management education for dental clinicians, such as hygienists and assistants. District staff visited the Madison College Dental Hygiene Clinic on 6/8/23, which functioned as both a clinic inspection and a discussion with instructors about the need for amalgam education. The District intends to respond to this identified need by conducting outreach to dental educators and encouraging them to thoroughly cover amalgam management in dental curriculum.

If any action was not implemented, please explain why.
See comments in Status/Activities column for specific actions.

C. Actions Taken to Maintain Source Reduction

PMP Action	2023 Planned Actions	Status/Comments
7. Continue dental certification program, supplemented with direct site visits to dental clinics, to ensure compliance with	The District plans to conduct its annual dental certification again in 2023. The District also plans to reassess the frequency of the dental certification, with the potential of lowering the frequency for consistently compliant clinics.	The District carried out its annual dental certification as it has done in the past several years. A more in-depth summary of this certification and observations is below.

amalgam separator and management requirements in the sewer use ordinance.		
8. Evaluate need for local limits and/or general permits related to mercury.	Not planned for 2023.	As planned, local limits and general permits were not considered in 2023. New regulation was not determined to be necessary given the overall low mercury values recorded at the plant.
9. Publicize options for residential and commercial disposal of mercury, particularly Dane County Clean Sweep.	The District has an active social media presence and occasionally promotes information about proper waste disposal to its followers. The pollution prevention team suggests topics to communication staff and will promote household hazardous waste disposal when appropriate.	The District made several posts related to mercury and/or household hazardous waste in 2023, listed and linked below this table.

If any action is not ongoing, please explain why.

See comments in Status/Activities column for specific actions.

Summary of annual dental certification:
The District carried out its annual dental certification process, which it has done in some form since 2008. This certification verifies that local dental clinics are continuing to follow best practices to keep amalgam waste out of the sewer system to the greatest extent possible, including proper maintenance of their amalgam separators or other amalgam capture devices.

As of this report, 101 out of 119 area dental clinics (85%) had returned their 2023 certification report, which is consistent with the response rate of previous years' certifications since switching to fully online reporting. The District sent multiple communications about the certification and followed up with all non-responding clinics reminding them to submit their reports. The District hired a Pretreatment program assistant in 2023, who was able to devote time to contacting clinics and reviewing submitted certifications.

The District has continued using an in-house, online Survey123 form to collect certification reports, which has the benefits of being paper-free, creates an immediate online database of responses, and allows for collection of photos of the amalgam separator to verify proper maintenance. The database makes it easier for the District to review trends in clinic compliance than by manually entering and comparing data from paper forms.

Of the clinics that submitted reports, 12 reported placing amalgam only in rare, unplanned emergency situations (i.e., they reported being exempt from local amalgam requirements). Of the remaining 89 clinics that reported regularly placing or removing amalgam fillings:

- 61 (69%) were in full compliance with amalgam best management practices
- 28 (31%) had at least one item that needed correction based on their certification responses. The most common practices that needed correction were:
    - Switching to a vacuum line cleaner with a neutral pH (11 clinics). This is a reduction from 18 clinics who were noncompliant in this area in 2022.
    - Checking their amalgam separator for proper function at least once a week (19 clinics, compared to 25 in 2022).

Clinics with corrective actions needed receive a message during completion of the report about those actions, and they also receive an automatically generated emailed report after submitting their certifications that summarizes the actions they need to take to be in full compliance. District staff also review the clinic-submitted photos of amalgam separators to ensure that they visually appear to be properly maintained and follow up with clinics whose separators are full or otherwise appear to need attention.

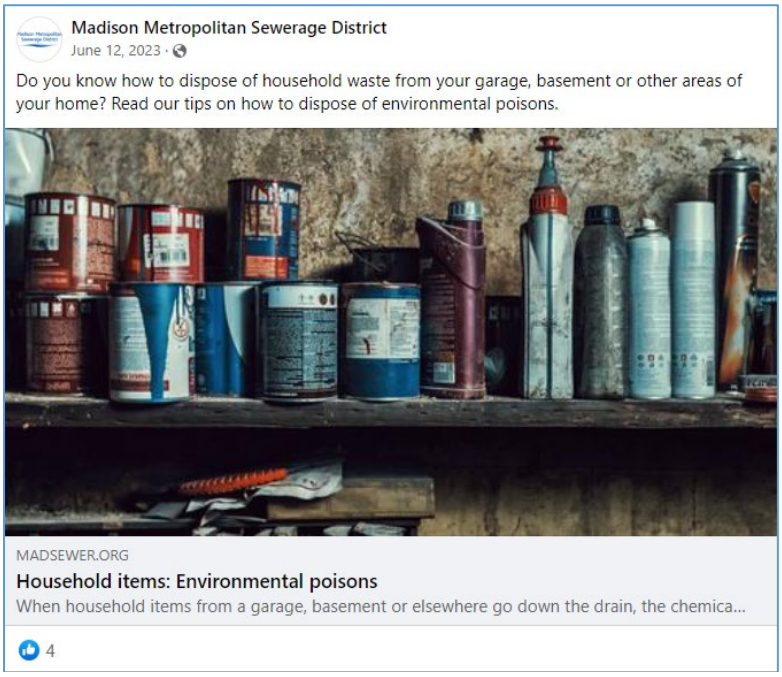
In general, clinics are following most required amalgam management practices. The District finds that the annual certification is a helpful reminder and education opportunity for clinics to prioritize amalgam management amid the many other responsibilities of a dental practice.

