UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
New England Regional Laboratory
Laboratory Services and Applied Sciences Division
11 Technology Drive
North Chelmsford, MA 01863-2431

Drafted Date: 08/08/2023
Finalized Date: 09/05/2023

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

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

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

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 sampling inspection: 08/02/2023 09:50
B. Weather conditions: sunny, approx. 70 °F
C. USEPA Representatives: Shannon Shea, Nafisah Ali
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 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 Poor Farm Brook, O'Hara Brook, Coal Mine 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 205,319.

VI. 08/02/2023 Sampling Inspection Summary

On 08/02/2023 EPA employees Shannon Shea and Nafisah Ali ("the EPA Inspection Team") conducted an unannounced compliance sampling inspection of the Worcester, MA MS4 at the locations described in Section VII. They were not accompanied by any city or state representatives. The inspection started near 240 Coburn Ave at approximately 09:50. At the time of the inspection, the weather was 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 07/29/2023 with 0.80 inches recorded. There was no precipitation recorded within the 72 hours before the inspection. According to the NWS, in the month (to date) of August, the area observed 5.64 inches of rain, which is approximately 149% of the 30-year normal value of 3.77 inches. According to the US Drought Monitor, as of 08/24/2023 Worcester County is experiencing no drought conditions.

The sampling locations described in Section VII 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.

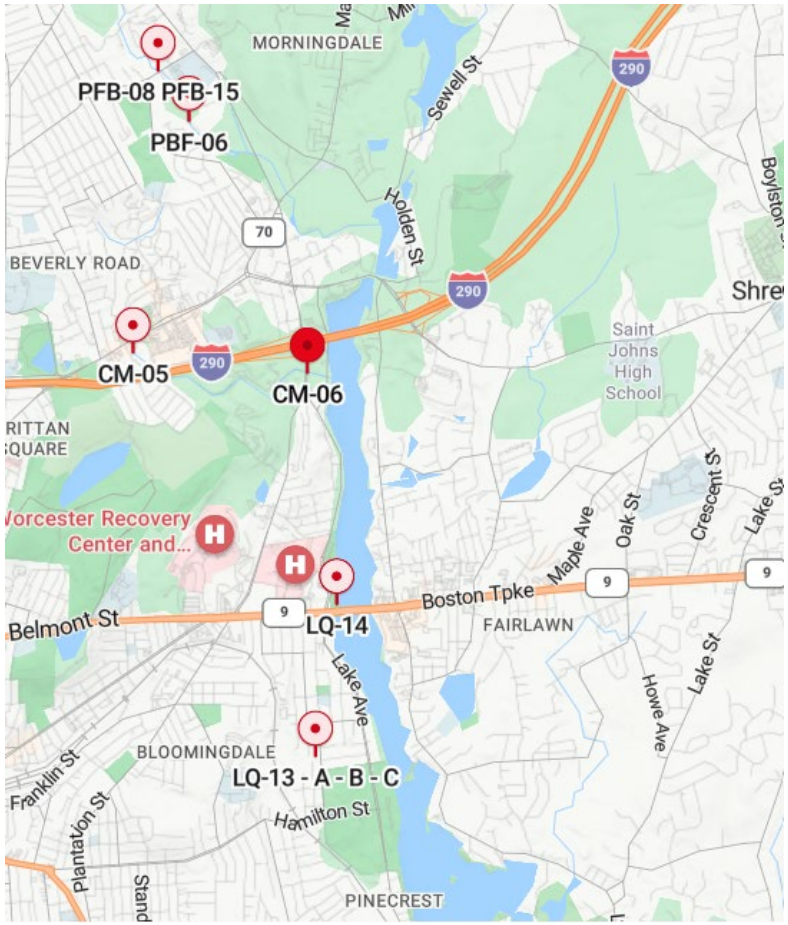
VII. Description of Sampling Locations (in order of collection time)

