REGION 1

NEW ENGLAND REGIONAL LABORATORY
NORTH CHELMSFORD, MA 01863

Date: July 15, 2024

Subject: Reconnaissance and Sampling Inspection Report
Clean Water Act – National Pollutant Discharge Elimination System
Worcester, MA

From: Anna Hatke, Inspector
Laboratory Services and Applied Science Division (LSASD)
Field Services Branch (FSB)

ANNA HATKE
Digitally signed by ANNA HATKE
Date: 2024.07.15 16:09:15 -04'00'

Reviewed By: Jerome Keefe, Investigations Team Leader
LSASD-FSB

JEROME KEEFE
Digitally signed by JEROME KEEFE
Date: 2024.07.16 12:59:53 -04'00'

To: Todd Borci, Manager
Enforcement and Compliance Assurance Division (ECAD)
Water Compliance Section 1

CC: Douglas Koopman, Inspector
ECAD

I. Facility Information

A. Facility Name: City of Worcester, MA
B. Facility Location: Worcester, MA
C. Facility Contact: Jay J. Fink, Commissioner, Dept. of Public Works and Parks, dpw@worcesterma.gov, (508) 929-1300
D. NPDES Permit ID: MAS010002 (MS4)

II. Background Information

A. Date/Start time of Reconnaissance inspection: **05/16/2024 11:02**
*B. Weather conditions: R*ainy, approx. 57°F
C. USEPA Representatives: Anna Hatke, Michelle Coombs
D. State/Local Representatives: N/A

A. Date/Start time of sampling inspection: **05/028/2024 09:45**
*B. Weather conditions: S*unny, approx. 70°F

C. USEPA Representatives: Anna Hatke, Michelle Coombs
D. State/Local Representatives: N/A
E. Federally Enforceable Requirements Investigated: Stormwater discharges and certain non-stormwater discharges from the Worcester, MA Municipal Separate Storm Sewer Systems (MS4) are authorized by the National Pollutant Discharge Elimination System (NPDES) General Permit for the Discharge of Stormwater from Small MS4 (hereinafter, the Permit), issued by the Environmental Protection Agency (EPA) Region 1. The City obtained coverage under the Permit with NPDES Permit ID MAS010002.
F. Pollutants Sampled: Pharmaceuticals and Personal Care Products (PPCPs), E. coli/Enterococcus, Ammonia (nitrogen), Total Chlorine, and Surfactants

III. Disclaimer:

Unless otherwise noted, this report describes conditions at the facility/property as observed by EPA inspector(s), and/or through records provided to and/or information reported to EPA inspector(s) by facility representatives and as understood by the inspector(s). This report may not capture all operations or activities ongoing at the time of the inspection. This report does not make final determinations on potential areas of concern. Nothing in this report affects EPA's authorities under federal statutes and regulations to pursue further investigation or action.

IV. Type and Purpose of Inspection(s)

The purpose of the reconnaissance inspection was to locate stormwater outfalls which discharge into Coal Mine Brook, O'Hara Brook, Fitzgerald Brook, and Lake Quinsigamond, while noting appearance, presence of flow, and access requirements for one or more sampling inspections.

The purpose of the compliance sampling inspection was to identify potential illicit connections or illegal discharges within the Worcester, MA MS4 that may adversely impact the water quality in Coal Mine Brook, O'Hara Brook, Fitzgerald Brook, and Lake Quinsigamond. Samples were collected from 7 locations in accordance with the FSB Investigations Team Stormwater Program Plan.

V. Permittee Details

The City of Worcester occupies approximately 38.5 square miles in Worcester County, MA approximately 39 miles east of Boston, MA. The city shares borders with the municipalities of Holden and West Boylston to the north, Shrewsbury and North Grafton to the east, Millbury and Auburn to the south, Paxton, and Leicester to the west. According to the 2020 U.S. Census, the population of Worcester, MA was 206,518.

VI. 05/16/2024 Reconnaissance Inspection Summary

On May 16, 2024, Anna Hatke, Nafisah Ali, and Tori Macleod ("the EPA Inspection Team") conducted an unannounced reconnaissance inspection of the Worcester, MA MS4 at the locations described in Section VIII, including locations described under the map of the sample locations. They were not accompanied by any city or state representatives. The inspection started near 616

Plantation St, Worcester, MA at approximately 11:02. At the time of the inspection, the weather was rainy and approximately 57 °F.