List of 2023 social media posts related to mercury:

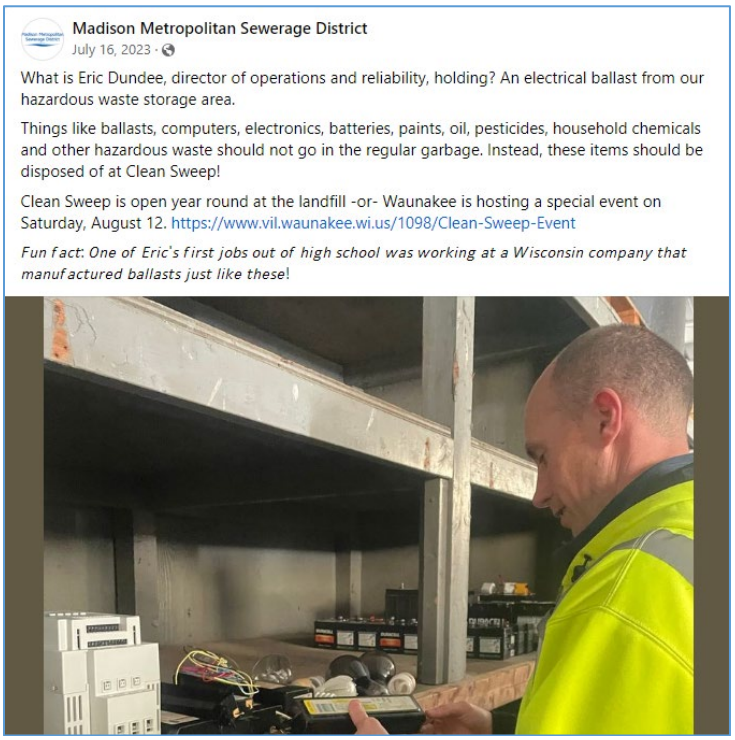
- March 6 post about dental resources newly posted on WDNR site: https://www.facebook.com/MadMetroSewer/posts/pfbid033YszpgqJYvCBfJwBUpwTsqsRTrix2HLf2qekesHG1SmA1xYJrN2mukweuyenP3PJl

- District blog post: https://www.madsewer.org/news-resources/blog/household-items-environmental-poisons/

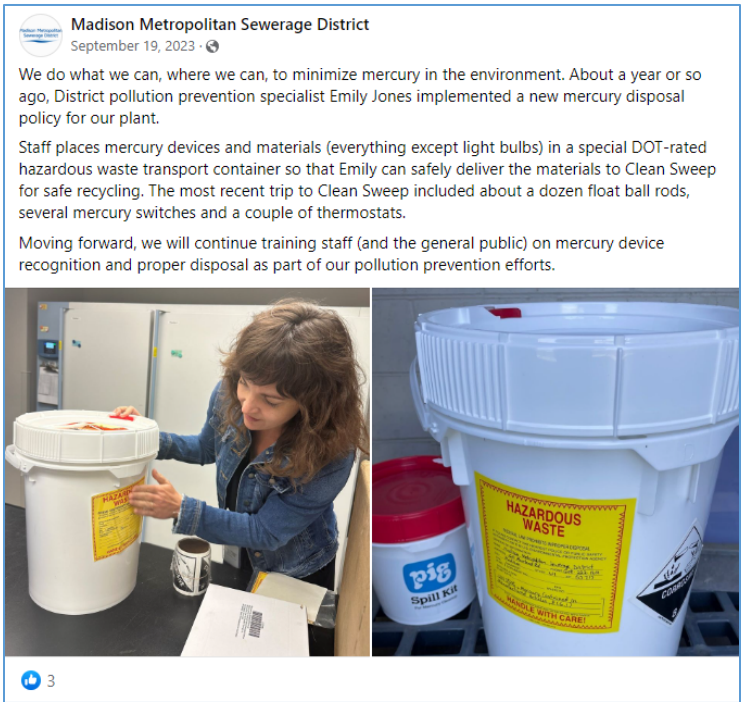
- June 12 social post promoting the blog post: https://www.facebook.com/MadMetroSewer/posts/pfbid0jEp7xCaKRtbxEzuYqeLJ7wav9cMidcN7Q94xNWV2os7z1J9YPXaitecH5vUJtE2zl