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

- **LQ-13B**: in-stream sample of an unnamed stream discharging to Lake Quinsigamond collected on the east side of the stone wall located at 240 Coburn Ave. Sample was collected approximately 2.5 feet from the western bank of the stream and 4 feet upstream from the entrance to the concrete stormwater conveyance structure. The concrete structure entrance is blocked by metal bars with broken concrete at the base. No odor was observed. Color was clear with fine particulate matter. No floatables were observed.
- **LQ-13C**: a single, PVC, circular outfall, approximately 12 inches in diameter, located on the east side of the stone wall located at 240 Coburn Ave inside the concrete stormwater conveyance structure. Discharge flow was approximately less than 5 gallons per minute (gpm) into an unnamed stream discharging to Lake Quinsigamond. Sample was collected at the mouth of the outfall. A sulfur odor was observed. Color and turbidity were clear. No floatables were observed.
- **LQ-13A**: in-stream sample of an unknown source discharging to Lake Quinsigamond collected on the east side of the stone wall located at 240 Coburn Ave. Sample was collected inside the concrete stormwater conveyance structure approximately 2 feet upstream of outfall LQ-13C and prior to convergence with the unnamed stream. A sulfur/feces odor was detected. Color and turbidity were clear. No floatables were observed.
- **CM06**: a single, stone, rectangular outfall, approximately 36 inches in height and 30 inches in width, located at 630 Plantation St. Discharge flow was approximately 5 gpm into Lake Quinsigamond. Sample was collected at the mouth of the outfall. A musty odor was observed. Color and turbidity were clear. Floatables observed include leaves and vegetation. Green algae growth was observed on the rocks downstream of the outfall. Heavy sediment build up was observed at the mouth of the outfall.
- **CM05**: a single, steel circular outfall, approximately 42 inches in diameter, located at 481 Lincoln Street. Discharge flow was approximately 20 gpm into Coal Mine Brook. Sample was collected at the mouth of the outfall. No odor was detected. Color and turbidity were clear. No floatables observed. Brown algae growth observed on the bottom of the pipe. Outfall rusted and corroded. Holes present on the bottom of the pipe. A murky gray/brown color was observed in the stream directly downstream of the outfall.
- **PFB-08(left)**: a double (with PFB-15(right)), concrete, circular outfall, approximately 60 inches in diameter, located at 275 Clark Street. Discharge flow was approximately 20 gpm into Poor Farm Brook. Sample was collected at the mouth of the outfall. No odor was detected. Color and turbidity were clear. Some suds were present on the effluent surface. Brown and green algae growth was observed inside the pipe. Light to medium sediment build up was observed on the bottom of the pipe and at the mouth of the outfall.
- **PFB-15(right)**: a double (with PFB-08(left)), concrete, circular outfall approximately 60 inches in diameter, located at 275 Clark Street. Discharge flow was approximately 20 gpm into Poor Farm Brook. Sample was collected at the mouth of the outfall. No odor was detected. Color and turbidity were clear. Some suds were present on the effluent surface. Brown and green algae growth was observed inside the pipe. Light to medium sediment build up was observed on the bottom of the pipe and at the mouth 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:
PBF-06: Inaccessible due to heavy vegetation growth
LQ-14: No flow