According to the National Weather Service (NWS) for the Worcester Regional Airport (KORH) the last precipitation event prior to the inspection occurred on May 14, 2024, with 0.47 inches recorded. There was precipitation recorded within the 72 hours before the inspection of 0.02 inches on May 12, 2024. According to the NWS, in the month (to date) of May, the area observed 2.61 inches of rain, which is approximately 146% of the 30-year normal value of 1.78 inches. According to the US Drought Monitor, as of May 16, 2024, Worcester County is experiencing no drought conditions.

VII. 05/28/2024 Sampling Inspection Summary

On May 28, 2024, the EPA Inspection Team conducted an unannounced compliance sampling inspection of the Worcester, MA MS4 at the locations described in Section VIII. They were not accompanied by any city or state representatives. The inspection started near 616 Plantation St, Worcester, MA at approximately 9:45. At the time of the inspection, the weather was partly sunny and approximately 70 °F.

According to the National Weather Service (NWS) for the Worcester Regional Airport (KORH) the last precipitation event prior to the inspection occurred on 05/28/2024 with 0.00 inches recorded. There was precipitation recorded within the 72 hours before the inspection, on May 27, 2024, of 0.66 inches. According to the NWS, in the month (to date) of May, the area observed 7.01 inches of rain, which is approximately 220% of the 30-year normal value of 3.19 inches. According to the US Drought Monitor, as of May 28, 2024, Worcester County is experiencing no drought conditions.

The sampling locations described in Section VIII were field screened using test kits for ammonia (nitrogen), surfactants, and total chlorine. In-situ measurements for specific conductivity, salinity, and temperature were also measured using a YSI water quality meter and recorded. Field data were recorded on field data sheets. Samples were delivered to and analyzed for E. coli, Enterococcus, and PPCPs at the EPA New England Regional Laboratory (NERL) in North Chelmsford, MA. Table 1 below summarizes the sampling and analytical data.

VIII. Description of Sampling Locations (in order of collection time)

Photographs depicting each sample location are included in Appendix A of this report.

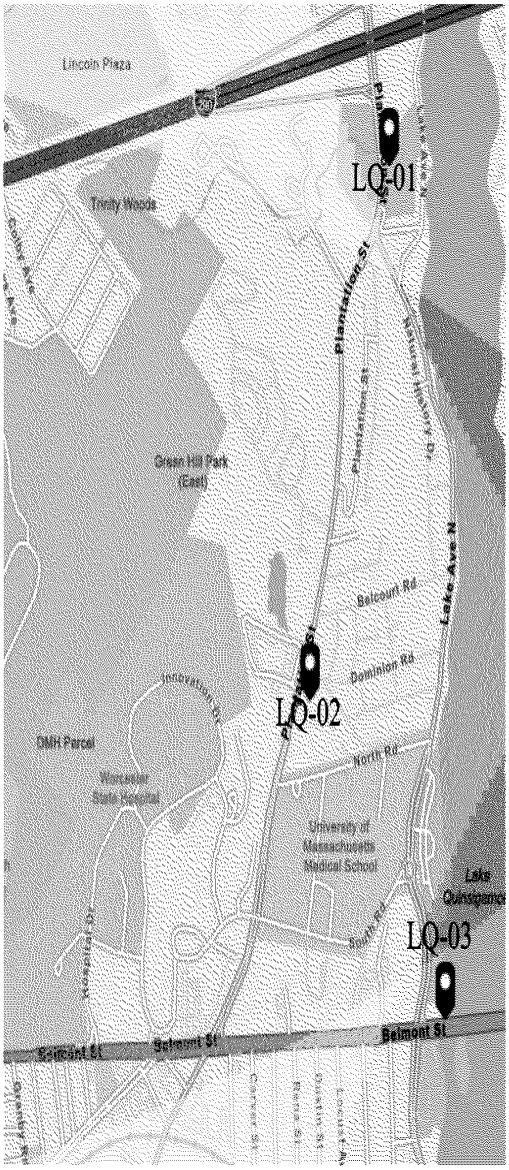
- **LQ-01**: One of two circular concrete outfalls on either side of a large rectangular culvert, approximately 3 feet in diameter located at 616 Plantation Street. Discharge flow was approximately 20 gallons per minute ("gpm") into Coal Mine Brook. Sample was collected at the mouth of the right-side outfall, looking up-stream. A light sewage and musty odor was detected. Color was clear and turbidity was low. No floatables were observed. Dark green algae growth was observed on the inside of the concrete pipe. Trash was observed in the stream directly downstream of the outfall. Outfall sampled was chosen based on the Worcester, MA stormwater sewer system map.
- **LQ-02:** One circular concrete outfall located at the base of a stone wall beside a construction site, approximately 4 feet in diameter located at 382 Plantation Street.