- July 16 post promoting Clean Sweep and HHW collection event: https://www.facebook.com/MadMetroSewer/posts/pfbid02ZFTChpokzhnnQDTNmuwyqfroVaoZaiLcvyNSBQ6Nn5KV4MqgXXVPMF6nMfZ5Ltu2l



- Sept 19 post about District mercury management: https://www.facebook.com/MadMetroSewer/posts/pfbid02Y5614xLqqYhBJ7WJX3M4EbYKk83WmBGibhmddpjUNKFVJnEaN2Tnqe8TMXkGcwchl



Section III: Summary of Progress and Barriers to PMP Effectiveness

Average Effluent Mercury Concentration in Previous Year (2022): 0.92 ηg/L

Average Effluent Mercury Concentration This Year (2023): 0.76 ηg/L

These values are the averages of 12 effluent grab samples, one per month.

Please attach a graph of variance pollutant concentration data over the last five years.

See Attachment A.

Have you encountered any barriers that have limited pollutant minimization program/source reduction measure effectiveness? If so, what adjustments will you make to the program during the next year to help address these barriers?

Overall, the District continues to record low mercury values in influent, effluent and biosolids, indicating that mercury source reduction efforts have been effective. Many of the challenges that the District encounters in its mercury reduction work are systemic and would be most effectively addressed at a higher level, rather than at an individual treatment plant, because these challenges affect dental clinics and treatment plants in other areas beyond the District service area.

Some of these systemic challenges, which the District has noted in the past, include the continued placement of new amalgam fillings in dental clinics, dental staff turnover leading to gaps in

amalgam management, and a geographic patchwork of amalgam requirements depending on the area. From the District's experience, dental clinic staff would benefit from standardized education and norms around amalgam management.

In 2024, the District plans to work to promote the inclusion of more information on amalgam management and amalgam separator maintenance in dental education, such as in dental hygiene training programs and in dental continuing education programs. This outcome would not benefit only the District, but other POTWs with mercury reduction obligations, and would benefit clinics by helping staff ensure compliant, safe workplaces.

The District encourages WDNR to continue advancing statewide information and resources related to mercury reduction that are relevant to multiple stakeholders, including POTWs and dental clinics. We were glad to see the launch of the WDNR dental resources webpage last year, and we welcome other WDNR efforts to standardize and disseminate mercury reduction messages.

Section IV: Planned Actions

The District included nine general actions in its application for a mercury variance in its upcoming permit. These actions, listed on the left in the table below, are the core planned activities for the District's next permit term, and future annual reports will summarize specific steps taken in each of these efforts.

PMP Action	2024 Planned Actions
Mercury Source Identification Efforts	
1. Explore possible operational influences on mercury levels, such as process chemicals.	The District may adjust its internal mercury waste handling practices after receiving the final report for the waste audit conducted in 2023, depending on the consultant's recommendations.
2. Conduct additional influent and/or collection system monitoring to identify variation in mercury levels based on time, location in the collection system, or other factors.	The District plans to analyze certain User Charge wastewater samples for mercury to investigate trends in mercury levels over time and differences between sewersheds with different building uses.
3. Review scientific literature and case studies from other POTWs to draw ideas from successful source identification/reduction activities elsewhere.	There are several POTWs in the state with current or historical mercury limits. The District hopes to identify success stories from other POTWs in mercury source reduction that could be incorporated into District strategy. The District plans to connect with other POTWs to discover successful activities that may be applicable in the District's service area.
4. Work with partners to extend the reach of mercury disposal messages to specific audiences, such as students.	Building on conversations that took place in 2023, the District plans to keep advocating for mercury education for dental clinics to be more standardized across the field. The District intends to engage with curriculum/content developers for dental clinician training to promote the inclusion of proper amalgam management in standard, far-reaching dental education.
5. Discuss mercury management in direct meetings with users in healthcare, school and industrial sectors to identify any remaining mercury sources and provide information about disposal/alternatives.	The District pollution prevention team plans to meet with staff from the District's constituent communities 2024 and discuss pollution prevention topics in those meetings. A specific topic we intend to discuss is processes for notifications when new dental clinics open across the District service area, which would help the District communicate with those clinics early on about their amalgam management requirements.
6. Implement other outreach and/or regulatory approaches as may be informed by research and analysis.	To be conducted as needs or opportunities arise.

7. Continue dental certification program, supplemented with direct site visits to dental clinics, to ensure compliance with amalgam separator and management requirements in the sewer use ordinance.	The District plans to carry out its annual dental certification and continue assessing ways to make the certification as efficient as possible for clinics and the District while still gathering valuable information.
8. Evaluate need for local limits and/or general permits related to mercury.	As mercury levels have held low at the plant, we have not seen a need for new regulation at this point. The District will continue monitoring mercury levels at the plant and in the collection system to identify controllable sources, and will assess potential policy approaches if deemed necessary.
9. Publicize options for residential and commercial disposal of mercury, particularly Dane County Clean Sweep.	The District has an active social media presence and occasionally promotes information about proper waste disposal to its followers. The pollution prevention team suggests topics to communication staff and will promote household hazardous waste disposal when appropriate.