Table 1: Summary of Sampling and Analytical Data

Location	Site ID	LQ-13B	LQ-13C	LQ-13A	CM-06	CM-05
	Sample Date	08/02/23	08/02/23	08/02/23	08/02/23	08/02/23
	Sample Time	10:00	10:10	10:20	11:24	11:57
Coordinates[1] (decimal degrees)	North	42.2639	42.2639	42.2639	42.3091	42.2933
	West	-71.7593	-71.7593	-71.7593	-71.7723	-71.7769
YSI Meter	Salinity, ppt.	0.1	0.1	0.1	0.8	0.4
	Temperature, ºC	16.0	18.6	17.3	13.4	20.8
	Conductivity, µS/cm	309.5	260.5	262.4	1535	895
Field Test Kits (mg/L)	Ammonia	0.25	0.25	0.0	0.25	0.25
	Total Chlorine	0.14	0.10	0.17	0.15	0.19
	Surfactants	0.25	0.25	0.25	0.25	0.25
Bacteria (MPN/100mL)	E. coli	384	21	3466	192	>9678
	Enterococcus	173	ND	588	122	1850
PPCPs (ng/L)	Cotinine	1.5	0.57	5.4	ND	28
	Acetaminophen	ND	ND	170	ND	510
	Paraxanthine	5.8	ND	33	ND	400
	Atenolol	ND	ND	ND	ND	7.1
	Caffeine	18	ND	120	ND	500
	Metoprolol	ND	ND	3.4	ND	8.2
	Diphenhydramine	ND	1.2	2.3	ND	7.5
	Carbamazepine	ND	ND	1.6	ND	2.0

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: Red ≥ 10,000 col/100ml, Orange ≥ 1,260 col/100ml, Yellow ≥ 235 col/100ml, Black < 235 col/100ml

Entero: Red ≥ 1,000 col/100ml, 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.

	Site ID	PBF-08(left)	BPF-15(right)
Location	Sample Date	08/02/23	08/02/23
	Sample Time	12:45	13:05
Coordinates[1] (decimal degrees)	North	42.3124	42.3124
	West	-71.7749	-71.7749
YSI Meter	Salinity, ppt.	0.3	0.1
	Temperature, ºC	18.6	18.7
	Conductivity, µS/cm	595	601
Field Test Kits (mg/L)	Ammonia	0.25	0.25
	Total Chlorine	0.13	0.16
	Surfactants	0.25	0.25
Bacteria (MPN/100mL)	E. coli	208	124
	Enterococcus	85	31
PPCPs (ng/L)	Cotinine	2.4	0.84
	Acetaminophen	25	ND
	Paraxanthine	16	2.0
	Atenolol	ND	ND
	Caffeine	150	9.2
	Metoprolol	ND	ND
	Diphenhydramine	ND	ND
	Carbamazepine	0.53	0.48

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: Red ≥ 10,000 col/100ml, Orange ≥ 1,260 col/100ml, Yellow ≥ 235 col/100ml, Black < 235 col/100ml

Entero: Red ≥ 1,000 col/100ml, 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; 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.

VIII. Appendix

Appendix A: Photograph Log

IX. 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-13B (photo taken 08/02/2023 at approx. 10:24) Stream located near 240 Coburn Ave, discharging into the unnamed stream to Lake Quinsigamond. Sample point is indicated by a red X.

Photo 2: LQ-13C (photo taken 08/02/2023 at approx. 10:24) Outfall located near 240 Coburn Ave, discharging into the unnamed stream to Lake Quinsigamond. Sample points are indicated by a red X.

Photo 3: LQ-13A (photo taken 08/02/2023 at approx. 10:24) Stream located near 240 Coburn Ave, discharging into the unnamed stream to Lake Quinsigamond. Sample points are indicated by a red X

Photo 4: CM-06 (photo taken 08/02/2023 at approx. 11:31) Outfall located near 630 Plantation Street, discharging into the unnamed stream discharging to Lake Quinsigamond. Sample points are indicated by a red X

Photo 5: CM-05 (photo taken 08/02/2023 at approx. 12:03) Outfall located near 481 Lincoln Street, discharging into the unnamed stream discharging to Cole Mine Brook. Sample points are indicated by a red X

Photo 6: PFB-08(left) (photo taken 08/02/2023 at approx. 12:45) Outfall located near 275 Clark Street, discharging into the unnamed stream discharging to Poor Farm Brook. Sample points are indicated by a red X

Photo 7: PFB-15(right) (photo taken 08/02/2023 at approx. 13:00) Outfall located near 275 Clark Street, discharging into the unnamed stream discharging to Poor Farm Brook. 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