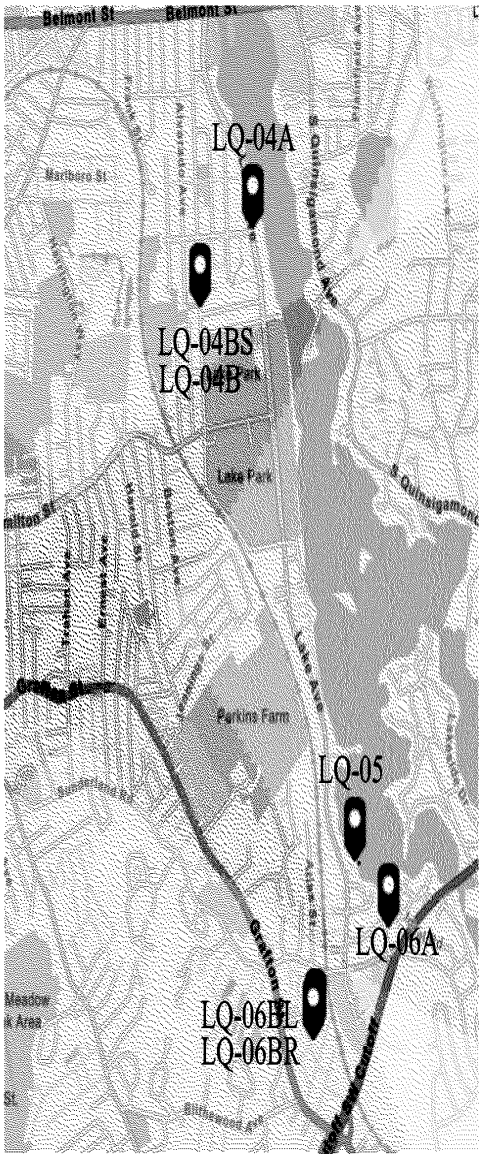
Discharge flow was approximately 5 gpm into an unnamed stream/brook. Sample was collected at the mouth of the outfall. A musty odor was detected. Color was clear and some particulate matter was observed. Foam clusters were observed coming from the mouth of the outfall. The outfall was three-quarters submerged.

- **LQ-04BS**: In-stream sample of Fitzgerald Brook discharging into Lake Quinsigamond collected at 240 Coburn Avenue. The sample was collected approximately 5 feet from the Northern bank of the stream at the mouth of a stone culvert outflow approximately 50 feet downstream of LQ-04B. A sewage odor was detected. Color was clear-brown, and turbidity was low. Foam was observed coming out of the culvert and collecting in an eddy directly downstream. Dark brown algae growth was observed on the rocks and stream bed directly downstream of the culvert. Trash and grass clippings were observed in and around the stream directly downstream of the culvert.
- **LQ-04B**: A singular circular clay outfall approximately 1 foot located on the inside of a concrete stormwater conveyance structure on the East side of a stone wall culvert at 240 Coburn Avenue. Discharge flow was approximately <1 gpm into Fitzgerald Brook. Sample was collected at the mouth of the outfall. A smaller pipe adjacent to the outflow was observed with no flow. A sweet earthy smell was detected. Color was clear and turbidity was low. No floatables were observed. Dark brown algae growth was observed on the inside of the outfall pipe as well as on the bottom of the concrete conveyance structure. Trash and grass clippings were observed upstream of the outfall. A duplicate sample was taken at this outfall location.
- **LQ-05:** One of two circular concrete outfalls, approximately 2 feet in diameter located at 5 Suntaug Road. Discharge flow was approximately 2 gpm into Lake Quinsigamond. Sample was collected at the mouth of the left-side outfall, looking up-stream. A slight brackish and rank odor was detected. Color was clear and turbidity was low. No floatables were observed. Green algae growth was observed on the inside of the concrete pipe as well as the flume leading directly into Lake Quinsigamond. Outfall sampled was chosen based on the Worcester, MA stormwater sewer system map.
- **LQ-06BL**: One of two circular concrete outfalls on either side of a larger circular concrete culvert, approximately 3 feet in diameter located at 10 Crane Street. Discharge flow was approximately 1 gpm into an unnamed stream discharging into Lake Quinsigamond. Sample was collected at the mouth of the left-side outfall, looking up-stream. No notable odor was detected. Color was clear and some suspended particulates were observed. Off-white foam was observed coming from the outfall and collecting directly downstream of the outfall.
- **LQ-06BR**: One of two circular concrete outfalls on either side of a larger circular concrete culvert, approximately 1.5 feet in diameter located at 10 Crane Street. Discharge flow was approximately 5 gpm into an unnamed stream discharging into Lake Quinsigamond. Sample was collected at the mouth of the right-side outfall, looking up-stream. No notable odor was detected. Color was clear and some suspended particulates were observed. Foam was observed coming from the outfall and orange staining was observed on both the inside of the outfall pipe and on the rocks directly downstream of the outfall.