Section V: Notes

No additional notes.

Section VI: Certification

I certify that the information contained in this document and all attachments were gathered and prepared under my supervision and based on inquiry of people directly under my supervision and that, to the best of my knowledge, the information is true, accurate, and complete.

Authorized Representative Signature: 

Date of PMP Annual Report Submittal to WDNR: 1/31/2024

Attachment A – Mercury Data and Graphs

Sampled date	Influent Hg concentration (ppt)	Effluent Hg concentration (ppt)
1/10/2023	40	0.59
2/7/2023	33	0.20*
3/7/2023	17	0.68
4/18/2023	32	1.08
5/9/2023	42	0.96
6/6/2023	67	0.21*
7/20/2023	44	0.21*
8/15/2023	33	1.20
9/6/2023	49	1.24
10/3/2023	64	0.97
11/7/2023	44	0.83
12/5/2023	43	0.90
Average	**42**	**0.76**

Month (monthly composite)	GBT biosolids Hg concentration (mg/kg, dry weight)
1/2023	0.2
2/2023	0.3
3/2023	0.4
4/2023	0.3
5/2023	0.3
6/2023	0.4
7/2023	0.2
8/2023	0.3
9/2023	0.2
10/2023	0.3
11/2023	0.2
12/2023	0.3
Average	**0.3**

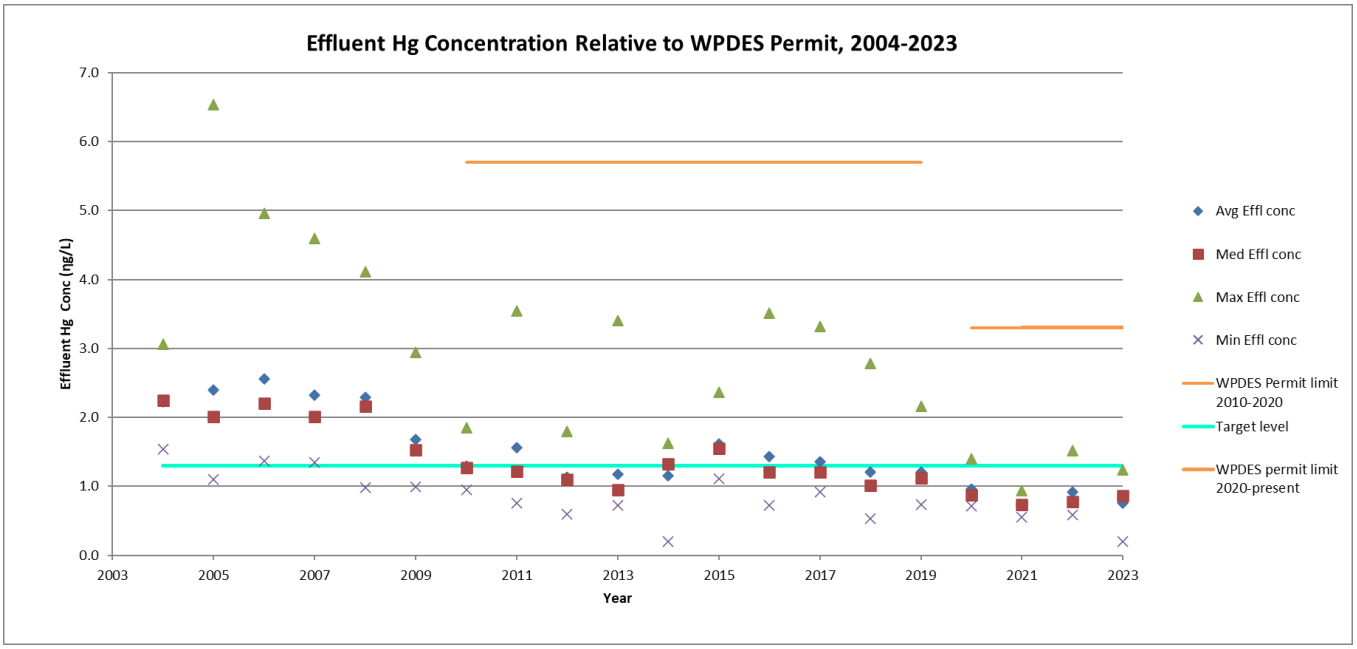
* Lab qualifier b: analyte concentration below Method Detection Limit so MDL was reported

Summary of year:

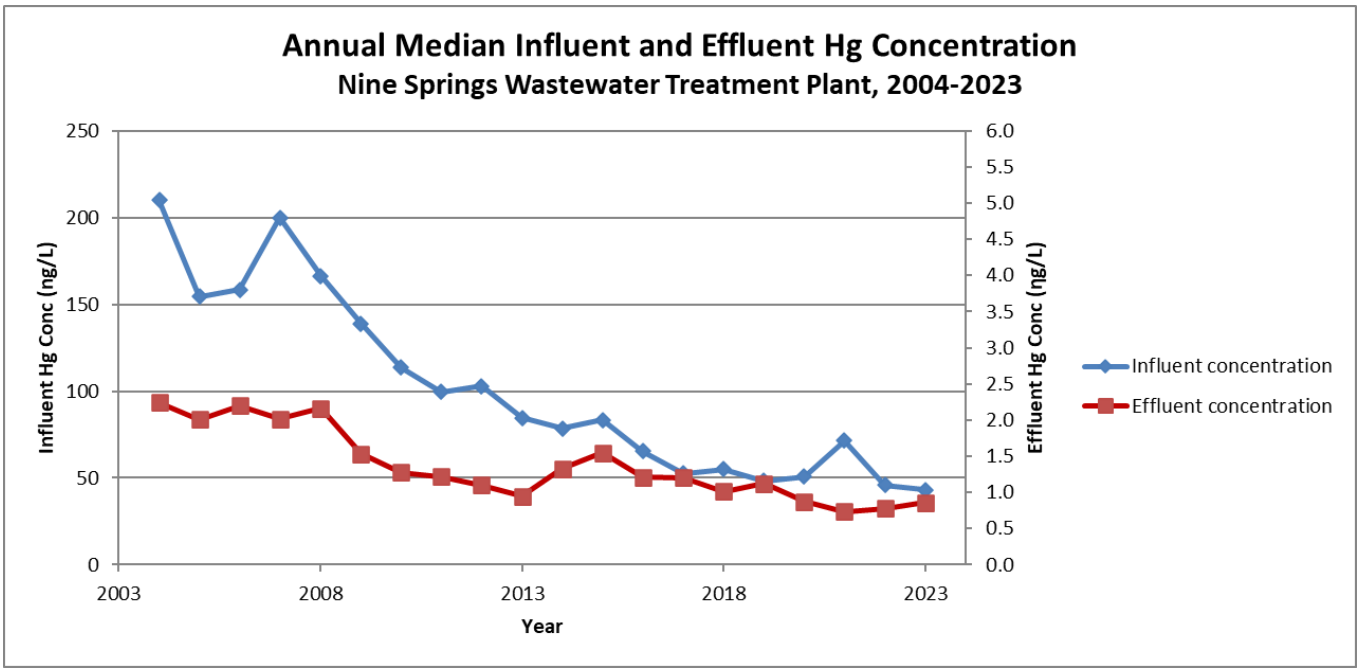
The District conducts influent mercury analysis in-house, using EPA method 254.7. The influent sample is a 24-hour composite. Biosolids samples are collected from the gravity belt thickener (GBT) and also analyzed in-house. The effluent sample is a grab sample collected according to the "clean hands-dirty hands" protocol. This sample is sent out for low-level mercury analysis via EPA method 1631E at Pace Analytical in Green Bay, WI.

Mercury levels remained low overall in 2023, consistent with values recorded in recent years. There were no unexpectedly high mercury values in influent, effluent, or biosolids. All effluent mercury concentration values were below the District's variance permit limit of 3.3 ηg/L. The annual mean influent concentration of 42 ηg/L was the lowest recorded in the District's plant mercury data set, indicating a positive trend in mercury discharges to the sewer system.

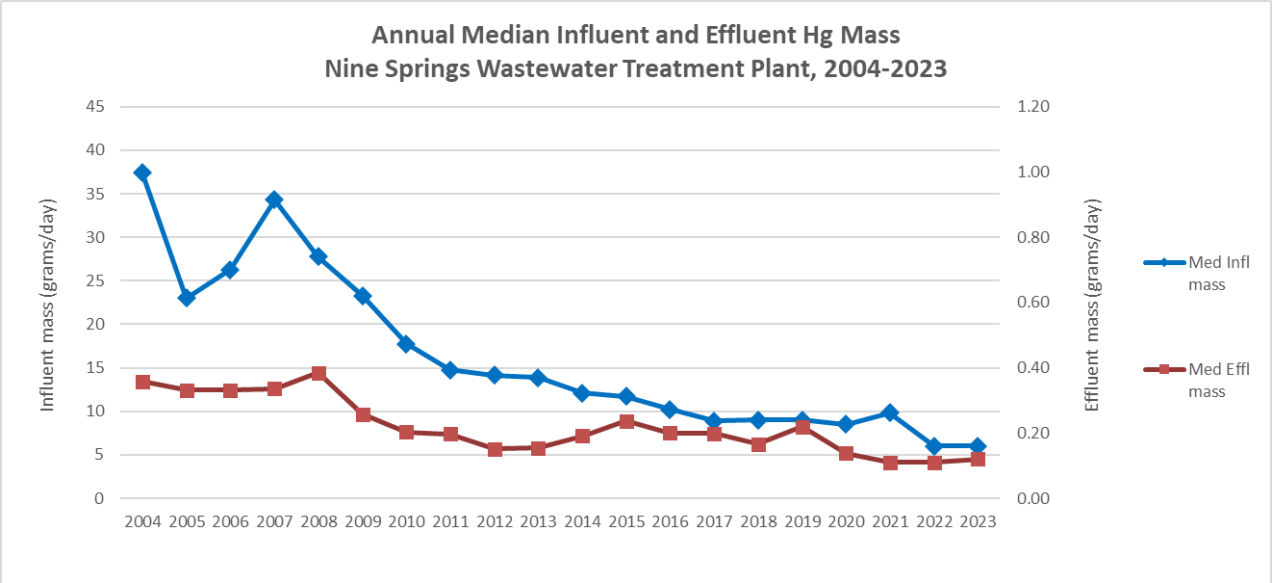
Graph 1 – Annual Effluent Mercury Concentration, 2004-2023



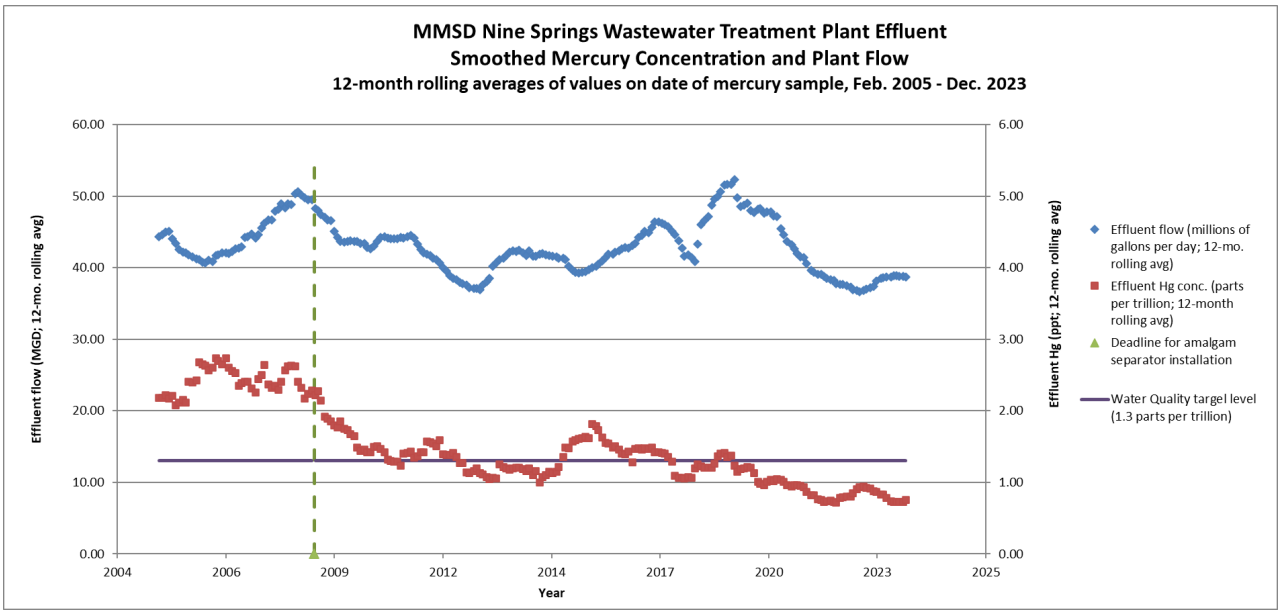
Graph 2 – Annual Median Influent and Effluent Mercury Concentration