Map of Sample Locations

Note: the locations on the map were estimated using Google Earth and are used for display purposes only.





Note:
LQ-03: No flow
LQ-04A: No flow
LQ-06A: Outfall was 80% submerged and no flow was observed/ water was stagnant

Table 1: Summary of Sampling and Analytical Data

Location	Site ID	LQ-01	LQ-02	LQ-04BS	LQ-04B	LQ-05
	Sample Date	05/28/24	05/28/24	05/28/24	05/28/24	05/28/24
	Sample Time	9:59	10:42	11:53	12:20	13:00
Coordinates[1] (decimal degrees)	North	42.2909	42.2803	42.2640	42.2641	42.2446
	West	-71.7600	-71.7638	-71.7592	-71.7592	-71.7472
YSI Meter	Salinity, ppt.	0.7	0.4	0.2	0.1	0.2
	Temperature, °C	16.5	21.6	15.0	13.1	17.4
	Conductivity, µS/cm	1363	784.0	428.3	177.3	376.4
Field Test Kits (mg/L)	Ammonia	0.20	0.25	0.25	0.25	0.25
	Total Chlorine	0.10	0.04	0.03	0.02	0.02
	Surfactants	0.40	0.25	0.25	0.25	0.25
Bacteria (MPN/100mL)	E. coli	2747	3466	9678	16	308
	Enterococcus	[redacted]	[redacted]	886	31	355
PPCPs (ng/L)	Cotinine	9.1	4.0	7.3	5.6	2.1
	Acetaminophen	[redacted]	3.7	[redacted]	ND	[redacted]
	Paraxanthine	50	2.2	43	53	21
	Atenolol	ND	ND	ND	ND	ND
	Caffeine	170	63	[redacted]	24	160
	Metoprolol	ND	ND	ND	ND	ND
	Diphenhydramine	2.5	ND	1.9	0.75	ND
	Carbamazepine	5.1	ND	0.77	ND	ND

Abbreviations and Notes:

1. The coordinates listed in Table 1 were derived from the map created in Google Earth, therefore the coordinates are estimates of the actual locations.

N/A: Not Analyzed

ND: Not Detected above Reporting Limit

E. Coli/Fecal Coliform: [redacted], Orange ≥ 1,260 col/100ml, Yellow ≥ 235 col/100ml, Black < 235 col/100ml

Entero: Red ≥ 1,[redacted], Orange ≥ 350, Yellow ≥ 61 col/100ml, Black < 61 col/100ml

NH_3: Red ≥ 6 mg/L, Orange ≥ 0.5 mg/L, Yellow ≥ 0.25 mg/L, Black < 0.25 mg/L

Cl_2: Red ≥ 1.0 mg/L, Orange ≥ 0.3 mg/L, Yellow ≥ 0.02 mg/L, Black < 0.02 mg/L

Surfactants: Red ≥ 1.0 mg/L, Orange ≥ 0.5 mg/L, Yellow ≥ 0.25 mg/L, Black < 0.25 mg/L (may give false positive at salinity greater than 1 ppt)

PPCPs: Red ≥ 100x the RL, Orange ≥ 10x the RL, Yellow ≥ 3x the RL; Black < 3x the RL*

*See Reporting Limit (RL) values for each compound in attached Laboratory Report for Source Tracking

EPA notes while there are currently no numerical standards to compare pharmaceutical results against, it is EPA's experience that acetaminophen is the single best bacterial source tracking compound of those listed above, and any detection of this compound may indicate a source of sanitary sewage. With respect to all of the above compounds, when a sanitary sewage source is present, depending on the type of source, distance from the sample location, and the strength of the source, concentrations of these compounds may range from the low ng/l range up to thousands of ng/L.

Table 1: Summary of Sampling and Analytical Data, cont.