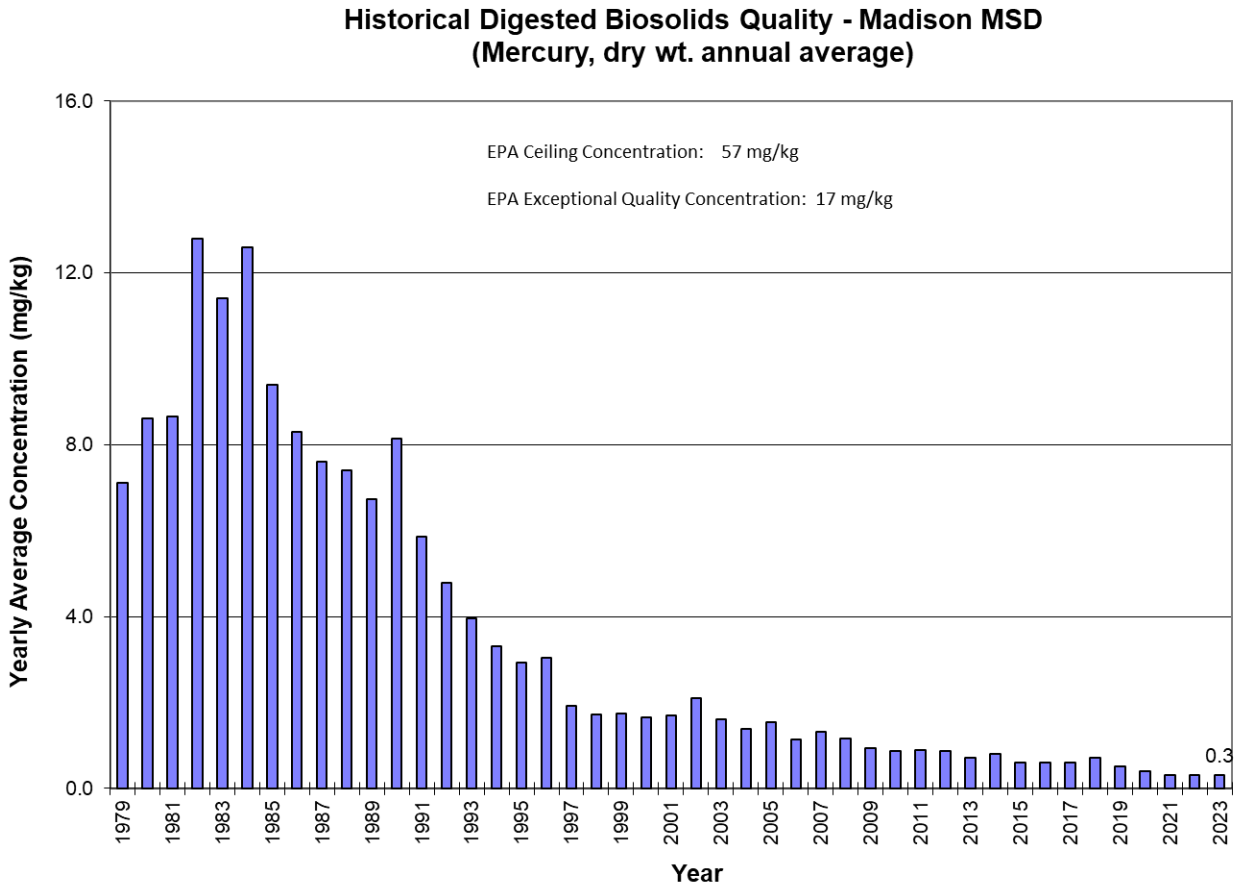
Graph 3- Annual Median Influent and Effluent Mercury Mass



Graph 4 – Rolling Average Flow and Effluent Mercury Concentration



Graph 5 – Gravity Belt Thickened Biosolids Mercury Levels



Attachment B – Special Mercury Sampling Values

The District conducts special sampling to help identify potential sources of mercury to the plant, as well as the nature and location of these sources. The District obtained two new mercury data sets in 2023, discussed below:

1. **Concentration values from USGS mercury isotope sampling:**
   In 2022, the District collected samples of influent at the plant and in the collection system to provide to the USGS Mercury Lab for isotope analysis, which is used to characterize the sources of mercury in a sample based on the proportion of different mercury isotopes. Specifically, different mercury isotopes are associated with more photochemical processing (indicating environmental sources) and less photochemical processing (indicating industrial/manufactured sources), which could help the District roughly categorize where mercury in its influent is coming from and in what proportions.

   The 2022 samples have as of this report not been analyzed for mercury isotopes due to instrument issues in the analysis lab. However, the USGS provided concentration data for the samples. The collection system samples were collected from two sewersheds with different building uses. One sewershed was a primarily residential subdivision (Q153) only a few years old (i.e., with no historical or current facilities with mercury uses), and the other sewershed (Q97) was a mixed-use, older sewershed containing homes, a school, an auto shop, and a dental clinic. The USGS concentration data for these sites follows:

Site/Date	Dissolved Organic Carbon, mg/L	Filtered Methylmercury, ng/L	Filtered Total Mercury, ng/L	Particulate Methylmercury, ng/L	Particulate Total mercury, ng/L	Particulate Methylmercury, ng/g of dry material	Particulate Total mercury, ng/g	Suspended Particulate Matter, mg/L
HEADWORKS-INFLUENT	47.72	0.36	4.56	0.82	39.00	3.90	184.66	211.20
5-Nov	42.10	0.34	3.80	0.90	25.20	4.54	127.42	197.77
6-Nov	45.30	0.38	3.99	0.97	46.00	4.20	199.09	231.05
7-Nov	37.30	0.41	4.00	0.92	47.30	4.36	223.27	211.85
8-Nov	68.60	0.42	5.06	0.62	28.20	3.00	135.60	207.96
9-Nov	45.30	0.26	5.96	0.71	48.30	3.40	232.89	207.39
USER CHARGE Q153	50.10	0.20	2.67	0.29	8.72	1.52	45.56	191.28
1-Nov	61.80	0.21	2.56	0.22	10.10	0.98	45.17	223.59
7-Nov	38.40	0.19	2.78	0.36	7.33	2.28	46.11	158.98
USER CHARGE Q97	68.90	0.14	22.82	0.37	287.70	2.36	1831.54	157.08
10-Oct	62.90	0.20	7.63	0.42	83.40	2.51	495.65	168.27
11-Oct	74.90	0.08	38.00	0.32	492.00	2.18	3372.23	145.90

There are some notable observations in this data set:

- The filtered and particulate total mercury values in Q97 (the mixed-use sewershed) are substantially higher than the values in Q153 (the newer, primarily residential sewershed), indicating potential new or historical sources of mercury in Q97.
- Of the two values collected for Q97, the Oct. 10 sample (the composite collected over the previous weekend) had a much lower concentration than the Oct. 11 sample (the composite collected for the previous Monday). Although only two data points, the higher value on a weekday opposed to a weekend may indicate a mercury discharge occurring from operations during business hours.

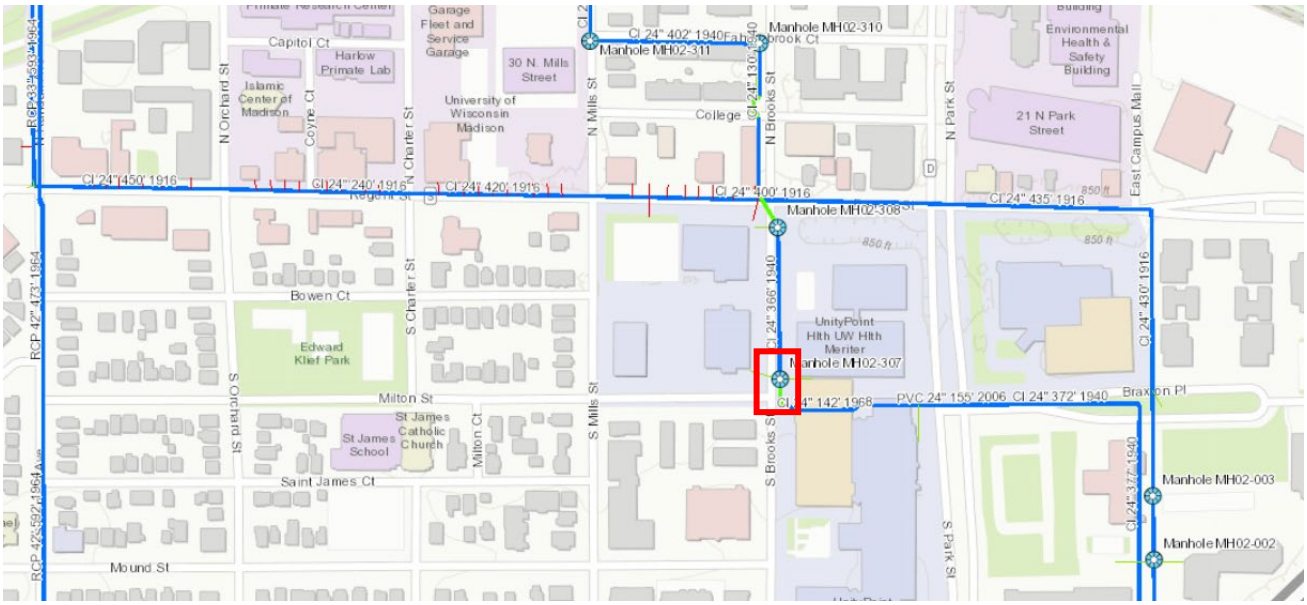
- The influent values for the samples taken at Headworks at the plant were generally consistent and in the same range as the typical monthly influent sample, indicating a low degree of variation in influent mercury in the sampling period.

The District intends to further investigate mercury concentrations at these sites in 2024 to see how additional values compare with this initial data.

2. **Concentration values from follow-up sampling downstream of medical facilities**
The District has been collecting sewer sludge samples as opportunities arise in the collection system, such as during sewer cleaning projects, to analyze for mercury. Compared to mercury levels in other collected sludge samples, the District recorded a much higher value in 2020 sampling for a stretch of sewer that receives wastewater from multiple healthcare facilities, including a lab. This sampling took place during sewer cleaning in that area, so it's possible that this higher value was due to legacy mercury dislodged during jetting, but the District wanted to determine whether the lab (historically a user type implicated in mercury discharges) was contributing new mercury to the sewer system.

To investigate the possibility of new mercury discharges, the District collected four special samples at the same point where the high value had been recorded, just downstream of the lab. 24-hour composite samples were collected at manhole 02-307 (bounded in red in the map below). The date indicates when the sample was collected, so the value corresponds to the 24-hour period prior to collection:

Date	Mercury concentration (ppt)
4/17/2023	88.3
4/18/2023	70.7
4/19/2023	50.5
4/20/2023	21.3



The concentration values for this sampling site were similar to the typical influent mercury concentrations recorded at the treatment plant, so it did not appear from this sampling event that there was a disproportionately large source of mercury upstream of the sampling site. No further sampling is currently planned for this site.