Location	Site ID	LQ-06BL	LQ-06BR
	Sample Date	05/28/24	05/28/24
	Sample Time	13:48	13:50
Coordinates[1] (decimal degrees)	North	42.2387	42.2387
	West	-71.7506	-71.7506
YSI Meter	Salinity, ppt.	0.1	0.2
	Temperature, °C	14.2	14.4
	Conductivity, µS/cm	211.8	40.36
Field Test Kits (mg/L)	Ammonia	0.15	0.25
	Total Chlorine	0.00	0.00
	Surfactants	0.25	0.25
Bacteria (MPN/100mL)	E. coli	39	8
	Enterococcus	31	ND
PPCPs (ng/L)	Cotinine	ND	1.4
	Acetaminophen	ND	ND
	Paraxanthine	ND	2.9
	Atenolol	ND	ND
	Caffeine	ND	14
	Metoprolol	ND	ND
	Diphenhydramine	ND	ND
	Carbamazepine	ND	0.41

Abbreviations and Notes:

1. The coordinates listed in Table 1 were derived from the map created in Google Earth, therefore the coordinates are estimates of the actual locations.

N/A: Not Analyzed

ND: Not Detected above Reporting Limit

E. Coli/Fecal Coliform: [redacted], Orange ≥ 1,260 col/100ml, Yellow ≥ 235 col/100ml, Black < 235 col/100ml

Entero: Red ≥ 1,000 [redacted], Orange ≥ 350 col/100ml, Yellow ≥ 61 col/100ml, Black < 61 col/100ml

NH_3: Red ≥ 6 mg/L, Orange ≥ 0.5 mg/L, Yellow ≥ 0.25 mg/L, Black < 0.25 mg/L

Cl_2: Red ≥ 1.0 mg/L, Orange ≥ 0.5 mg/L, Yellow ≥ 0.02 mg/L, Black < 0.02 mg/L

Surfactants: Red ≥ 1.0 mg/L, Orange ≥ 0.5 mg/L, Yellow ≥ 0.25 mg/L, Black < 0.25 mg/L (may give false positive at salinity greater than 1 ppt)

PPCPs: Red ≥ 100x the RL, Orange ≥ 10x the RL, Yellow ≥ 3x the RL; No Pink < 3x the RL*

*See Reporting Limit (RL) values for each compound in attached Laboratory Report for Source Tracking

EPA notes while there are currently no numerical standards to compare pharmaceutical results against, it is EPA's experience that acetaminophen is the single best bacterial source tracking compound of those listed above, and any detection of this compound may indicate a source of sanitary sewage. With respect to all of the above compounds, when a sanitary sewage source is present, depending on the type of source, distance from the sample location, and the strength of the source, concentrations of these compounds may range from the low ng/l range up to thousands of ng/L.

IX. Appendix

Appendix A: Photograph Log

X. Attachments

Attachment A: Laboratory Report for PPCPs (Source Tracking) Analysis
Attachment B: Laboratory Report for E. coli Analysis
Attachment C: Laboratory Report for Enterococcus Analysis

End of Report

Appendix A
Photograph Log

Photo 1: LQ-01 (photo taken 05/28/2024 at approx. 9:59) Stream located near 616 Plantation St, discharging into Coal Mine Brook, upstream of Lake Quinsigamond. Sample point is indicated by a red X.

Photo 2: LQ-02 (photo taken 05/28/2024 at approx. 10:42) Outfall located near 382 Plantation Street, discharging into the unnamed stream uphill of Lake Quinsigamond. Sample points are indicated by a red X.

Photo 3: LQ-04BS (photo taken 05/28/2024 at approx. 11:53) Stream located near 240 Coburn Ave, is Fitzgerald Brook which discharges into Lake Quinsigamond. In-stream Sample points are indicated by a red X.

Photo 4: LQ-04B (photo taken 05/28/2024 at approx. 12:20) Outfall located near 240 Coburn Ave, discharging into Fitzgerald Brook which discharges into Lake Quinsigamond. Sample points are indicated by a red X.

Photo 5: LQ-05 (photo taken 05/28/2024 at approx. 13:00) Outfall located near 5 Suntaug Road, discharging into Lake Quinsigamond. Sample points are indicated by a red X.

Photo 6: LQ-06BL (photo taken 05/28/2024 at approx. 13:48) Outfall located near 10 Crane Street, discharging into an unnamed stream that discharges into Lake Quinsigamond. Sample points are indicated by a red X.

Photo 7: LQ-06BR (photo taken 05/28/2024 at approx. 13:50) Outfall located near 10 Crane Street, discharging into the unnamed stream that discharges into Lake Quinsigamond. Sample points are indicated by a red X.

Attachment A
Laboratory Report for
Source Tracking Analysis

Author: LSASD Laboratory Services Branch
Pages: 16

Attachment B
Laboratory Report for
E. coli Analysis

Author: LSASD Laboratory Services Branch
Pages: 4

Attachment C
Laboratory Report for
Enterococcus Analysis

Author: LSASD Laboratory Services Branch
Pages: 4

End of Report